Robert J. Marks II

Curriculum Vitae

September 5, 2016

Contents

1 Education **4**

2 Contact Information **4**

3 Employment History **4**

4 Recognition **5**
- 4.1 Honors & Awards . . . 5
- 4.2 Listings . . . 6
- 4.3 Honorary Conference Positions . . . 8

5 Professional Societies **9**
- 5.1 Publications . . . 9
- 5.2 Administrative . . . 10
- 5.3 Conferences . . . 13

6 Publications **16**
- 6.1 Books . . . 16
- 6.2 Journal Articles . . . 17
- 6.3 Proceedings & Other Publications . . . 30
- 6.4 Book Chapters . . . 50
- 6.5 Patents . . . 53
- 6.6 Abstracts . . . 54
- 6.7 Videos . . . 58
  - 6.7.1 Lectures . . . 58
  - 6.7.2 Classes . . . 60
- 6.8 Selected Talks (since 2003) . . . 61
- 6.9 Tutorials . . . 65
- 6.10 Technical Essays . . . 66

7 Research Grants & Contracts **66**

8 Courses Taught **70**
8.1 Baylor University . . . 70
8.2 University of Washington . . . 70

9 Consulting & Other External Activities **71**
9.1 Organizations . . . 71
9.2 Expert Witness . . . 72
9.3 Consulting . . . 72

10 Statistics **73**
10.1 Publication Count . . . 73
10.2 Erdös and Bacon Numbers . . . 73
10.3 Citation Count . . . 74
10.4 Website Rankings . . . 74

11 Appendices **75**
11.1 Graduate Theses and Dissertations . . . 75
11.1.1 Students Advised . . . 75
11.1.2 Cross Disciplinary Research . . . 77
11.2 Coauthors . . . 78
11.2.1 Publications with Nationals . . . 81
11.3 Journals . . . 82
11.4 Venues . . . 83
11.5 Citation List . . . 88
11.6 Selected Citation Quotes . . . 96
11.6.1 The Piecewise Isoplanatic Approximation . . . 96
11.6.2 Space Variant Sampling Theory . . . 96
11.6.3 Ambiguity Function Display . . . 97
11.6.4 Phase Coded Reference Beams . . . 97
11.6.5 Shift Variant Sampling Theory . . . 97
11.6.6 Optimal Detection in Laplace Noise . . . 98
11.6.7 Single Input Ambiguity Function . . . 98
11.6.8 Temporal Holography . . . 98
11.6.9 Light Speed Extrapolation . . . 99
11.6.10 Differintegral Interpolation . . . 99
11.6.11 Tomographic Posedness . . . 100
11.6.12 Restoring Lost Samples . . . 100
11.6.13 Derivative Interpolation Noise Sensitivity . . . 100
11.6.14 Ill-Posed Sampling Theorems . . . 100
11.6.15 Derivative Noise Sensitivity . . . 102
11.6.16 Nonintersecting Convex Set POCS . . . 102
11.6.17 Sample Dependency at Nyquist Rates . . . 103
11.6.18 Matched Filter Error Correction . . . 103

11.6.19 Detector Relative Efficiencies . . . 103
11.6.20 Hopfield: Synchronous Versus Asynchronous . . . 104
11.6.21 Associative Memories With Nonlinearities in the Correlation Domain 104
11.6.22 Optical POCS . . . 104
11.6.23 Algebraic Optical Processors Error Correction . . . 104
11.6.24 Alternating Projection Neural Networks . . . 104
11.6.25 Sampling Below Nyquist Without Aliasing . . . 105
11.6.26 Cone Shaped Kernels: Zamograms . . . 105
11.6.27 Neural Networks Versus CART . . . 110
11.6.28 Load Forecasting . . . 110
11.6.29 Neural Smithing . . . 110
11.6.30 APNN's . . . 110
11.6.31 Kernel Synthesis . . . 111
11.6.32 Shorted Winding Detection . . . 111
11.6.33 Sub-Nyquist Sampling . . . 111
11.6.34 Shannon Sampling Book . . . 112
11.6.35 Radiotherapy . . . 112
11.6.36 ZAM Distribution Properties . . . 112
11.6.37 Fuzzy control of backpropagation . . . 114
11.6.38 r-shrink Wireless Communication . . . 115
11.6.39 Fuzzy Fusion & Annihilation . . . 115
11.6.40 Intelligence: Computational Versus Artificial . . . 115
11.6.41 Vulnerability Indices . . . 116
11.6.42 Time Scale Nonregressivity . . . 117
11.6.43 Protector, Refugee and Aggressor Swarms . . . 117
11.6.44 Active Information . . . 118
11.6.45 Transmitters for spectral conformity . . . 119
11.6.46 Handbook of Fourier Analysis . . . 119
11.6.47 Search for the Search . . . 121
11.6.48 EV Vivisection . . . 122
11.6.49 Going Nonlinear . . . 123
11.6.50 Radar chirp waveform selection . . . 124
11.6.51 Chirp Waveform Selection . . . 124
11.6.52 Spectrally Defined Reconfiguration . . . 125
11.6.53 Unexpected Swarms Behavior . . . 125
11.6.54 Cognitive Radio Networks Using Game Theory . . . 126
11.6.55 Radar Power Amplifier Circuit and Waveform Optimization . . . 126
11.6.56 Solving the Spectrum Crisis . . . 126

1 Education

- Ph.D., Electrical Engineering, Texas Tech University, 1977
- M.S., Electrical Engineering, Rose-Hulman Institute of Technology, 1973
- B.S., Engineering, Rose-Hulman Institute of Technology, 1972

2 Contact Information

- Email: Robert_Marks@Baylor.edu
- Web Page: RobertMarks.org
- Office: Baylor Campus, Rogers Bldg. 305C
- Office Phone: (254) 710-7302
- Mailing Address: One Bear Place #97356, Waco, TX 76798-7356

3 Employment History

- 2003-present: Distinguished Professor of Electrical and Computer Science, Baylor University.
  - 2003-2005: Graduate Program Director, Departments of Mechanical and Electrical & Computer Engineering, Baylor University.
  - 2004-2008: Baylor Christian Graduate Student/Faculty Fellowship, Faculty Advisor.
  - 2004-2007: University Tenure Committee, Chair (2006-2007), Member (2004-2006).
  - 2008-2014: Faculty Search Committee, Chair.
  - 2008-2009: ECE Lecturer Search Committee, Chair.
  - 2008-2011: ECE Tenure Policy Committee, Chair.
  - 2008-present: IEEE Baylor Student Branch, Faculty Advisor.
  - 2009-2011: Baylor Compensation, Benefits, and Personnel Committee, Member.
- 1987-2003: Professor of Electrical Engineering, University of Seattle, Washington.
- 1982-1987: Associate Professor of Electrical Engineering, University of Seattle, Washington.
- 1978-1982: Assistant Professor of Electrical Engineering, University of Seattle, Washington.

- ◇ 1975-1977: Research Assistant, Texas Tech University, Lubbock, Texas.
- ◇ 1974-1975: Reliability Engineer, Crane Naval Weapons Depot, Crane, Indiana.
- ◇ 1972-1973: Graduate Student Teaching Assistant, Rose-Hulman Institute of Technology, Terre Haute, Indiana.
- ◇ 1970-1975: Disc Jockey, WPFR, Terre Haute, Indiana.
- ◇ 1968-1972: Student, Rose-Hulman Institute of Technology, Terre Haute, Indiana.

4 Recognition

4.1 Honors & Awards

- ◇ Fellow of the Optical Society of America (OSA)[1]
- ◇ Fellow of the Institute of Electrical & Electronic Engineers (IEEE)[2]
- ◇ Honorary Inductee: Junior Membership in the Ohio Academy of Science (at the age of eighteen)
- ◇ IEEE Distinguished Lecturer
- ◇ Honorary Member: Puget Sound Section of the Optical Society of America
- ◇ IEEE Centennial Medal and Certificate
- ◇ IEEE Outstanding Branch Counselor/Advisor Award
- ◇ Charter President of the IEEE Neural Networks Council
- ◇ Rose-Hulman Institute of Technology Outstanding Young Alumni Award
- ◇ Texas Tech Electrical Engineering Academy
- ◇ IEEE Neural Networks Council Meritorious Service Award
- ◇ IEEE CASS (Circuits and Systems Society) Golden Jubilee Medal
- ◇ Judith Stitt Award, American Brachytherapy Society 23rd Annual Meeting (2001)
- ◇ NASA Tech Brief Award (2004)
- ◇ Pioneer in Neural Network Award (IJCNN) (2006)
- ◇ IEEE Dallas Section Volunteer of the Year Award (2007)

[1] "For contributions to image recovery and synthesis, optical processing, and eletro-optical neural networks."

[2] "For leadership and contributions to the field of neural networks."

- DARPA[3]

4.2 Listings

- *Access Research Network* top award for the "Top 10 Darwin and Design Science Stories" for 2009.[4]
- CollegeCrunch.org. "The 20 Most Brilliant Christian Professors," April 4, 2010.[5]
- SuperScholar.org. "The 20 Most Influential Christian Scholars," 2010.[6]
- TheBestSchools.org. "The 50 Smartest People of Faith." 2012.[7]

[3] DARPA Radar/Communications Co-Design Challenge (2015) Arlington, VA 22203-2114. "The SSPARC [Shared Spectrum Access for Radar and Communications] program office will bring together a few [four] of the most senior, idea-driven, thoughtful researchers that have spanned both the radar and communications disciplines through their careers and challenge them to offer a vision of how to tackle the joint radar and communications co-design problem."

[4] "*Access Research Network* has just released its annual 'Top 10 Darwin and Design Science Stories' for 2009. Gaining top honors on the list was a peer-reviewed article by intelligent design theorists William Dembski and Robert Marks II in the September 2009 journal IEEE Transactions on Systems, Man and Cybernetics. The authors used computer simulations and information theory to challenge the ability of neo-Darwinian processes to create new functional genetic information."

[5] "The professors listed here are all 'brilliant' in the original sense of the wordthey shine brightly among their peers as towering figures in the academic world. In addition, they are all Christians who do not hide their Christianity and see it as significantly impacting their intellectual work." "Robert J. Marks II, Distinguished Professor of Electrical and Computer Engineering at Baylor University. A founder of the field of computational intelligence (comprising fuzzy sets, neural networks, and evolutionary computing), Marks has published hundreds of articles on an very wide range of problems (everything from optimal detection of non-Gaussian noise to proper placement of radioactive inserts to treat prostate cancer). His work has enormous practical implications that are felt every dayall major North American utilities deliver energy using his work on neural networks. An Christian intent on understanding teleology in nature, Marks founded the Evolutionary Informatics Lab, which publishes peer-reviewed scientific papers supporting the controversial theory of intelligent design."

[6] "Super Scholars 20 most influential Christian scholars have profoundly influenced the world by advancing Christian belief, by reconceptualizing it, or even by fundamentally challenging it. In any case, each of the thinkers below has deeply impacted Western cultures self-understanding." "Robert J. Marks II (b. 1950), Baylor Universitys leading research professor, has emerged as the public face of intelligent design. As the movements premier scientist, he has been dubbed the Charles Darwin of intelligent design. At one point, his research on intelligent design was removed by Baylor officials from the universitys website. Since then he has published seminal work on such themes as whether computers have minds and whether Darwinian processes can generate biological information. He is widely quoted as saying, Computers are no more able to create information than iPods are capable of creating music. His Law of Conservation of Information purports to demonstrate inherent limitations on natural selection, suggesting that the intricate information needed for life requires an intelligent source."

[7] The qualifications for inclusion on our list are twofold

1. Intellectual brilliance, evidenced by a very high level of achievement, whether in the natural sciences, the social sciences, the humanities, literature, the fine arts, or public service; and
2. Religious faith, evidenced either through explicit personal witness or through publicly professed respect for religion.

By religious faith, we mean religion in the monotheistic, or Abrahamic, traditionwhich we happen to know best. We do not doubt that a similar list of brilliant and devout Hindus, Buddhists, Daoists, Confucianists,

- ◇ L. A.Yahaya, "PERSONAL CHARACTERISTICS OF REPUTABLE SCHOLARS" 2013.[8]
- ◇ TheBestSchools.org. "The 50 Most Influential Scientists in the World Today." 2014.[9]

Shintoists, and others could easily be drawn up, and we hope it will be, by those qualified to do so.

It is presented in alphabetical order.

⋮

Robert J. Marks II (b. 1950). Marks was born in West Virginia. He was educated at the Rose-Hulman Institute of Technology (BS, Engineering, 1972; MS, Electrical Engineering, 1973) and Texas Tech (PhD, Electrical Engineering, 1977). He taught for many years at the University of Washington, in Seattle. He is currently Distinguished Professor of Electrical and Computer Engineering at Baylor University, in Waco, Texas. Marks, who is Protestant, has made a number of contributions to cutting-edge technology at the interface between electrical engineering and computer science. For example, in 1991 he was the first to apply artificial neural networks to the problem of forecasting power demands by electrical utility companiesa practice that is widespread today. More recently, Marks and colleagues developed an algorithm for the real-time tracking of the placement of radioactive seeds in prostate cancer therapy. In addition, his team developed the first closed-form solution for the Neyman-Pearson optimal detection of signals in non-Gaussian noise. In 2007, Marks inaugurated his *Evolutionary Informatics Lab*, a web site dedicated to simulating evolutionary processes. The Labwhich has demonstrated severe constraints on the creative potential of Darwinian-style algorithms was afterwards shut down by the Baylor University administration, and Marks has since moved it to a private server. Books: *Fuzzy Logic Technology and Applications*, editor (IEEE, 1994); *Neural Smithing: Supervised Learning in Feedforward Artificial Neural Networks*, co-author (MIT Press/Bradford Books, 1999); *Handbook of Fourier Analysis and Its Applications,* (Oxford UP, 2009)

[8] "Academic profession like other essential professions has its demands. For anyone to succeed in the profession, he/she needs to possess some personal characteristics. The focus of this presentation is to sensitize academic staff, particularly the young academics on the personal characteristics that are required to succeed in academic career. Some notable scholars who possessed the appropriate personality characteristics and that have excelled in academic endavour include: Fransisco Ayala, Abdulhamid Bin Badis, Ali Jabar, Abdul Qader Arnaoot, Peter L. Berger, Benjamin Carson, Hassan Hathont , Francis Collins , Omar Khalidi, Robert J. Marks. Others are...

[9] From biotechnology and digital media to sustainable energy and cloud computing, almost everything today is somehow affectedand sometimes entirely reshapedby scientific and technological advances.

By science in this article we mean the natural and engineering sciences (we thus exclude pure mathematics as well as the social sciences). Thus, in this article, we focus on scientists in the biological, medical, and physical sciences as well as those concerned with technology and especially computers.

As a society, we have come to take the fruits of science for granted, such as our use of computers, our access to running water and electricity, and our dependence on various forms of transportation and communication. But all such benefits follow from the discoveries and inventions of scientists as they pursue deep insights into the workings of nature and its materials.

This article focuses on the 50 most influential scientists alive today and their profound contributions to science. These are scientists who have invented the Internet and fiber optics, challenged AIDS and cancer, developed new drugs, and in general made crucial advances in medicine, genetics, astronomy, ecology, physics, and computer programming.

In referring to the scientists on this list as "influential," this article attempts to gauge their influence on science as such. In other words, the scientists listed here are influential because of the groundbreaking scientific work they have done and its impact on the world.

Some scientists are enormously influential as popularizers or culture critics or public intellectuals. In this respect, figures like Richard Dawkins and Lawrence Krauss, or Carl Sagan and Stephen Jay Gould a generation back, come to mind. The scientists on this list, however, are here because of their preeminence as scientists doing science.

The scientists described here are all creative and brilliant. Many of them are also unusual and interest-

4.3 Honorary Conference Positions

- ◇ International Advisory Chair. The RNNS [Russian Neural Network Society] IEEE Symposium on Neuroinformatics and Neurocomputing Rostov-on-Don , Russia , October 7-10, 1992,
- ◇ International Advisory Co-Chair. International Joint Conference on Neural Networks (IJCNN), Beijing, China. November 1992
- ◇ International Advisory Committee Member. International Joint Conference on Neural Networks (IJCNN), Nagoya, Japan, October 25-29, 1993.
- ◇ International Conference on Neural Information Processing (ICONIP '95), October 30 - November 3, 1995, Beijing China. International Advisory Committee, Member.
- ◇ 1993 IEEE/Tsukuba International Workshop on Advanced Robotics, November 8-9, 1993, AIST Tsukuba, Japan - Advisory Committee

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ingcolorful personalities that it would be a pleasure to know!

As you feast on the names and biographies of the scientists on this list, also check out our article The Worlds 50 Smartest Teenagers. Some of the most influential scientists in the future will be drawn from this list.

⋮

28. Robert J. Marks II

Robert J. Marks II is the Distinguished Professor of Electrical and Computer Engineering at Baylor University in Waco, Texas. Previously, he was on the faculty of the University of Washington for 25 years. He is a pioneer in the field of computational intelligence (which includes neural networks, fuzzy sets, and evolutionary computing), and was the first president of the Institute of Electrical and Electronics Engineers (IEEE) Neural Networks Council.

Marks received his PhD in electrical engineering from Texas Tech University. He has over 300 peer-reviewed journal publications. He is also a proponent of intelligent design, holding that certain features of the universe and of living things are best explained by an intelligent cause, not an undirected process such as natural selection.

Marks has made important technical contributions across widely diverse areas, such as the spacing of radium inserts to treat prostate cancer, signal display, remote sensing, optical image sampling, optical computers, and the use of fuzzy logic to control the electrical grid (how electricity is delivered today depends crucially on the work of Marks). He has served as a consultant to companies such as Microsoft and Boeing corporation.

Marks has authored several books including, the Handbook of Fourier Analysis and Its Applications, Neural Smithing: Supervised Learning in Feedforward Artificial Neural Networks, and Applications of Neural Networks to Power Systems, among others.

Marks has received numerous awards, including the IEEE Distinguished Lecturer twice, once from the IEEE Neural Networks Council in 199192, and again from the IEEE Neural Networks Society in 200203, as well as the Golden Jubilee Medal in 1999 from the IEEE Circuits and Systems Society. He is a fellow of the IEEE.

In 2007, Marks founded the Evolutionary Informatics Lab at Baylor to study the information-theoretic underpinnings of intelligent design. The research of that lab has produced a steady stream of peer-reviewed engineering publications that are influencing many in the engineering community to accept intelligent design, controversial though it remains, as a legitimate scientific theory.

- Honorary Program Committee Member. IEEE/IAFE [International Association of Financial Engineers] Computational Intelligence in Financial Engineering, (CIFEr).
  - Nashville, TN, March 30-April 2, 2009,
  - Paris, France, April 11-15, 2011.
- International Symposium on Neural Networks (ISNN) Advisory Committee.
  - 3rd International Symposium on Neural Networks (ISNN 2006) Chengdu, China, May 28 - June 1, 2006
  - 4th International Symposium on Neural Networks (ISNN 2007) Nanjing, China June 3-7, 2007
  - 5th International Symposium on Neural Networks (ISNN 2008) Beijing, China, September 24-28, 2008
  - 6th International Symposium on Neural Networks (ISNN 2009) Wuhan, China, May 26-29, 2009
  - 7th International Symposium on Neural Networks (ISNN 2010) Shanghai, China, June 6-9, 2010
  - 7th International Symposium on Neural Networks (ISNN 2011) Guilin, China May 29 June 1, 2011

5 Professional Societies

5.1 Publications

- IEEE
  - IEEE Transactions on Neural Networks, Editor-in-Chief (1992-1997)
  - IEEE Transactions on Fuzzy Systems, Associate Editor (1993-1999)
  - IEEE Transactions on Systems, Man & Cybernetics, Associate Editor (2011-2014)
- Optical Society of America
  - Topical Editor, Journal of the Optical Society of America A: Optics and Image Science in Optical Signal Processing and Image Science (1990-92).
- Other
  - International Journal of Computer Vision & Signal Processing (2011-present)
  - Bio-Complexity, Editorial Board Member (2010-2014), Editor-in-Chief (2015-present) [http://bio-complexity.org/]
  - International Journal of Neurocomputing, Editorial Board Member (1989-1992).
  - Australian Journal of Intelligent Information Processing Systems, Editorial Board Member (1994-2007).

- Journal of Advanced Computational Intelligence, (ACI), Fuji Press Co., Tokyo, Editorial Board Member (1996-present).
- Association for Computing Machinery, The ACM SIGART Magazine of Intelligent Machinery, Editorial Board, (1996-2000).
- JOURNAL OF SAMPLING THEORY IN SIGNAL AND IMAGE PROCESSING-An International Journal, Editorial Board Member (2000-2014).
- JOURNAL OF ENGINEERING RESEARCH, International Advisory Editorial Board (2002-2004).
- International Journal of Soft and Intelligent Computing and Mathematics, Editorial Board Member (2008-2009).
- International Journal of Artificial Life Research, Editorial Board Member (2009-2011).

5.2 Administrative

- IEEE Technical Activities Board
  - Technical Activities Board, Member (1990-91).
  - IEEE Technical Activities Board New Technology Directions Committee (1991 - Member).
  - IEEE TAB Meetings Council (1992 -member).
  - Division X Director Nominating Committee (1992 - Chair).
  - TAB Periodicals Council ad hoc Subcommittee on Budgetary Needs (1993 - Member).
  - TAB Transactions Committee (1996 - member).
- IEEE Computer Society
  - Task Force on Virtual Intelligence
- IEEE LEOS
  - Representative to the IEEE Neural Networks Council (1994-96).
- IEEE Power Engineering Society
  - Representative to the IEEE Neural Networks Council (2002-04).
- IEEE Circuits and Systems Society
  - Fellows Committee (2004)
  - Vice-President of Administration (2003-04)
  - Chair, Administrative Activities Committee (2004).

- Board of Governors (1994-99, 2000-02)
- Restructuring and Best Practices Committee (Chair 2002).
- Society Parliamentarian (2001-04)
- CASS Policies and Procedures Formation Committee, Chair (2003, 2004).
- Budget Committee, Chair (2003, 2004).
- Technical Society on Neural Systems and Applications in the IEEE Circuits and Systems Society
  - Co-Founder (1987)
  - First Chair (1987-89)
- Darlington Award Committee (1996)-member
- CAS Publications Steering Committee (1996-97) member
- Constitution & Bylaws Committee (2000 member; 2002-03 Chair).
- Restructuring Committee (2001-02) member
- Representative to the IEEE Neural Networks Council (1996-98).
- Representative to the IEEE Neural Networks Committee (1987-88).

◇ IEEE Nanotechnology Council

- AdCom Member (2004-06)

◇ IEEE Computational Intelligence Society

- Awards Chair (2004-05)
- AdCom Member (2004-07)
- Fellows Committee (Member, 2004-05 ; Chair 2006)
- Representative to the IEEE Nanotechnology Council (2004-06)
- Technical Committee of Neural Networks Member (2004-06)
- Founder and First Chair, CIS Chapter of the Dallas IEEE Section (2006-07).

◇ IEEE Neural Networks Society

- AdCom Member (2002-4).
- Technical Activities Committee (Member 2002)

◇ IEEE Neural Networks Council

- (first) President, (1990-91)
- Past President (1992-93)
- Nomination Committee Chair (1992-93)
- Constitution & Bylaws Committee Chair (1997)

- Technical Committees (member)
  - Neural Networks Technical Committee (1996-2004)
  - Computational Finance Technical Committee (1995-2000)
  - Awards Committee (member, 1997, 1999-2001)
  - Fellows Evaluation Committee (member, 1997-2001)
  - Publications Committee (member, 1999)
- Projects initiated during this period.
  - The International Conference of Fuzzy Systems (FUZZ-IEEE).
  - The Neural Networks Newsletter (CoNNections).
  - The Neural Networks Council Forum meeting series.
  - Neural Network Council Book Series (IEEE Press).
  - IEEE Neural Networks Council Pioneer Awards.
  - The IEEE Transactions on Fuzzy Systems.
  - The World Congress on Computational Intelliegence
  - IEEE Neural Networks Standards Committee.
  - IEEE Neural Networks Distinguished Lecture Program.

◇ IEEE Neural Networks Committee

- Chair (1989)
- Chair pro tem (1988-89)
- Secretary (1988).
- Ad Hoc Committee for founding the IEEE Transactions on Neural Networks (Chair)
- Projects initiated during Chairmanship
  - The IEEE Transactions on Neural Networks.
  - The first International Joint Conference of Neural Networks.

◇ IEEE

- Faculty Advisor to UW Student Section (1978-81).
- Faculty Advisor to Baylor Student Section (2008-present).

◇ Optical Society of America

- Puget Sound Section of the Optical Society of America
  - Co-Founder (1987).
  - First President (1987-88).
  - (First) Honorary Member (1988).

5.3 Conferences

- ◇ IEEE Conference on Computational Intelligence for Financial Engineering & Economics (CIFEr)
  - New York, New York, April 9-11, 1995, Program Co-Chair
  - New York, New York, March 24-26, 1996, Co-Chair
  - New York, New York, April 9-11, 1997, Co-Chair
  - New York, New York, March 29-31, 1998, Co-Chair
  - Nashville, TN, March 30April 2, 2009, Honorary Program Committee Member
  - Paris, France, April 11-15, 2011, Honorary Program Chair
- ◇ IEEE World Congress on Computational Intelligence
  - Orlando, FL, July 1994, Technical Program Director
  - Anchorage, AL, 1998, Tutorials Chair
- ◇ Information Processing by Neural Networks, (IP+NN ' 97), October 10-17, 1997, Ukraine, Crimea, Gurzuf Russian Academy of Science, Russian Neural Network Society, International Academy of Computer Science; Program Co-Chair.
- ◇ IEEE International Conference on Fuzzy Systems (FUZZ-IEEE)
  - Yokohama, Japan, March 20 to March 24, 1995, International Program Committee
  - Seoul, Korea, August 22-25, 1999, International Organizing Committee Member
- ◇ IEEE Virtual Reality Annual International Symposium (VRAIS)
  - 1993 Seattle, (first) Organizing Chair
  - 1995 Research Triangle Park, NC, Organization Chair
- ◇ The RNNS [Russian Neural Network Society] IEEE Symposium on Neuroinformatics and Neurocomputing
  - Rostov-on-Don, Russia, October 7-10, 1992, International Advisory Chair
  - Rostov-on-Don, Russia, October 9-11, 1995, Program Co-Chair
- ◇ IEEE-SP International Symposium on Time-Frequency and Time-Scale Analysis, Victoria, BC; October 4-6, 1992, Organization Chair
- ◇ International Forum on Applications of Neural Networks to Power Systems. July 23-26, 1991, Seattle , WA.
  - Technical Program Chair
  - Tutorial Chair

- Host Committee, Member
- Potentials & Challanges of Neural Network Applications to Power, Systems, Panel Member

◇ International Workshop on Artificial Neural Networks (IWANN ' 93), June 9-11, 1993, Barcelona, Spain , (sic) Programme Committee Member

◇ International Conference on Neural Networks (ICNN)

- 1988 San Diego ICNN, Program Committee Member
- 1993 San Francisco ICNN, Program Committee Member
- 1994 Perth ICNN, Program Co-Chair

◇ International Joint Conference on Neural Networks (IJCNN)

- 1989 Washington D.C. IJCNN, January 1989, Planning Committee Member
- 1991 Singapore IJCNN, 18-21 Nov. 1991, Technical Program Committee Member
- IEEE Neural Networks President' s Forum, Moderator, at the 1991 Seattle IJCNN (Tuesday, July 9, 1991) - Presidents of Chinese, European, Japanese and Russian neural network professional societies - (presentation and panel discussion).
- 1992 Beijing IJCNN, November 1992, International Advisory Co-Chair.
- 1993 Nagoya (Japan) IJCNN, October 25-29, 1993.
  - † Program Committee Co-Chair
  - † Advisory Committee Member
- 2000 Como , Italy IJCNN, July 24-27, 2000 .
  - † Special Sessions Chair

◇ IEEE International Symposium on Circuits and Systems (ISCAS)

- 1987 ISCAS, Philadelphia (May 6, 1987), Artificial Neural Systems and Applications, Session Organizer and Co-Chair
- 1989 ISCAS, 9 May 1989, Portland., Neural Networks Session Chair
- 1994 ISCAS, London, Program Committee Member
- 1995 ISCAS, Seattle, General Chair
- 1996 ISCAS, Atlanta, Steering Committee Member

◇ New Zealand International Two-Stream Conference on Artificial Neural Networks and Expert Systems (ANNES)

- Programme Committee -member; (ANNES '93), November 24-26, 1993, Otage University , Dunedin , New Zealand .
- International Programme Committee -member; (ANNES '94), November 20-23, 1995, University of Otago , Dunedin , New Zealand.

- American Mathematical Society
  - 1051st AMS Meeting, Baylor University, October 16-18, 2009, Session Co-Organizer (with John Davis and Ian Gravagne): Dynamic Equations on Time Scales: Analysis and Applications.
- IEEE Symposium on Swarm Intelligence, Pasadena, March 2005 (Steering Committee Chair)
- National Faculty Leadership Conference (National CLM Meeting)
  - June 24-27, 2004, Washington, D.C., The Christian World View in Engineering and Technology, Program Committee Chair
- Sixth International Symposium on Neural Networks (ISNN 2009) Wuhan, China, May 26-29, 2009, Advisory Committee Member.
- International Symposium on Intelligent Decision Technologies,
  - IDT 2010, Baltimore, USA, 28-30 July 2010, International Programme Committee
- Texas Symposium on Wireless & Microwave Circuits & Systems, April 4–5, 2013, Baylor University, Waco, Texas, Organization Chair.
- 45th IEEE Southeastern Symposium on System Theory, March 10–12, 2013, Baylor University, Waco, Texas, Organization Chair.
- Other
  - Workshop on the Future Directions for Optical Information Processing, Texas Tech University , Lubbock (May 1980), Panel Discussion leader for "Space-variant coherent optical processing"
  - Limits of Passive Imaging Workshop, Mackinac Hotel, Mackinac Island, MI (May 24-26,1983), Chair of Processing Group
  - Workshop on Optical Artificial Intelligence, Gold Lake , Colorado (3-5 August, 1987), Chair of Working Group on Perception.
  - WVU Neural Network Symposium, West Virginia University , Morgantown , (15-16 June, 1989), Panel Discussion Member
  - First Workshop in Neural Networks, Auburn University Hotel & Conference Center, 5-6 February, 1990, Panel Discussion Member, "Application of neural networks and the future".
  - Conference on Active Materials and Adaptive Stuctures , Washington D.C., (Nov. 6-8, 1991), Session Committee Member
  - Annual IEEE Seattle Section Pizza Feed, February 20, 1991 , South Campus Center Auditorium, Master of ceremonies

- Pacific Gas & Electric R&D Electric Distribution Program External Advisory Goup Meeting, Silverado Country Club, Napa Valley , California , (August 22-23, 1991).
- Fuzzy Logic & Intelligent Systems Seminar, Boeing Computer Services, Red Lion Inn, Bellevue, WA, December 2, 1991, Panel Discussion: Moderator.
- International Workshop on Artificial Neural Networks, June 9-11, 1993 , Sitges (Barcelona), Spain , Program Committee -member.
- 1995 Workshop on Sampling Theory & Applications, September 20-22, 1995 , Jurmala (Riga), Latvia , Program Committee -member
- 1996 IEEE International Workshop on Neural Networks for Identification, Control, Robotics and Signal/Image Processing (NICROSP), September 21-23, 1996, Venice, Italy, Program Committee -member
- 30th International Symposium on Automotive Technology and Automation, Dedicated Conference on Megatronics, Florence Italy , 16-19 June 1997, Programme Committee member.
- The Fourth International Conference on Neural Information Processing – The Annual Conference of the Asian Pacific Neural Network Assembly, jointly with The Fifth Australian and New Zealand International Conference on Intelligent Information Processing Systems, and The Third New Zealand International Conference on Artificial Neural Networks and Expert Systems 24-28 November, 1997, Dunedin/Queenstown, New Zealand; program committee member.
- The IEEE International Electric Machines and Drives Conference (IEEE-IEMDC), 9-12 May, 1999, Seattle, WA , Publicity Chair & Publications Chair.
- American Scientific Affiliation (ASA) 64th Annual Meeting, Baylor University (Sunday, August 2, 2009), Session Chair (Origins).
- ACM Genetic and Evolutionary Computation Conference (GECCO), Vancouver, Canada on July 12-16, 2014, ACO-SI track program committee member
- Alternatives to Methodological Naturalism, Online Meeting - April 16, 2016, Advisory Panel

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Reprints of many of these papers can be downloaded from RobertMarks.org.

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50. Joseph Barkate, Alexander Tsatsoulas, Matthew Fellows, Matthew Flachsbart, Charles Baylis, Lawrence Cohen, Robert J. Marks II. "Fast, Momentum-Aided Optimization of Transmitter Amplifier Load Impedance and Input Power for Cognitive Radio Using the Power Smith Tube," 2016 IEEE Radio & Wireless Week, Austin, Texas, USA, JW Mariott Austin, 24-27 January, 2016

51. Matthew Fellows, Sarvin Rezayat, Jennifer Barlow, Joseph Barkate, Alexander Tsatsoulas, Charles Baylis, Lawrence Cohen, Robert J. Marks II. "The Bias Smith Tube: Simultaneous Optimization of Bias Voltage and Load Impedance in Power Amplifier Design," 2016 IEEE Radio & Wireless Week, Austin, Texas, USA, JW Mariott Austin, 24-27 January, 2016

6.7 Videos

6.7.1 Lectures

1. B.G. Song, R.J. Marks II, S. Oh, P. Arabshahi, T.P. Caudell and J.J. Choi, "Adaptive membership function fusion and annihilation," Fuzzy Logic and Neural Networks: Clips from the Field (FUZZ-IEEE '93), San Francisco, March 1993.

2. Les Atlas and R.J. Marks II, Introduction to Artificial Neural Systems, College of Engineering, University of Washington , Seattle , September 15-16, 1988 (video made available from AMCEE or the College of Engineering , University of Washington).

3. R.J. Marks II, "Shannon Sampling and Interpolation Theory," UW course offering recorded Spring Quarter, 1989 and Spring Quarter, 1990 (video made available from AMCEE.)

4. R.J. Marks II, "Artificial Neural Networks: Supervised Models, in Artificial Neural Networks With Applications to Power Systems," El-Sharkawi and Niebur, Editors, IEEE Educational Activities Board, (ISBN: 0-7803-4008-6) 1997.

5. R.J. Marks II, "Great Expectations: Information Theory," for Ricochet.com.
http://youtu.be/Uc6Ktq0SEBo

6. Casey Luskin & R.J. Marks II, "Darwin as the Pinball Wizard: Talking Probability with Robert J. Marks II", ID the Future, (Podcast 2010. Video posted 2013),
http://youtu.be/Kxv3Q0VaX9E

7. " 'Darwin or Design' with Dr. Tom Woodward with guest Dr. Robert J. Marks II," C.S. Lewis Society, Jan 5, 2011.
http://youtu.be/Yoj9xo0YsOQ

8. "Information. What is it?," Intro. to Engineering Lecture, January 17, 2012.
http://youtu.be/d7seCcS_gPk

9. "IEEE CIS History Commitee: Donald C. Wunsch II interviews R.J. Marks II," March 26, 2012.
http://youtu.be/RigIZwpCWOA

10. " 'TeleTalk' With Bob Marks (November 26, 1973)," published Apr 26, 2012.
http://youtu.be/v5eFEQ6-0h4

11. "Dr. Robert Marks: Active Information in Metabiology," May 30, 2014
http://youtu.be/tJSJg0IZtfI

12. "From PODCAST to 'Expelled: No Intelligence Allowed' published June 8, 2014
http://youtu.be/15YTKyMPaXM

13. "On Algorithmic Specified Complexity," by Robert J. Marks II. CSCA/ASA/CiS 2014 Conference, July 2014, McMaster University, Hamilton, Ontario, Published on Aug 5, 2014
http://youtu.be/No3LZmPcwyg

14. "The Impact of Christian Faith on Mathematics & Science: Yesterday & Today," Baylor Student Chapter of the American Scientific Affiliation, October 12, 2014
http://youtu.be/hdNNNJMZJ_c

15. "Alternating Projections onto Convex Sets Examples,"
https://youtu.be/_-T4Y0aof3s

16. "Seven Things Not To Do With Electricity." Baylor Student IEEE Group, April 13, 2015.
https://youtu.be/BzeHgmW5xfI

17. "2015 IEEE Radar Conference Tutorial: Radar Transmitter Design for the Crowded Radio Spectrum" May 10, 2015, Texas Symposium
https://youtu.be/vrmN_2kQ8Cs

18. "Information: What Is It Anyway?" ID the Future Podcast, November 9, 2015 https://youtu.be/c2UCPX5mKio

19. "Ten Thousand Expanding Psychedelic Circle Hexes," Periodicity Examples for Multidimensional Signal Processing, Published on Nov 8, 2014 http://youtu.be/bXoP5F0s33c

20. Algorithmic Specified Complexity, ID the Future Podcaast (with Winston Ewert) 2016

    - Part I: Genesis

    - Part II: Application to Conways Game of Life https://youtu.be/yivqPiuqQf8
    - Part III: Measuring Meaning in Images https://youtu.be/2lhiB8jTLjc

21. "Evo-Info: Algorithmic Information Theory & Why Automata Will Never Create Information," Origin of Biological Information, Aug 19-21, Canaan Valley Resort, Davis, WV).
    https://youtu.be/RCWJXlIH7ZU

22. "The Nature of Omniscience: A Conversation with Dr. Robert Marks," Apologetics Academy Podcast, August 27, 2016.
    https://youtu.be/cW6N8NCH-dI
    Unedited: https://youtu.be/Vof0tt3cB9Q

6.7.2 Classes

23. R.J. Marks II, *Probability and Random Processes*

    - Lecture 1, http://youtu.be/SEoH-51EzaM
    - Lecture 2, http://youtu.be/l5gMUK-Toj4
    - Lecture 3, http://youtu.be/muVqs9tJ8Ck
    - Lecture 4, http://youtu.be/_B1MYUPu95o
    - Lecture 5, http://youtu.be/iHbNnXqf1Sg
    - Lecture 6, http://youtu.be/oSyACKCkJJc
    - Lecture 7, http://youtu.be/Q_d-NF8_px4
    - Lecture 8, http://youtu.be/lYgce7JHZ1w
    - Lecture 9, http://youtu.be/mZ75uM6YZLk
    - Lecture 10, http://youtu.be/dJPNHfcFC9I
    - Lecture 11, http://youtu.be/CO59JL9Z_0k
    - Lecture 12, http://youtu.be/E07nr-flg8E
    - Lecture 13, http://youtu.be/-ZV1J3Hv6dE

- ◇ Lecture 15, http://youtu.be/jQXMsi_pKFo
- ◇ Lecture 16, http://youtu.be/ph1lCDc-1UE
- ◇ Lecture 17, http://youtu.be/j6XaLQkcee8

24. R.J. Marks II, *Introduction to Computational Intelligence*

- ◇ Lecture 1, http://youtu.be/fgtUFzxNztA
- ◇ Lecture 2, http://youtu.be/8RrBmnFufn4
- ◇ Lecture 3, http://youtu.be/PCyBEy_22F4
- ◇ Lecture 4, http://youtu.be/I_Oj1qe8jO4
- ◇ Lecture 5, http://youtu.be/OWKzDmXV1-
- ◇ Lecture 6, http://youtu.be/WW4sMx1-cC0
- ◇ Lecture 7, http://youtu.be/MVHiE0NS5hY
- ◇ Lecture 8, http://youtu.be/1sp-OHr4_YA
- ◇ Lecture 9, http://youtu.be/EyHHxP5UHcE
- ◇ Lecture 10, http://youtu.be/BzUZRtwAaBs
- ◇ Lecture 11, http://youtu.be/RXHq7B0-V9s
- ◇ Lecture 12, http://youtu.be/Ef7seYvoFFc
- ◇ Lecture 13, http://youtu.be/rDsLmikMjG
- ◇ Lecture 14, http://youtu.be/XOOpDhkX_k8
- ◇ Lecture 15, http://youtu.be/pJh3dWLSigM
- ◇ Lecture 16, http://youtu.be/LSXKLtqJ8a8
- ◇ Lecture 17, http://youtu.be/FK33Lj382KI
- ◇ Lecture 18, http://youtu.be/i2SHIXdHgC0
- ◇ Lecture 19, http://youtu.be/j6-dcqivT0w

6.8 Selected Talks (since 2003)

- ◇ "Perceptron Inversion: Properties and Applications", Institute of Engineering Cybernetics, Wroclaw University of Technology , Wroclaw , Poland (April 3, 2003).
- ◇ "Fundamentals of Swarm Intelligence", APL Invited Colloquia, Applied Physics Laboratory, University of Washington (April 10, 2003).
- ◇ "What Does Calculus Have to Do With Christianity?" San Jose State University, November 30, 2003.
- ◇ "Swarm Intelligence: The Method Behind the Mobs", NASA Office of Biological and Physical Research Program Review, California Institute of Technology, December 17-18, 2003.

- ◇ "Time Scale Nonregressivity in Switched Linear Circuits" Special Session on Dynamic Equations on Time Scales: Theory and Applications, AMS Western Sectional Meeting, University of Southern California, Los Angeles, CA, April 3-4, 2004 (with Ian Gravagne, John M Davis, Jeffrey J DaCunha).
- ◇ "Added Information in Targeted Evolutionary Search", Perry Conference, Hotel Pattee, Perry, Iowa, April 17-20, 2006.
- ◇ "Evolutionary Search: A Free Source of Design Information?" RAPIDS 2 Conference, BIOLA, May 11-13, 2006.
- ◇ "Science and the Bible: The Emerging Harmony," CDIS (Chengdu International School), Chengdu, China (May 29, 2006) and CaiDa Southwest Economics University, Chengdu, China (May 30, 2006) .
- ◇ "Computational Intelligence: A Free Source of Information?" International Symposium on Neural Networks (ISNN), Chengdu, China (May 29, 2006) A Keynote Talk
- ◇ "The Need for Active Information in Evolutionary Search," Wistar Retrospective Symposium, Boston, MA (June 3-6, 2007).
- ◇ "Gödel to Turing to Chaitin to the Edge of Naturalism: Some Things Computers Will Never Do," B.E.A.R.S. Seminar, Baylor University, (September 28, 2007).
- ◇ "Conservation of Information in Evolutionary Search Algorithms: Measuring the Cost of Success," University of Missouri, Columbia, (November 12, 2007). IEEE CIS Distinguished Lecture for Columbia Chapter of IEEE CIS Society.
- ◇ "Gödel to Turing to Chaitin to the Edge of Naturalism: Some Things Computers Will Never Do," (April 2, 2008), SWBS, IEEE CIS Distinguished Lecture for Dallas Chapter of IEEE CIS Society.
- ◇ "Measuring the Cost of Success: Conservation of Information in Evolutionary Search Algorithms," Southern Methodist University (SMU), Department of Electrical Engineering (September 25, 2008).
- ◇ "Knowing What is Unknowable: Things a Computer Can't Do," Baylor American Scientific Affiliation (ASA) Student Chapter. Also sponsored by the Baylor Society for Conversations in Religion, Ethics and Science, Baylor University (April 15, 2008).
- ◇ "What does Calculus have to do with Christianity?" Dallas Christian Leadership (DCL) at SMU for Faculty Commons (September 25, 2008).
- ◇ "Evolutionary Informatics: Measuring the Cost of Success," American Scientific Affiliation (ASA) 64th Annual Meeting, Baylor University (Sunday, August 2, 2009) with William A. Dembski
- ◇ "Science & Christianity: Separate but Equal?" Covenant Presbyterian Church, Austin, TX (August 16, 2009)

- ◇ "Lessons from Gödel, Turing and Chaitin: Things Computational Intelligence Will Never Do," IEEE MetroCon 2009, Innovating for Society, August 17th, 2009, Sheraton Arlington, Arlington, Texas. (IEEE CIS Distinguished Lecture.)
- ◇ "God Ever Geometrizes: Apologetics in Mathematics," Baylor American Scientific Affiliation (ASA) Student Chapter. Also sponsored by the Baylor Society for Conversations in Religion, Ethics and Science, Baylor University (December 1, 2009).
- ◇ "Gödel to Turing to Chaitin to the Edge of Naturalism: Some Things Computational Intelligence Will Never Do," IEEE CIS Distinguished Lecture for St. Louis Chapter of IEEE CIS Society presented at the Missouri University of Science and Technology, Rolla, Mo., April 13, 2010.
- ◇ "Measuring the Cost of Success: Conservation of Information in Search," IEEE CIS Distinguished Lecture for St. Louis Chapter of IEEE CIS Society presented at the Missouri University of Science and Technology, Rolla, Mo., April 13, 2010.
- ◇ "Time Scale Discrete Fourier Transforms," Guest Lecture, Missouri University of Science and Technology, Rolla, Mo., April 14, 2010.
- ◇ "God Ever Geometrizes: Apologetics in Mathematics," Probe Ministries, Plano, Texas, (June 28, 2010).
- ◇ "Spectrum Issues in Amplifier Design," Fifth Annual Emerging Spectrum Technology (EST) Workshop on Advanced Radar Technologie to Improve Spectrum Use, Double Tree Hotel, Annapolis Maryland, September 13-14, 2010 (with Charles Baylis).
- ◇ "Power Amplifier Circuit and Waveform Optimization for Reduced Spectral Spreading in Radar Transmitters," IDGA's 4th Annual Military Radar Summit, Feb 8-10, 2011, Vienna, VA (with Charles Baylis).
- ◇ "Evolutionary Simulations and Sources of Active Information," Discovery Retreat, Santa Barbara, CA (March 1-4, 2011)
- ◇ "Measuring Cross Harmonic Coupling in Nonlinear Systems," WMCS Advisory Board, March 31, 2011, Baylor University.
- ◇ "Evolutionary Informatics. Why all the fuss?" Baylor Alumni Association, Lifelong Learning in Retirement, April 15, 2011, Great Hall of the Hughes-Dillard Alumni Center, Waco, Texas
- ◇ "Evolution Models Do Not Create Information," Great Expectations Conferences, Borgo Finocchieto, Tuscany, Italy, June 12-16, 2011 (with Winston Ewert).
- ◇ "THE GOD DIALOGUES II: A Panel Discussion," Texas A&M University, October 27, 2011, Sponsored by Ratio Christi (Debate between Muslim, Atheist and Christian views of God.)

- ◇ "Three Predominant Interpretations of Creation (Young Earth Creationism, Old Earth Creationism, and Theistic Evolution)," Live Oak Classical School, Waco, TX, May 24, 2012 (one of three panelists)
- ◇ "CHRISTIAN CALCULUS: The Impact of Christian Faith on Mathematics & Science Yesterday & Today," Sept 27, 2012 (sponsored by Baylor's ESC LLC and the Baylor Student Chapter of the American Scientific Affiliation)
- ◇ "Joint Optimization of Radar Power Amplifier and Waveforms for Reduced Spectral Spreading," North Atlantic Treaty Organization (NATO) SET-182 Research Task Group Meeting, 2012 October 17-18, 2012 (with Charles Baylis. Remote Presentation.)
- ◇ "God Ever Geometrizes: Apologetics in Mathematics" November 6, 2012, Texas A&M University, (sponsored by TAMU's Ratio Christi student group)
- ◇ "Information: Measuring Design & Understanding the Unknowable," 2013 National Conference & Ratio Christi Symposium, Southern Evangelical Seminary, October 11-13 2013, Matthews, North Carolina
- ◇ "Love and Cookies," Panel at Teal Residential College, February 13, 2014 (with Brian Thomas and Randall Jean)
- ◇ "Spectral Issues," Spectrum Forum, Texas Symposium on Wireless and Microwave Circuits and Systems, Baylor University, Waco (April 4, 2014)
- ◇ "Electrical & Computer Engineering," Lorena High School, Lorena, Texas (Career Day) May 30, 2014 (with Charles Baylis and Matthew Fellows)
- ◇ "Man Up," Panel at Teal Residential College, May 1, 2014 (with Ian Gravagne and Ken Van Treuren)
- ◇ "The Impact of Christian Faith on Mathematics & Science: Yesterday & Today," September 29, 2014. (Sponsored by Baylor's Student Chapter of the American Scientific Affiliation)
- ◇ "Seven Things Not To Do With Electricity." Baylor Student IEEE Group, April 13, 2015.
- ◇ "Adaptability and Reconfigurability: Radar Operational Infrastructure Redux," DARPA Radar/Communications Co-Design Challenge, DARPA, Crystal City, VA (April 27, 2015)
- ◇ "Effects of Power Amplifier Nonlinearities on the Radar Ambiguity Function." 2015 IEEE International Radar Conference (RadarCon), Arlington, VA. May 10, 2015
- ◇ "Ambiguity Functions and Spectral Constraints." International Microwave Symposium, May 22, 2015, Phoenix, AZ

6.9 Tutorials

- ◇ Introduction to Artificial Neural Systems, College of Engineering , University of Washington, Seattle, August 20-21, 1987 . Offered again on September 15-16, 1988 (video made available by AMCEE) - with Les Atlas.
- ◇ Shannon Sampling and Interpolation Theory, regular UW course offering taped Spring Quarter, 1989 and Spring Quarter, 1990 (video made available by AMCEE.)
- ◇ Artificial Neural Systems, Ireste University in Nantes France, March 5-30, 1990 .
- ◇ Neural Networks and Their Applications to Power Engineering, Power Industry Computer Applications (PICA) Conference, Baltimore, MD, May 6, 1991 (with R. Eberhart and M.A. El-Sharkawi).
- ◇ Artificial Neural Networks in Electric Power Systems, Decisions Systems International, Monaco, July 1-3, 1991 (with M.A. El-Sharkawi).
- ◇ Neural Networks Tutorial, First International Forum on Applications of Neural Networks to Power Systems, Seattle, WA, July 23, 1991 (with R. Thomas and H. Mori).
- ◇ Auditory Neural Systems and Time-Frequency Theory, IEEE Conference on Neural Networks for Ocean Engineering, Washington D.C., August 15-17, 1991 (with L.E. Atlas).
- ◇ Artificial Neural Networks in Electric Power Systems, Decisions Systems International, Madrid, Spain , September 7-11, 1992 (with M.A. El-Sharkawi).
- ◇ Artificial Neural Networks: Supervised Models, 1996 Winter Meeting, IEEE Power Engineering Society January 24, 1996, and Summer Meeting, IEEE Power Engineering Society, July 31, 1996, Denver, CO .
- ◇ Modern Neural Networks: The First Decade, IV Escola de Redes Neurais, Florianopolis , Brazil, July 21, 1997.
- ◇ Diagnostics and Control of Electric Machines Using Computational Intelligence IEEE IEMDC'99. International Electric Machines and Drives Conference. May 9, 1999 Seattle , Washington, USA (with M.A. El-Sharkawi).
- ◇ Neural Networks: The Fundamentals, Buryat State University, Ulan-Ude, Russia, March 5, 2001.
- ◇ An Introduction to Fuzzy Inference, IEEE PES Summer Meeting 2000, Seattle , WA .
- ◇ Introduction to Evolutionary Informatics, Discovery Institute Summer Symposium, Seattle, WA., July 2007.
- ◇ Information and Evolution, Discovery Institute Summer Symposium, Seattle, WA., July 2009.

- ◇ Power Amplifier Circuit and Waveform Optimization for Reduced Spectral Spreading in Radar Transmitters, 4th Annual Military Radar Summit, Washington, D.C., February 79, 2011 (with Charles Baylis)
- ◇ Why Design Information is Required to Find Improbable Complex Targets, Discovery Institute Summer Symposium, Seattle, WA., July 2011.
- ◇ Radar Transmitter Design for the Crowded Radio Spectrum, 2015 IEEE International Radar Conference (RadarCon), Crystal City, Arlington, VA. May 10, 2015 (with Charles Baylis & Lawrence Cohen)
- ◇ Radar in a Communications-Driven Spectrum: Innovative System, Component, and Circuit Design for the Evolving Spectrum Environment, International Microwave Symposium, May 22, 2015, Phoenix, AZ (with Charles Baylis & Lawrence Cohen)

6.10 Technical Essays

- ◇ Robert J. Marks II, "Music under Darwinism," Evolution News and Views, April 23, 2012.
- ◇ Robert J. Marks II, "The Turing Test Is Dead. Long Live the Lovelace Test," Evolution News and Views, July 3, 2014,
- ◇ Robert J. Marks II, "Biological information: New perspectives from intelligent design," Human Events, Aug 19, 2014.

7 Research Grants & Contracts

1. "Lensless space-variant processing," Graduate School Research Fund (1978-79), $5,824.
2. "Coherent optical extrapolation of two-dimensional bandlimited signals," National Science Foundation (1979-81), $32,000.
3. "Coherent optical interpolation of continuously sampled images," Graduate School Research Fund (1982-83), $6,596.
4. AT&T Research Equipment Grant (1985)...with L.E. Atlas, $62.000. "Analysis and application of neural nets," Boeing High Technology Center (1986-88).with L.E. Atlas-$110,000.
5. 'Neural network computer architectures," The Washington Technology Center (1987-89) with L.E. Atlas.
6. "Increasing the accuracy of inexact processors," SDI/IST through ONR & the Optical Systems Lab at Texas Tech University and WTC (1988-1989), $230,000.

7. "Power Systems Stability and Security Assessments Using Artificial Neural Networks" NSF (1988-1990), Project Coordinator, co P.I. with M.A. El-Sharkawi, M. Damborg & L.E. Atlas-$337,500.

8. "Neurocomputers," The Washington Technology Center (1989-91) with L.E. Atlas, $150,000.

9. "Electric load forecasting using artificial neural networks," Puget Sound Power and Light Company (1989-90) with M. El-Sharkawi, L.E. Atlas & M. Damborg-$115.000.

10. "Advanced Time-Frequency Displays," Boeing Commercial Airplane Company, September 1, 1989 through October 30, 1990, co-P.I. with Les Atlas-$128,000.

11. "Neural Network & Learning Systems," The Washington Technology Center (1991-92) with L.E. Atlas, $150,000.

12. "Solution of Inverse Problems in Electromagnetic and Optical Propagation Using Artificial Neural Networks," National Science Foundation, February 15, 1991 to February 14, 1993, (with Jenq-Neng Hwang, Leung Tsang and Akira Ishimaru),-$151,000.

13. "Advanced Neural Network Paradigms and Applications," Boeing Computer Services, January 1, 1991 to December 31, 1993-$90,000.

14. "Simulation Studies on Biomagnetic Detection of Bundle of His Signal and Its Application to the Cardiac Syncope Problem," General Electric, Schenectady NY, January 1, 1992 to May 31, 1992, co Principal Investigator (Lee Huntsman, Project Coordinator; with co PI's G.H. Bardy, C. Ramon, S.Oh)-$40,000.

15. "Biomagnetic Imaging of Three-Dimensional Current Distribution," National Science Foundation, Stage 1: 6-1-92 to 5-31-95. Stage 2: 6-1-94 to 2 29, 1996 (co PI with C. Ramon)-$497,080 + 104,358.

16. "Detection of Short Turns in Turbo Alternators," Southern California Edison, August 1, 1992 to July 31, 1993, (co Principal Investigator M.A. El-Sharkawi)-$93,765.

17. "S&P 500 Trading Using Spectrally Trained Neural Networks," Washington Technology Center, January 1993 to June 1993, $25,000.

18. "Tune & Prune Adaptation of Fuzzy Inference Engines," Royalty Research Fund, University of Washington, June 15, 1993 to September 1994, $14,000.

19. "Localization of Short Turns in Turbo Alternators," Southern California Edison, August 1, 1992 to July 31, 1993, (co Principal Investigator M.A. El-Sharkawi)-$94,000.

20. 'Financial Neural Networks," Washington Technology Center, August 1993 to March 1994, $10,000.

21. "Detection of Short Turns in Operating Turbo Alternators," Southern California Edison, August 1, 1993 to August 31, 1994, (co Principal Investigator M.A. El-Sharkawi)-$93,000.

22. "Advanced Neural Network Paradigms and Applications," Boeing Computer Services, January 1, 1994 to December 31, 1996-$90,000. "Wavelet Based Neural Networks," Washington Technology Center, January 1995 to June 1995, $7,000.

23. "Genetic Algorithm Carbon Brake Analysis," Boeing Airplane Company, September 1994 to December 1994, $23,000.

24. "Under-Load Evaluation of Breaker Contacts Condition," National Science Foundation, GOALI Grant No.ECS-9634600, September 1, 1996 to August 31, 1997, (Co-PI with Mohamed A. El-Sharkawi in collaboration with Isador Kerszenbaum, Southern California Edison), $50,000.

25. "Intelligent Systems Applications for Transmissions and Distribution Systems," (Co-PI with Mohamed A. El-Sharkawi), Southern California Edison, 1996-97, $79,530.

26. "Advanced Neural Network Paradigms and Applications," Boeing Computer Services, January 1, 1996 to December 31, 1997-$23,000; 1997-98 $23,000; 1998-99 $23,000.

27. "UG Cable Replacement," Southern California Edison, 1997 - $50,000 (Co-PI with Mohamed A. El-Sharkawi).

28. "Twin signal signature sensing: application to shorted winding monitoring, detection and localization," NSF/EPRI, 1995-1999, (co Principal Investigator M.A. El-Sharkawi), $398,000.

29. "Environmentally Adaptive Sonar," Office of Naval Research/ Applied Physics Laboratory, September 1997 to September 1999 - $90,000 (Co-PI with Mohamed A. El-Sharkawi).

30. "A New Paradigm for Designing Radiation Beams for Cancer Treatment," The Whitaker Foundation, January 1998 to December 2000 - $210,000 (Co-PI with Paul Cho, Department of Radiation Oncology, UW School of Medicine.)

31. "Automatic Decision Aggregation," Boeing Defense, Nov 1997 through May 1998, $26,000.

32. 'Automatic Environmentally Adaptive Sonar Control," Office of Naval Research, 1998-2001, - $333,000 (Co-PI with M.A. El-Sharkawi).

33. "Assessment of prostate seed implants NIH, October 1, 2001 to Dec 31, 2002 (Co-PI with Paul Cho, Department of Radiation Oncology, UW School of Medicine.), NIH, $212,000.

34. "Sensor Coverage for Vehicle Health and Safety Systems," Boeing Defense, June 2001 to Dec. 2001 (PI $25,000).

35. "Intelligent Sensor and Satellite Networks for Earth Science & Exploration," JPL & NASA Sept 1, 2000 to Dec 31, 2002 (co PI with M.A. El-Sharkawi, subcontract from JPL for $250,900.)

36. "Model-Based Complex Data Set Correlation Boeing Airplane Company, Jan 16, 2001 to Jan 16, 2002, (PI $42,099)

37. "Physiologic Development of Speech Production," NIH, Sept 1, 2001 to Sept 2006 (PI. Christopher A. Moore, Speech & Hearing Sciences. R.J. Marks II is a co-investigator, Grant Total is $2,861,174.).

38. "Reconstruction of Missing Sensor Readings on Jet Aircraft Engines," Boeing Phantom Works, September 2001 to May 2002 ($32,000).

39. "Missing Sensor Data Restoration: Computationally Intelligent Discovery of Reading Dependencies," NSF, Sept 16, 2001 to Aug 31, 2004, (co-PI with M.A. El-Sharkawi, $588,898). Undergraduate support addenda, $12,000.

40. "Intraoperative Dose Optimization for Prostate Brachytherapy," ARO, co-PI with Paul Cho and Y. Kim. $550,000, 2003-06 (3 years).

41. "Application of computationally intelligence techniques to long term multistatic sonar systems (ONR - EE/APL, 3 years, Marks Co-PI) $960k total.

42. "Collective Behavior of Biological Swarms: System Modeling, Analysis, and Algorithmic for Distributed Dynamic Resource Allocation Problems," JPL Director's Research and Development Fund, Jet Propulsion Laboratory, Co-PIs are Payman Arabshahi (JPL), R.J. Marks II (UW), Michael Dickinson (Cal Tech) and Alcherio Martinoli (Cal Tech), 2003-04, $200,000.

43. "Reconstruction of Missing Sensor Readings on Jet Aircraft Engines: Phase II," Boeing Phantom Works, April 2003 to July 2003, ($32,000),

44. "Supplemental RA Support," Applied Physics Lab, University of Washington, Spring Quarter, 2003, ($11,138).

45. "Real-Time Distributed Control Networks: Dynamic Bandwidth Allocation via Adaptive Sampling" (with Ian Gravagne and John Davis, Baylor University) NSF, 3 years, $311k. [Supplemental REU funds obtained for supporting summer undergraduate research.]

46. "Mu-Dynamics on Time Scales: Adaptive Time Domains for Dynamical Systems," (with Ian Gravagne and John Davis, Baylor University) NSF, 3 years, $143k.

47. "Multi-Agent System Based Intelligent Distributed Control System for Power Plants," (with Kwang Y. Lee, P.I. and Ian Gravagne), 2008–2011, $132k.

48. "Inversion of Swarm Dynamics for Underwater Tactical Applications," Office of Naval Research, 2009–2011, $270,000 (with Benjamin B, Thompson, ARL Penn State)

49. "Joint Optimization of Radar Power Amplifier and Waveforms for Reduced Spectral Spreading," ARL (Chales Baylis, P.I.) $62,000.

50. "Tactical Task Allocation and Resource Management in Nonstationary Swarm Dynamics," Office of Naval Research, 2012–2013, $270,000 (with Benjamin B, Thompson, ARL Penn State)

51. "Evaluation of Airport Wireless Interference Assessment and Comparison with University Campus Wireless Coexistence," TEM Consulting, (Charles Baylis, P.I., R.J. Marks co P.I.) $2000, Sept 19, 2013 to Sept 20, 2014 .

52. "EARS: Joint Circuit and Waveform Optimization for Cognitive, Spectrally Confined Radar Transmission ," National Science Foundation, (Charles Baylis, P.I., R.J. Marks co P.I.) $400,000. October 1, 2013 to September 30, 2017. Supplemental $16,000 Research Experiences for Undergraduates (REU) awarded 2015. Supplemental $16,000 Research REU awarded 2016.

53. "Reconfigurable Power Amplifier and Filter Technology for Real-Time Adaptive Next Generation Radar," Army Research Laboratory, (Charles Baylis, P.I., R.J. Marks co P.I.) $855,453.19, May 11, 2016 to December 11, 2017

8 Courses Taught

8.1 Baylor University

1. EGR 3335, Signals & Systems
2. EGR 5001, Baylor Engineering & Research Seminars
3. ELC 5358, Introduction to Computational Intelligence
4. ELC 5354, Random Signals & Noise
5. ELC 5351, Multidimensional Signal Processing
6. ELC 5370, Introduction to Information Theory

8.2 University of Washington

1. EE 306, Elements of Electrical Engineering
2. EE 310, Electronics Laboratory
3. EE 235, Circuits & Systems I
4. EE 333, Circuits & Systems II
5. EE 335, Linear Systems Analysis I
6. EE 381, Electrophysics I
7. EE 383, Electrophysics II

8. EE 416, Random Signals for Communications and Signal Processing
9. EE 417, Introduction to Communication Theory I
10. EE 418, Introduction to Communication Theory II
11. EE 341, Discrete Time Linear Systems
12. EE 440, Linear Systems Analysis II
13. EE 446, Control Systems Analysis
14. EE 468, Fourier Optics & Holography
15. EE 500, Graduate Seminar
16. EE 505, Introduction to Probability & Random Processes
17. EE 508, Stochastic Processes
18. EE 518, Digital Signal Processing
19. EE 521, Multidimensional Signal Processing
20. EE 522, Shannon Sampling & Interpolation Theory
21. EE 523, Signal Analysis
22. EE 559, Computational Neural Networks
23. EE 579, Advanced Topics in Electromagnetics
24. EE 595, Introduction to Fuzzy Systems
25. EE 595, Advanced Topics in Communication Theory

9 Consulting & Other External Activities

9.1 Organizations

- ◇ Arbor Ministries, Seattle, Washington, Board of Directors, Secretary (2002-2012).
- ◇ Center for Evolutionary Informatics, Board of Directors, President (2008-present).
- ◇ American Institute for Technology and Science Education (AITSE), Advisory Council, (2009-2013).
- ◇ Education Axis (EduAxis) Advisory Board, (2015-present)

9.2 Expert Witness

- Neuromedical Systems, Inc (Plaintiff) vs. Neopath (Defendant), United States District Court, Southern District of New York (1997-98) - for the Defendant.
- Neopath (Plaintiff) vs Neuromedical Systems, Inc (Defendant) vs., United States District Court, Seattle (1997-98) - for the Plaintiff.
- Nestor, (Plaintiff) vs. Hecht-Nielsen Corporation Software (Defendant), filed Nov. 25, 1998, in U.S. District Court in Rhode Island.
- Hecht-Nielsen Corporation Software (Plaintiff) vs. Transaction Systems Architects Inc. and ACI Worldwide Inc. (Defendants), U.S. District Court in San Diego.
- Ysleta Del Sur Pueblo: Tigua Gaming Agency (Defendant)vs State of Texas (Plaintiff) -for the Defendant

9.3 Consulting

- Microsoft Corporation, Redmond, WA
- Boeing Computer Services
- Boeing Airplane Company
- Applied Physics Lab, University of Washington
- APPA Systems Inc., Bellevue, WA
- Technical Arts Mfg. Co. Inc., Redmond ,WA
- John Fluke Manufacturing Company Inc., Everett, WA
- Space Labs, Redmond, WA
- Lasentec, Bellevue, WA
- Flow Industries, Kent, WA.
- Philipp Technologies, Bellevue, WA
- Multidimensional Systems Corporation, Lynnwood, WA
- Pacific Gas & Electric
- American Pioneer Corporation, Ballard
- Decisions Systems Corporation, Atlanta, GA
- Inficom Corp, Redmond, WA
- DARPA, Crystal City, VA

10 Statistics

For the bean counters.

10.1 Publication Count

- ◇ 9 books. (List in Section 6.1 on page 16.)
- ◇ 158 journal publications. (List in Section 6.2 on page 17.)
- ◇ 200 conference papers. (List in Section 6.3 on page 30.)
- ◇ 31 book chapters. (List in Section 6.4 on page 50.)
- ◇ 3 patents. (List in Section 6.5 on page 53.)
- ◇ 51 abstracts. (List in Section 6.6 on page 54.)
- ◇ 24 videos. (List in Section 6.7 on page 58.)
- ◇ 64 supervised theses and dissertations. (List in Section 11.1.1 on page 75.)
- ◇ 54 cross disciplinary theses and dissertations. (List in Section 11.1.2 on page 77.)
- ◇ 53 grants. (List in Section 7 on page 66.)
- ◇ 224 coauthors. (List in Section 11.2 on page 78.)
- ◇ 26 different coauthor countries. (List in Section 11.2.1 on page 81.)
- ◇ 57 distinct journals. (List in Section 11.3 on page 82.)
- ◇ 139 different city venues. (List in Section 11.4 on page 83.)
- ◇ Number of different courses taught.
  - ◦ 6 at Baylor University. (List in Section 8.1 on page 70.)
  - ◦ 25 at the University of Washington. (List in Section 8.2 on page 70.)

10.2 Erdös and Bacon Numbers

- ◇ Erdös number[10] = 3

[10] Here are the details.

1. Robert J. Marks II coauthored with Donald C. Wunsch.
   - ◦ D.C. Wunsch II, R.J. Marks II, T.P. Caudell and C.D. Capps, "Limitations of a class of binary phase-only filters," Applied Optics, vol. 31, no.26. pp.5681-5687 (1992).
   - ◦ D.C. Wunsch II, T.P. Caudell, C.D. Capps, R.J. Marks II and R. A. Falk, "An optoelectronic implementation of the adaptive resonance neural network," IEEE Transactions on Neural Networks, vol.4, no.4, pp.673-684 (1993).

- ◇ Bacon number[11] = 2
- ◇ Erdös - Bacon number[12] = 5

10.3 Citation Count

Citation data[13] taken from Google Scholar.[14]

- ◇ h-index[15] = 48.
- ◇ i-10 index[16] = 150.
- ◇ citations = 9160

10.4 Website Rankings

Rankings from `www.alexa.com`[17] All rankings times 1000.

Date	EI	GS	HB	RM	TC	TiS	TeS	STD
9/5/14	11,180	2,411	18,730	16,286	17,266	11,620	–	
12/20/14	20,711	5,196	–	9,719	24,466	23,559	–	
3/13/15	3,241	4,019	–	4,931	21,559	–	27,618	19,431
US Rank	–	808	–	–	–	–	–	–
5/9/15	2,938	3,624	27,467	6,308	20,179	–	18,563	–
US Rank	–	425	–	–	–	–	–	–
4/30/16	18,410	3,551	–	13,430	18,892	–	3,100	–
US Rank	–	1,475	–	–	–	–	677	–
8/11/16	9,070	5,037	–	12,637	–	–	677	–
US Rank	–	1,162	–	–	–	–	7,961	–

2. Donald C. Wunsch coauthored with Frank Harary.
   - Frank Harary, Meng-Hiot Lim, Amit Agarwal, Donald C. Wunsch, "Algorithms for derivation of structurally stable Hamiltonian signed graphs," Int. J. Comput. Math. 81(11): 1349-1356 (2004)
3. Frank Harary coauthored with Paul ö.
   - Paul Erdös, Frank Harary and W.T. Tutte, "On the dimension of a graph," *Mathematika* 12 (1965) pp.118-122
   - Paul Erdös, Frank Harary and M. Klawe, "Residually-Complete- Graphs," Annals of Discrete Mathematics, Vol. 6, pp 117- 123 (1980).

[11] Marks was in *Expelled: No Intelligence Allowed* with Ben Stein who was in *Planes, Trains and Automobiles* with Kevin Bacon. IMDb data: http://www.imdb.com/name/nm2990293/

[12] The sum of one's Erdös and Bacon number

[13] The publications and their citations are listed in Section 11.5 on page 88.

[14] Google Scholar gives the most liberal citation counts. Counts include self citations.

[15] This means that 48 papers have been cited 48 or more times.

[16] The number of papers cited 10 or more times.

[17] EI=Evoinfo.org, GS=GunsmokeNet.com, HB = HandbookOfFourierAnalysis.com, RM=RobertMarks.org, TC=TheChortle.com, TiS= TimeScales.org TeS=TexasSymposium.org, STD=SaberToothDuck.com

11 Appendices

11.1 Graduate Theses and Dissertations

11.1.1 Students Advised

Following is a list of graduate students with an MS thesis or a Ph.D. dissertation.

1. D. K. Smith, "Extrapolation of Two-dimensional Bandlimited Images," Thesis (1980).
2. R. C. Hickey, "An Iterative Design Technique for Computer Generated Holograms," Physics Master's Project (1982).
3. D. Radbel, "Noise and Truncation Effects in the Estimation of Sampled Bandlimited Signals," Thesis (1983).
4. C. M. Maxey, "Optical Detection of Flaws in Thirty Five Millimeter Photographic Film," Thesis (1983).
5. R. A. Spielmaker, "A Coherent Optical Implementation of an Algorithm to Restore Continuously Sampled Aliased Data," Thesis (1983).
6. K. F. Cheung, "The Generalized Sampling Expansion: Its Stability, Posedness and Discrete Equivalent," Thesis (1983).
7. D. Kaplan, "Bandlimited Signal Interpolation: Continuous and Interlaced Sampling," Thesis (1983).
8. M. H. Goldburg, "Signal Synthesis in the Presence of an Inconsistent Set of Constraints," Thesis (1984).
9. T. Reightly, Iterative evaluation of extrema of integrals of trigonometric polynomials (1985).
10. C.A. Green, Composite Matched Filters, Thesis (1987).
11. Shiao-Min Tseng, "Noise Level Analysis for Linear Restoration Algorithms," Thesis (1984).
12. M. Dadi, "A Study of Relative Efficiency in Laplace Noise," Thesis (1985).
13. H. K. Ching, "Truncation Effects on the Estimation of Two-Dimensional Continuous Bandlimited Signals," Thesis (1985).
14. W. C. Wu, "Multidimensional Window Design Using Abel Projection," Thesis (1985).
15. J. J. Choi, "A Performance Analysis of Associative Memories With Nonlinearities in the Correlation Domain," Thesis (1987).
16. H. Amindavar, "CMF Performance in the Presence of Input and Processor Noise," Thesis (1987).
17. W. S. Leung, "Use of a Liquid Crystal Television as a Programmable Spatial Light Modulator," Thesis (1987).
18. K. H. Ho, "A Monte Carlo study of fault tolerant aspects of the alternating projection neural network," Thesis (1988).
19. K. F. Cheung, "Image sampling density reduction below that of Nyquist," Dissertation (1988).
20. Dennis Sarr, "Image processing using the alternating projection neural network," Thesis (1989).
21. S. Oh, "Homogeneous alternating projection neural networks," Dissertation (1989).
22. P. Arabshahi, "Fully parallel, real-time optical architectures for superior time-frequency representations of signals," Thesis (1990).
23. D.C. Park , "Identification of stationary/nonstationary systems using artificial neural networks," Dissertation (1990).
24. J.J. Choi, "Efficient learning in artificial neural networks," Dissertation (1990).
25. Rabayrol Bruno, "Training set selection for a binary classifier artificial neural network," Practical Training for IRESTE Engineer Degree, (Nantes, France), Thesis, (1990).
26. Christophe F. Bas, "Artificial neural networks as detectors of signals corrupted with Laplace noise," Practical Training for IRESTE Engineer Degree, (Nantes , France), Thesis, (1991).
27. D. Wunsch , "An Electro-Optical Learning Machine," Dissertation, (1991).
28. J.N. Hwang, Query based learning, (1991).
29. R. Streifel, "Synthesis of time-frequency representation by the method of projections onto convex sets," Thesis (1991).
30. M.G. Meyer, "Application of the projection theorem in biomagnetic computed tomography," Thesis (1991).

31. Zhi Li, "A partial table-lookup RNS-decimal number conversion algorithm and its implementation," Dissertation (1993).
32. Payman Arabshahi , "Fuzzy Adaptive Inference in Neural Networks and Search," Dissertation (1994).
33. Piotr Czapski, "Finite Element Modeling of Magnetic Fields Resulting From the Excitation Process in the Normal and Diseased Heart," Dissertation (1995).
34. Russell Reed, "Some Aspects of Generalization in Feed-Forward Neural Networks," Dissertation (1995).
35. Robert Streifel, "Application of Computational Intelligence to Electromechanical Systems," Dissertation (1996).
36. Frank S. Holman III, "Platform Independent 2D and 3D Geometry Representation and Related Applications Using Neural Networks," Thesis (1996).
37. Sigurdur Guttormsson, "Novelty Detection of Shorted Turns in Turbo-Generator Rotors," Thesis (1997).
38. Shinhak Lee, "Projections onto Fuzzy Convex Sets and Its Application to Radiation Beam Optimization in Radio Therapy," Dissertation (1997).
39. Georgios Chrysantholopolis, "Autonomous Agents Utilying Self-Reflection, Instincts and External Behavior Learning in a Simulated Environment: Orgs in Orgland," Thesis, (1998).
40. Frank S. Holman II, "Neural Network Based Shaped Neighborhoods: A Design Retrieval System," Dissertation (1999).
41. Gorkem Kuterdem, "Automatic control of Radiation Therapy Dosage," Thesis, (1999).
42. Martin Weikart, "Dynamic Control of Radiation Therapy Dosage," Thesis, (1999).
43. Frank S. Holman III, PhD EE, "Neural Network Based Shaped Neighborhoods: A Design Retrieval System," Dissertation 1999.
44. Brian Adams, MS EE, "Automatic Decision Aggregation for Smart Cockpit Control," (MS Project), 1999.
45. Ram Balasubramanian, "The Maximally-Receptive Classifier/Regression Bank ," Thesis (2000).
46. George Chrysanthakopoulis, "A Fuzzy-Logic Autonomous Agent Applied as a Supervisory Controller in a Simulated Environment," Dissertation 2000.
47. Sreeram Narayanan , "Fast Cross-projection Algorithm for Reconstruction of Seeds," MS Thesis, 2001.
48. Jae-Byung Jung, "Neural Network Emulation of Acoustic Models," Dissertation, 2001.
49. Benjaman Thompson, "Implicit Learning in Neural Network Encoders," MS Thesis, 2002.
50. Arindam Das, "Swarm Intelligence Applications to Communications Routing," Dissertation, Summer 2003.
51. Stephen Lam, "Query Based Data Base Construction for Supervised Learning," Dissertation, 2002.
52. Jiho Park "POCS Restoration of Degraded JPEG Images," Dissertation, 2002.
53. Sreeram Narayanan , "Rapid 3D Seed Reconstruction from Incomplete Data Sets for Image Guided Prostate Brachytherapy," Dissertation, 2004.
54. Jeffrey Weinschenk, "Reducing the rule explosion in fuzzy inferencing," Dissertation (2004).
55. Benjamin B. Thompson, "Ensonification control using layered perceptrons," Dissertation (2004).
56. Matthew Trumbo, "A New Modality for Microwave Tomographic Imaging: Time Transit Tomography," Thesis (2006).
57. Firasath Riyaz, "Evolving a Disjunctive Predator Prey Swarm using PSO: Adapting Swarms with Swarms," Thesis (Computer Science) (2006).
58. Steve Maule, "Principal Component and Artificial Neural Network Calibration of a Microwave Frequency Composition Measurement Sensor," Thesis (2007).
59. Winston Ewert, "Studies of Active Information in Search," Thesis (2010).
60. George Moñtanez, "Information Storage Capacity of Genetic Algorithm Fitness Maps," Thesis (2011).
61. Benjamin Van Ruitenbeek, "Image Compression and Recovery Using Compressive Sampling and Particle Swarm Optimization," Thesis (2009)

62. Albert Yu, "Optimizing Multi-Agent Dynamics for Underwater Tactical Applications," Thesis, (2011).
63. Winston Ewert, "Algorithmic Specified Complexity" Dissertation (2013).
64. Jon Roach, "Emergent Behaviors of Multi-Objective Swarms with Applications in a Dynamic Underwater Environment," Thesis, (2013).

11.1.2 Cross Disciplinary Research

This is partial list of students worked with during undergraduate research, thesis or dissertation work in cross disciplinary research that resulting in one or more publications coauthored with the student and their advisor. The student's advisor is indicated in the square brackets at the end of the citation. Papers co-authored are listed in the publications Section 6 on page 16.

1. E.L. Kral, Optical Computing, (1978)[John Walkup]
2. S.V. Bell, Optical Computing, (1978) [John Walkup]
3. J.L. Whited, Optical Computing, (1978) [John Walkup]
4. M.I. Jones, Optical Computing, (1978) [John Walkup]
5. M.E. Aggoune, Application of Neural Networks to Power Systems, Dissertation 1989 [Mohamed El-Sharkawi]
6. J.W. Taylor, Neural Networks (1988) [Les Atlas].
7. Yunxin Zhao, Cone Shapped Kernels, (1989) [Les Atlas].
8. James W. Pitton, Time-Frequency Representations, (1990) [Les Atlas].
9. C.M. Lam, Neural Networks, (1990) [Leung Tsang]
10. S. Kitamaru, Neural Networks, (1990) [Akira Ishimaru]
11. S.Y. Chung, Power neural networks. (1991) [O. Mohammed]
12. Z. Chen, Remote Sensing, (1992) [Leung Tsang]
13. A.T.C. Chang, Remote Sensing, (1992) [Akira Ishimaru]
14. S. Weerasooriya, Security Assessment of Power System, (1992) [Mohamed El-Sharkawi].
15. C.H. Daly, Amputee prosthetic fitting, (1994) [Joan Sanders].
16. W.R. Cummings, Amputee prosthetic fitting, (1994) [Joan Sanders].
17. H.C. Lai, Biomagnetic sensing, (1994) [Ceon Ramon].
18. B.G. Song, Fuzzy Systems, (1997) [James Ritcey].
19. C.A. Jensen, Feature Selection and Inverse Problems, (1999) [Mohamed El-Sharkawi].
20. P. Peng, Load forecasting, (1999) [Mohamed El-Sharkawi].
21. A.S. Kulkarni, Shorted field rotors, (2000) [Mohamed El-Sharkawi].
22. J. Xing, Shorted field rotors, (2000) [Mohamed El-Sharkawi].
23. L.S. Moulin, Support Vector Machines in Power Engineering, (2002) [A.P.A. da Silva].
24. Ioannis N Kassabalidis, Swarm Intelligence, (2002) [Mohamed El-Sharkawi].
25. J. Schreiber, Biomagnetic imaging, (2002) [Ceon Ramon].
26. Jens Haueisen, Biomagnetic imaging, (2002) [Ceon Ramon].
27. Paul Schimpf, Biomagnetic imaging, (2002) [Ceon Ramon].
28. Seongwon Cho, Iris recognition (2004) [Jaemin Kim]
29. Jinsu Choi, Iris recognition (2004) [Jaemin Kim]
30. Paul Reynolds, "Algorithm Implementation in FPGAs Demonstrated Through Neural Network Inversion on the SRC-6e," Thesis (2005) [Russ Duren].
31. Eric Green,"Design of a microwave sensor for non-invasive determination of blood-glucose concentration," Thesis (2005) [Randall Jean].
32. Jeffrey DaCunha, "Lyapunov Stability and Floquet Theory for Nonautonomous Linear Dynamic Systems on Time Scales," Dissertation (Mathematics) (2004) [John Davis].
33. Billy Jackson, "A General Linear Systems Theory on Time Scales: Transforms, Stability and Control," Dissertation (Mathematics) (2007) [John Davis].

34. Alice Ramos, "The Dynamic Lyapunov Equation on Time Scales," Dissertation (Mathematics) (2009) [John Davis].
35. John Miller, "Stability of Simultaneously Triangularizable Switched Linear Systems on Time Scales" Thesis (ECE) 2009.
36. Ben Van Ruitenbeek, "Image Compression and Recovery Using Compressive Sampling and Particle Swarm Optimization," Thesis (Computer Science) (2009) [David Sturgill].
37. Joseph Perry, Thermal Transient Modeling in Power MOSFETs, (2009) [Charles Baylis]
38. Dylan R. Poulsen, Time Scales, (2011) [John Davis].
39. Matthew Moldovan, "Piecewise Linear Approach for Optimizing Radar Chirps," (2012) [Charles Baylis].
40. Josh Martin, "Adaptive Load Impedance Optimization for Power Amplifiers in Reconfigurable Radar Transmitters," Thesis, (2012) [Charles Baylis].
41. Oby Akinbule, Microwave optimization, (2012) [Charles Baylis].
42. Loria Wang, "Side Lobe Modulation of Radar Antenna Pattern Utilizing an Auxiliary Array," Thesis, (2012) [Charles Baylis].
43. Yanqing Liu, Wireless Communication, (2013) [Liang Dong].
44. Stuart Gibbs "Estimation of Multi-Component Mixture Proportions using Regression Machine Analysis of Ultra-Wideband Spectroscopic Measurements" (2013) [Randall Jean]
45. Matthew Gardner "Estimation of Multi-Component Mixture Proportions using Regression Machine Analysis of Ultra-Wideband Spectroscopic Measurements" (2013) [Randall Jean]
46. Brandon Herrera "Estimation of Multi-Component Mixture Proportions using Regression Machine Analysis of Ultra-Wideband Spectroscopic Measurements" (2013) [Randall Jean]
47. Chris Faulkner "Estimation of Multi-Component Mixture Proportions using Regression Machine Analysis of Ultra-Wideband Spectroscopic Measurements" (2013) [Randall Jean]
48. Adam Parks "Estimation of Multi-Component Mixture Proportions using Regression Machine Analysis of Ultra-Wideband Spectroscopic Measurements" (2013) [Randall Jean]
49. Josh Daniliuc "Estimation of Multi-Component Mixture Proportions using Regression Machine Analysis of Ultra-Wideband Spectroscopic Measurements" (2013) [Randall Jean]
50. Paul Hodge "Estimation of Multi-Component Mixture Proportions using Regression Machine Analysis of Ultra-Wideband Spectroscopic Measurements" (2013) [Randall Jean]
51. Adam Parks "Feasibility of Microwave Radar System for Proton Therapy Control" (2015) [Randall Jean]
52. Yanqing Liu "Resource Management of Cognitive Radio Networks with Optimization Methods" (2015) [Liang Dong]
53. Brandon Herrera "A Low-Cost Embedded Network Analyzer for the Measurement of Material Properties" (2015) [Randall Jean]
54. Dylan Eustice "Adaptive Radar Waveform Synthesis via Alternating Projection," (2016) [Charles Baylis]

11.2 Coauthors

Here is a list of coauthors with whom I've published.

1. Oby Akinbule
2. George Andexler
3. M.E. Aggoune
4. Gregory M. Anderson
5. Payman Arabshahi
6. Les E. Atlas
7. Yianni Attikiouzel
8. Ram Balasubramanian
9. Joseph Barkate
10. Jennifer Barlow
11. Charles Baylis
12. Christophe F. Bas
13. Michael Behe
14. S.V. Bell
15. Matthew A. Beauregard
16. Stephen Berger
17. C.M. Brace
18. Walter Bradley

19. C Bunje
20. C. David Capps
21. Thomas P. Caudell
22. A.T.C. Chang
23. Zhengxiao Chen
24. Kwang F. Cheung
25. Paul S. Cho
26. Seongwon Cho
27. Jai J. Choi
28. Jinsu Choi
29. Georgios Chrysanthakopoulos
30. Suk Y. Chung
31. Lawrence Cohen
32. D.A. Cohn
33. Ronald Cole
34. William E. Combs
35. Jerome Conner
36. T.M. Cover
37. William R. Cummings
38. P. Czapski
39. M.I. Dadi
40. Colin H. Daly
41. Jeffrey J. DaCunha
42. Mark J. Damborg
43. Josh Daniliuc
44. Arindam Das
45. A. P. Alves da Silva
46. John M. Davis
47. Jean de Graaf
48. William A. Dembski
49. Tharam Dillon
50. R.C. von Doenhoff
51. Liang Dong
52. Witali L. Dunin-Barkowski
53. Lawrence Dunleavy
54. Russell Duren
55. Mohamed El-Sharkawi
56. Christian J. Eggen
57. Dylan Eustice
58. Winston Ewert
59. R. Aaron Falk
60. Chris Faulkner
61. Matthew Fellows
62. Robert Fischl
63. Jorge Fernandez
64. Matthew Flachsbart
65. David Fogel
66. Warren L. J. Fox
67. Toshio Fukuda
68. Stuart Gibbs
69. Ann K. Gauger
70. Stuart Gibbs
71. Marc Goldburg
72. Bruce Gordon
73. Ian A. Gravagne
74. Andrew Gray
75. Charles A. Green
76. Eric C. Green
77. Sigurdur E. Guttormsson
78. Marion O. Hagler
79. Douglas G. Haldeman
80. Michael W. Hall
81. Zachary Hays
82. Jens Haueisen
83. Megan U. Hazen
84. Michael Healy
85. Brandon Herrera
86. Paul Hodge
87. Wolfgang Hoffmann
88. Frank S. Holman III
89. F. Holt
90. T. Homma
91. M.Y. Huang
92. Steven Shyh-Jier Huang

93. Pieter J. van Heerden
94. Jenq-Neng Hwang
95. C.A. Irby
96. Akira Ishimaru
97. Billy J. Jackson
98. B. Randall Jean
99. Craig A. Jensen
100. Daniel Jepson
101. Michael I. Jones
102. Robert Jonk
103. Jae-Byung Jung
104. Dmitry Kaplan
105. Ioannis N Kassabalidis
106. Isidor Kerszenbaum
107. Jaemin Kim
108. Mingoo Kim
109. S. Kitamura
110. E. Lee Kral
111. Thomas F. Krile
112. Ramasamy Krishnan
113. David Krout
114. Amol S. Kulkarni
115. H. Görkem Kuterdem
116. Richard Ladner
117. H.C. Lai
118. Chi M. Lam
119. Steve T Lam
120. J.N. Larson
121. Steven Lardizabal
122. Casey Latham
123. Loren Laybourn
124. Kwang Y Lee
125. Shinhak Lee
126. Michael Lexa
127. Zhi Li
128. C.S. Lim
129. Yanqing Liu
130. Alan Lippman
131. C.G. Looney
132. T. P. Mann
133. Kirk Marquard
134. Josh Martin
135. J.G. McDonnell
136. M.G. Meyer
137. John E. Miller
138. Hunter Miller
139. Robert T. Miyamoto
140. Osama Mohammed
141. Matthew Moldovan
142. George Montañez
143. David Moon
144. Hiroyuki Mori
145. L. S. Moulin
146. Yeshwant Muthusamy
147. Sreeram Narayanan
148. D. Nguyen
149. V. Bogdan Neculaes
150. Aghogho Obi
151. Seho Oh
152. Marimuthu Palaniswami
153. Yoh-Han Pao
154. Alex Papalexopoulos
155. Dong Chul Park
156. Jiho Park
157. Adam Parks
158. Homayoon Parsaei
159. Joseph Perry
160. Hal Philipp
161. Mark H. Phillips
162. James W. Pitton
163. William Platt
164. M.C. Poon
165. H.Vincent Poor
166. D.R. Poulsen

167. Dmitry Radbel
168. Ceon Ramon
169. Alice A. Ramos
170. Russell D. Reed
171. Tonya Reightley
172. Sarvin Rezayat
173. A.J. Rocha Reis
174. Sarvin Rezayat
175. Grant Richter
176. James C. Ritcey
177. Jon Roach
178. C.J. Robinson
179. Alberto Rodriguez
180. Alonso Rodriguez
181. Benjamin Van Ruitenbeek
182. Fariborz Salamat
183. Joan E. Sanders
184. Frank Sanders
185. Iwan Njoto Sandjaja
186. Edgar Sánchez-Sinencio
187. John Sanford
188. Dennis P. Sarr
189. Hiroshi Sasaki
190. Paul Schimpf
191. J. Schreiber
192. David K. Smith
193. Michael J. Smith
194. Wesley E. Snyder
195. Mani Soma
196. Arun Somani
197. B.G. Song
198. Michael Z. Spivey
199. David Sturgill
200. Robert J. Streifel
201. J.W. Taylor
202. J.A. Thomas
203. Benjamin B. Thompson
204. Leung Tsang
205. Alexander Tsatsoulas
206. Shiao-Min Tseng
207. Matthew L. Trumbo
208. Alexander Tsatsoulas
209. Pieter J. van Heerden
210. S. Verdu
211. John L. Vian
212. John F. Walkup
213. Jack M. Webster
214. S.Weerasooriya
215. Jeffrey J. Weinschenk
216. John L. Whited
217. Wen-Chung Stewart Wu
218. Michael Wicks
219. Donald C. Wunsch II
220. Jian Xing
221. H.J. Youn
222. Albert R. Yu
223. Yunxin Zhao
224. Jacek Zurada

11.2.1 Publications with Nationals

Here is a list of some co-authors not born in the United State. Some have since become US citizens. Only one entry per country is given.

1. Argentina (Isidor Kerszenbaum)
2. Australia (Yianni Attikiouzel)
3. Brazil (A. P. Alves da Silva)
4. Canada (Winston Ewert)
5. China (Steven Shyh-Jier Huang)
6. Egypt (Mohamed El-Sharkawi)
7. India (Ram Balasubramanian)
8. Iran (Payman Arabshahi)
9. France (Christophe F. Bas)
10. Germany (Wolfgang Hoffmann)
11. Greece (Georgios Chrysanthakopoulos)

12. Iceland (Sigurdur E. Guttormsson)
13. Hong Kong (Kwang F. Cheung)
14. Indonesia (Iwan Njoto Sandjaja)
15. Japan (Toshio Fukuda)
16. Korea (Seho Oh)
17. Lebanon (M.E. Aggoune)
18. Mexico (Edgar Sánchez-Sinencio)
19. Nigeria (Oby Akinbule)
20. Poland (Jacek Zurada)
21. Romania (Josh Daniliuc)
22. Russia (Witali L. Dunin-Barkowski)
23. Taiwan (Wen-Chung Stewart Wu)
24. Turkey (H. Görkem Kuterdem)
25. Ukraine (Dmitry Radbel)
26. Vietnam(Steve T. Lam)

11.3 Journals

Here are journals in which publications appear.

1. Analog Integrated Circuits and Signal Processing,
2. Applied Optics
3. Bio-Complexity
4. Canadian Applied Mathematics Quarterly
5. Circuits, Systems, and Signal Processing
6. Computational Science and Engineering
7. Connections: Newsletter of the IEEE Neural Networks Council
8. Electronic Journal of Differential Equations
9. Engineering Intelligent Systems
10. IEEE Circuits and Devices Magazine
11. IEEE Computational Intelligence Magazine
12. IEEE Microwave Magazine
13. IEEE Power Engineering Review
14. IEEE Transactions on Acoustics, Speech and Signal Processing
15. IEEE Transactions on Aerospace and Electronic Systems
16. IEEE Transactions on Biomedical Engineering
17. IEEE Transactions on Circuits and Systems
18. IEEE Transactions on Circuits and Systems I: Regular Papers
19. IEEE Transactions on Electromagnetic Compatibility
20. IEEE Transactions on Energy Conversion
21. IEEE Transactions on Geoscience and Remote Sensing
22. IEEE Transactions on Image Processing
23. IEEE Transactions on Instrumentation and Measurement
24. IEEE Transactions on Fuzzy Systems
25. IEEE Transactions on Neural Networks
26. IEEE Transactions on Power Engineering
27. IEEE Transactions on Power Systems
28. IEEE Transactions on Signal Processing
29. IEEE Transactions on Systems, Man and Cybernetics: Systems
30. IEEE Transactions on Systems, Man and Cybernetics A, Systems and Humans
31. IEEE Transactions on Systems, Man and Cybernetics, Part B: Cybernetic
32. IEE Proceedings-C
33. IET Computer Vision
34. IET Radar, Sonar & Navigation
35. International Journal of Dynamical Systems and Differential Equations
36. International Journal of Information Technology and Intelligent Computing
37. International Journal of Microwave and Wireless Technologies
38. International Journal of Swarm Intelligence and Evolutionary Computation (IJSIEC)
39. International Journal of Tomography & Statistics
40. Journal of Advanced Computational Intelligence and Intelligent Informatics
41. Journal of The American Scientific Affiliation: Perspectives on Science and Christian Faith
42. Journal of the International Measurement Confederation (Measurement)

43. Journal of Clinical Engineering
44. Journal of Mathematical Analysis and Applications
45. Journal of the Optical Society of America
46. Journal of the Optical Society of America A
47. Journal of VLSI Signal Processing Systems
48. Mathematical and Computer Modelling
49. Measurement (Journal of the International Measurement Confederation)
50. Medical Physics
51. Neurocomputing
52. Neural Networks
53. Optical Engineering
54. Optics Letters
55. Perspectives on Science & Christian Faith
56. Phys. Med. Biol.
57. Proceedings of the IEEE

11.4 Venues

Conference, presentations and similar activities from a geographical perspective. Only one activity per city is listed.

Australia

1. Perth - IEEE International Conference on Evolutionary Computation, Perth, Australia. November 26-30, 1995.
2. Sydney - 2013 IEEE International Conference on Ultra-Wideband (ICUWB), Sydney Australia, September 15-18,2013.

Austria

3. Graz - Power Systems Computation Conference, Graz, Austria (August 19-24, 1990)

Brazil

4. Florianopolis - "Modern Neural Networks: The First Decade," IV Escola de Redes Neurais, Florianopolis , Brazil, July 21, 1997.

Canada

5. Alberta - Calgary - Eighth Canadian Biennial Conference, Canadian Society for Biomechanics, Calgary, August 18-20, 1994
6. Quebec City - Quebec - Fourteenth Congress of the International Commission for Optics, Quebec City, Quebec Canada, August 24-28, 1987.
7. British Columbia - Vancouver - IEEE International Conference on Systems, Man and Cybernetics, Vancouver, British Columbia, Canada, October 22-25, 1995
8. Hamilton - Ontario - CSCA/ASA/CiS 2014 Conference, McMaster's University
9. Ottawa - 2013 IEEE Radar Conference (RADAR), Ottawa, ON, Canada, April 29-May 3 2013
10. Victoria - IEEE Pacific Rim Conference on Communications, Computers and Signal Processing, Victoria, B.C. Canada, June 4-5, 1987.

China

11. Beijing - International Joint Conference on Neural Networks, Beijing, November 3-6, 1992.
12. Chengdu - "Computational Intelligence: A Free Source of Information?" International Symposium on Neural Networks (ISNN), Chengdu, China (May 29, 2006)
13. Hong Kong - 1989 International Symposium on Computer Architecture and Digital Signal Processing (Hong Kong Convention and Exhibition Centre, 11-14 October, 1989),
14. Nanjing - International Conference on Circuits and Systems, July 6-8, 1989, Nanjing, China
15. Shanghai - IEEE Wireless Communications and Networking Conference (WCNC), Shanghai, China, 7-10 April 2013
16. Wuhan - Sixth International Symposium on Neural Networks (ISNN 2009) Wuhan, China, May 26-29, 2009

England

17. London - 1978 International Computing Conference, London, England, 1978

Finland

18. Espoo - 1991 International Geoscience and Remote Sensing Symposium, 3-7 June 1991, Espoo, Finland.
19. Helsinki - 1988 IEEE International Symposium on Circuits and Systems, pp. 503-506, Helsinki, 7-9 June, 1988.

France

20. Carry-le-Rouet - 1997 IEEE International Symposium on Diagnostics for Electrical Machines, Power Electronics and Drives, (SDEMPED '97), Carry-le-Rouet, France, September 1-3, 1997,
21. Montpellier - International Conference on Intelligent System Application to Power Systems, Montpellier, France, September 5-9, 1994.
22. Nantes - "Artificial Neural Systems," Ireste University in Nantes France, March 5-30, 1990 .
23. Paris - IEEE/IAFE [International Association of Financial Engineers] Computational Intelligence in Financial Engineering, (CIFEr). Paris, France, April 11-15, 2011.
24. Toulouse - 19th AIAA Int. Communications Satellite Systems Conf., 17-20 April 2001, Toulouse, France.

Germany

25. Heidleberg - International Conference on the Use of Computers in Radiation Therapy XIII, Heidleberg, Germany (May 22-25, 2000)
26. Munich - IEEE Nanotechnology Council Meeting
27. Duisburg, "A signal space interpretation of neural network associative memories and classifiers" at the University of Duisburg, W. Germany, May 31, 1988.

Hungary

28. Budapest - IEEE ISAP2001, Budapest, Hungary, June 18-21,2001

Italy

29. Capri - International Optical Computing Conference, Capri, Italy, September 1976
30. Como - 2000 Como , Italy IJCNN, July 24-27, 2000 .
31. Florence - 30th International Symposium on Automotive Technology and Automation, Dedicated Conference on Megatronics, Florence Italy, 16-19 June 1997
32. La Spezia - Impact of Environmental Variability on Acoustic Predictions and Sonar Performance (N. G. Pace and F. B. Jensen, eds.),16-20 September 2002, Lerici, La Spezia, Italy,Sept. 2002.
33. Sorrento - 1994 International Conference on Artificial Neural Networks May 26-29, 1994, Sorrento, Italy.
34. Tuscany - "Evolution Models Do Not Create Information," Great Expectations Conferences, Borgo Finocchieto, Tuscany, Italy, June 12-16, 2011
35. Venice - 1996 IEEE International Workshop on Neural Networks for Identification, Control, Robotics and Signal/Image Processing (NICROSP), September 21-23, 1996, Venice, Italy

Japan

36. Nagoya - Second International Forum on Applications of Neural Networks to Power Systems , Nagoya, Japan, 1993;
37. Tokyo - IEEE-IECEJ-ASJ International Conference on Acoustics, Speech and Signal Processing, Tokyo, Japan, March 1986.
38. Tsukuba - 1993 IEEE/Tsukuba International Workshop on Advanced Robotics, November 8-9, 1993, AIST Tsukuba, Japan
39. Yokohama - International Conference on Fuzzy Systems (FUZZ-IEEE), Yokohama, Japan, March 20-24, 1995.

Latfia

40. Jurmala - 1995 Workshop on Sampling Theory & Applications, September 20-22, 1995 , Jurmala (Riga), Latvia

Mexico

41. Cancun - IEEE Technical Activities Board (TAB) 1999
42. Mexico City - IEEE TAB Symposium

Monaco

43. Monaco - "Artificial Neural Networks in Electric Power Systems," Decisions Systems International, Monaco, July 1-3, 1991

New Zealand

44. Dunedin - New Zealand International Two-Stream Conference on Artificial Neural Networks and Expert Systems (ANNES) November 24-26, 1993, Otage University, Dunedin, New Zealand

Poland

45. Gliwice - Faculty Fellowship, March 31, 2003 "Scientists and God: The Myth of Incompatibility"
46. Krakow - Faculty Fellowship, April 1, 2003 "Fuzzy Union Rule Configuration: Avoiding Exponential Rule Explosion".

47. Szczyrk - Second Conference of Neurl Networks and Their Applications, 1996
48. Wroclaw - "Perceptron Inversion: Properties and Applications", Institute of Engineering Cybernetics, Wroclaw University of Technology, Wroclaw, Poland (April 3, 2003).

Russia

49. Moscow - "Moscow Airport Encounters," University ofWashington EE News, March 1993, Volume 4, Number 2, p.8.
50. Rostov-on-Don - 1992 RNNS/IEEE Symposium on Neuroinformatics and Neurocomputing, Rostov-on-Don, Russia, October 7- 10, 1992.
51. Ulan-Ude - "Neural Networks: The Fundamentals," Buryat State University, Ulan-Ude, Russia, March 5, 2001.

Singapore

52. Singapore - 1991 International Joint Conference on Neural Networks, Singapore, November 18-21 (1991).

South Korea

53. Seoul - International Conference on Intelligent Systems Applications to Power Systems (ISAP), Seoul, Korea, July 6-10, 1997.

Ukraine

54. Crimea - Information Processing by Neural Networks, (IP+NN ' 97), October 10-17, 1997, Ukraine, Crimea, Gurzuf Russian Academy of Science, Russian Neural Network Society, International Academy of Computer Scienc

Spain

55. Barcelona - International Workshop on Arti cial Neural Networks (IWANN ' 93), June 9-11, 1993, Barcelona
56. Madrid "Artificial Neural Networks in Electric Power Systems," Decisions Systems International, Madrid, Spain , September 7-11, 1992

United States

Alabama

57. Auburn - First Workshop on Neural Networks: Academic/Industrial/NASA/Defense, Auburn University and Conference Center, 4-6 February, 1990, Auburn, Alabama
58. Huntsville - SPIE Symposium/Workshop on the Effective Utilization of Optics in Radar Systems, Huntsville, Alabama, September 1977.

Alaska

59. Anchorage - 1998 IEEE International Conference on Evolutionary Computation (ICEC) at the 1998 IEEE World Congress on Computational Intelligence, Anchorage, Alaska, May 5-9, 1998

Arizona

60. Scottsdale - IEEE International Symposium on Circuits and Systems, Scottsdale, Arizona, May 26-29, 2002
61. Tempe - Microwave Measurement Symposium (ARFTG). Tempe, Arizona. 2011 78th ARFTG 1-2 Dec. 2011.
62. Tucson - Optical Society of America, Annual Meeting, Tucson, Ariz ., Oct. 19-22, 1976.
63. Phoenix - International Microwave Symposium, May 22, 2015

California

64. Los Angeles - O-E/LASE '88 Conference on Neural Network Models for Optical Computing, Los Angeles, January 1988
65. Monterey - Proceedings of the Twenty Fourth Asimomar Conference on Signals, Systems and Computers, 5-7 November, 1990, Asilomar Conference Grounds, Monterey, California.
66. Napa Valley - Pacific Gas & Electric R&D Electric Distribution Program External Advisory Goup Meeting, Silverado Country Club, Napa Valley , California , (August 22-23, 1991).
67. Pasadena - IEEE CAS Workshop on Wireless Communications and Networking, Pasadena, CA, Sept. 5-6, 2002.
68. Santa Barbara - "Evolutionary Simulations and Sources of Active Information," Discovery Retreat, Santa Barbara, CA (March 1-4, 2011)
69. San Diego - IEEE First International Conference on Neural Networks, San Diego, June 1987
70. San Francisco - Second IEEE International Conference on Fuzzy Systems (FUZZ-IEEE '93), San Francisco, March 1993
71. San Jose - "What Does Calculus Have to Do With Christianity?" San Jose State University, November 30, 2003.

72. San Mateo - International Conference on Acoustics, Speech and Signal Processing, San Mateo, CA, 1987.

Colorado

73. Boulder - 74th ARFTG (Automatic RF Techniques Group) Microwave Measurement Symposium, December 1st - 4th, 2009, Broomfield/Boulder, Colorado
74. Denver - IEEE International Joint Conference on Neural Networks, San Diego, July 24-27, 1988
75. Gold Lake - Workshop on Optical Arti cial Intelligence, Gold Lake , Colorado (3-5 August, 1987),

Florida

76. Jacksonville - 2012 44th Southeastern Symposium on System Theory (SSST), Jacksonville, Fla pp.18-23, 11-13 March 2012.
77. Miami - INFOCOM 2005. 24th Annual Joint Conference of the IEEE Computer and Communications Societies. March 2005 Miami, Fla
78. Orlando - IEEE World Congress on Computational Intelligence, June 26 - July 2,1994 Walt Disney World Dolphin Hotel, Orlando, Florida.
79. Tampa - IEEE 15th Annual Wireless and Microwave Technology Conference (WAMICON)

Georgia

80. Atlanta - Symposium on Dyagnostics for Electric Machines, Power Electronics and Drives, Atlanta, GA 24-26 August 2003

Hawaii

81. Honolulu - 2002 International Joint Conference on Neural Networks, 2002 IEEE World Congress on Computational Intelligence, May12-17, 2002, Honolulu
82. Kauai - 2012 International Waveform Diversity & Design Conference

Indiana

83. Terre Haute - Rose-Hulman Institute of Technology Outstanding Young Alumni Award Cermony

Illinois

84. Chicago - Faculty leadership conference, Campus Crusade for Christ, June 1997.

Iowa

85. Perry - "Added Information in Targeted Evolutionary Search", Perry Conference, Hotel Pattee, Perry, Iowa, April 17-20, 2006.

Louisiana

86. New Orleans - 113th Annual Meeting of the American Mathematical Society (AMS), New Orleans, January 5-7, 2007.

Maryland

87. Annapolis - "Spectrum Issues in Amplifier Design," Fifth Annual Emerging Spectrum Technology (EST) Workshop on Advanced Radar Technologie to Improve Spectrum Use, Double Tree Hotel, Annapolis Maryland, September 13-14, 2010
88. Baltimore - International Conference on Neural Networks, Baltimore , June 1992.
89. College Park - 2012 ONR University/Laboratory Initiative Program Review, University of Maryland University, College Park, June 5-7, 2012
90. Hyattsville - 2012 University Laboratory Initiative Program Review, 5-7 June

Massachusetts

91. Boston - 1995 Design Engineering Technical Conferences, American Society of Mechanical Engineers (ASME), Boston Massachusetts, September 17-20, 1995.
92. Cambridge - 1989 IEEE International Conference on Systems, Man and Cybernetics, (Hyatt Regancy, Cambridge, Massachusetts, 14-17 Nov. 1989),

Michigan

93. Mackinac Island - Limits of Passive Imaging Workshop, Mackinac Island, MI, pp.45-55, May 24-26, 1983
94. Dearborn - "Homogeneous and layered alternating projection neural networks," The International Symposium on Optical Engineering and Industrial Sensing for Advanced Manufacturing Technologies held at the Dearborn Hyatt, Michigan, June 26-30, 1988.

Minnesota

95. Minneapolis - IEEE Power Engineering Systems 1990 Summer Meeting, Minneapolis, Minnesota, 15-19 July 1990.

Mississippi

96. Biloxi - Oceans '02 MTS/IEEE, Biloxi, Mississippi

Missouri

97. Columbia - "Conservation of Information in Evolutionary Search Algorithms: Measuring the Cost of Success," University of Missouri, Columbia, (November 12, 2007). IEEE CIS Distinguished Lecture for Columbia Chapter of IEEE CIS Society.

98. Rolla - "Time Scale Discrete Fourier Transforms," Guest Lecture, Missouri University of Science and Technology, Rolla, Mo., April 14, 2010.

99. St. Louis - Artificial Neural Networks in Engineering, (ANNIE 95), Artificial Neural Networks, Fuzzy Logic and Evolutionary Programming for Designing Smart Engineering Systems, November 12 - 15, 1995, Marriott Pavilion Hotel, St. Louis, Missouri

Nebraska

100. Lincoln - University of Nebraska-Lincoln Math Symposium, December 7, 2007

New York

101. Ithaca, Information & Biology, Cornell, University, Spring 2011

102. New York - IEEE Conference on Computational Intelligence for Financial Engineering & Economics (CIFEr) April 9-11, 1995

103. Rochester - 1977 Optical Society of America Annual Meeting, Rochester, NY

North Carolina

104. Research Triangle Park - IEEE Virtual Reality Annual International Symposium (VRAIS) 1995 Research Triangle Park, NC

105. Indian Trail, North Carolina. 30th Annual National Conference on Christian Apologetics, October 11-12 2013 First Baptist Church Indian Trail.

106. Matthews, North Carolina. 2013 Ratio Christi Symposium, Southern Evangelical Seminary, October 12-13 2013

Oklahoma

107. Winston Ewert, William A. Dembski, Robert J. Marks II, Algorithmic Specified Complexity, in Engineering and Metaphysics, Tulsa, OK, 2012.

Oregon

108. Portland - 1989 IEEE International Symposium on Circuits and Systems, 9-11 May 1989, Portland

Pennsylvania

109. Philadelphia - International Symposium on Circuits and Systems, pp.370-376, Philadelphia, May 1987.

Rhode Island

110. Newport - ONR University/Laboratory Initiative in Undersea Weapons Technology at the Naval Undersea Warfare Center (NUWC), Newport, RI (June 2-4, 2009).

South Carolina

111. Clemson - NSF Workshop on Applications of Artificial Neural Network Methodology in Power Systems Engineering, April 8-10, 1990, Clemson University

Tennesee

112. Nashville - IEEE/IAFE [International Association of Financial Engineers] Computational Intelligence in Financial Engineering, (CIFEr). Nashville, TN, March 30-April 2, 2009,

Texas

113. Arlington - "Lessons from Gödel, Turing and Chaitin: Things Computational Intelligence Will Never Do," IEEE MetroCon 2009, Innovating for Society, August 17th, 2009, Sheraton Arlington, Arlington, Texas.

114. Austin - "Science & Christianity: Separate but Equal?" Covenant Presbyterian Church, Austin, TX (August 16, 2009)

115. El Paso - 2014 Expert Witness, Ysleta del Sur Pueblo (Federal Court)

116. College Station - "THE GOD DIALOGUES II: A Panel Discussion," Texas A&M University, College Station, TX. October 27, 2011, Sponsored by Ratio Christi (Debate between Muslim, Atheist and Christian views of God.)

117. Dallas - 1990 IEEE Ap-S International Symposium and URSI Radio Science Meeting, 7-11 May, 1990, Dallas, Texas.

118. El Paso - 2014 U.S. District Court, Western District of Texas (Expert Witness)

119. Lubbock - 1977 Midwest Symposium on Circuits and Systems, Texas Tech University, Lubbock, August 1977.
120. Houston - INTERNATIONAL CONFERENCE ON NEURAL NETWORKS (ICNN'97) Westin Galleria Hotel, Houston, Texas, USA, June 9-12, 1997, "Neural Networks: Reduction to Practice"
121. Leakey, "2013 Communio: A Retreat for Faculty (Baylor University)" Laity Lodge, May 20-24, 2013
122. Plano - "God Ever Geometrizes: Apologetics in Mathematics," Probe Ministries, Plano, Texas, (June 28, 2010).
123. San Antonio - IEEE Globecom 2001, Nov. 25-29, 2001 , San Antonio , Texas.
124. Tyler - 42nd Meeting of the Southeastern Symposium on System Theory, University of Texas at Tyler, March 7-9, 2010
125. Waco - 2013 Texas Symposium on Wireless & Microwave Circuits & Systems, Waco, Texas, April 4-5, 2013.

Virginia

126. Arlington, Virginia. 2015 IEEE International Radar Conference (RadarCon), Crystal City, May 10, 2015
127. Crystal City, Virginia. DARPA Radar/ Communications Co-Design Challenge, DARPA, (April 27, 2015)
128. Vienna, Virginia. "Power Amplifier Circuit and Waveform Optimization for Reduced Spectral Spreading in Radar Transmitters," IDGA's 4th Annual Military Radar Summit, Feb 8-10, 2011, Vienna, VA
129. Crystal City, Virginia. NSF Review Panel.

West Virginia

130. Morgantown - WVU Neural Network Symposium, West Virginia University , Morgantown, (15-16 June, 1989).
131. Davis - Origin of Biological Information, Canaan Valley Resort Aug 19-21, 2016

Utah

132. Salt Lake City - XII International Conference on the Use of Computers in Radiation Therapy, May, 1997, Salt Lake City .

Washington DC

133. Washington DC - 1980 International Computing Conference, Washington D.C., April 1980

Washington

134. Ballard - American Pioneer Corporation, Ballard (consulting) Bellevue - Fuzzy Logic & Intelligent Systems Seminar, Boeing Computer Services, Red Lion Inn, Bellevue, WA, December 2, 1991,
135. Everett - John Fluke Manufacturing Company Inc., Everett, WA (consulting)
136. Kirkland - Financial Neural Networks, Inc., Kirkland, WA (consulting)
137. Redmond - Microsoft Corporation, Redmond, WA (consulting)
138. Richland - Workshop on Enviornmental and Energy Applications of Neural Networks, Richland, Washington, 30-31 March 1995
139. Seattle - IEEE International Joint Conference on Neural Networks, San Diego, July 24-27, 1988

11.5 Citation List

This list is from Google and forms the basis for the h-index and i-10 index in Section 10.3 on page 74. Most highly cited papers are listed first.

1. Electric load forecasting using an artificial neural network - 900 citations, 1991 , DC Park, MA El-Sharkawi, RJ Marks, LE Atlas, MJ Damborg : Power Systems, IEEE Transactions on 6 (2), 442-449
2. Neural smithing: supervised learning in feedforward artificial neural networks - 590 citations, 1998 , RD Reed, RJ Marks : Mit Press
3. The use of cone-shaped kernels for generalized time-frequency representations of nonstationary signals - 438 citations, 1990 , Y Zhao, LE Atlas, RJ Marks : Acoustics, Speech and Signal Processing, IEEE Transactions on 38 (7), 1084-1091
4. Introduction to Shannon sampling and interpolation theory - 426 citations, 1991 , II Marks, J Robert : Springer-Verlag New York, Inc.
5. Support vector machines for transient stability analysis of large-scale power systems - 209 citations, 2004 , LS Moulin, MA El-Sharkawi, RJ Marks : Power Systems, IEEE Transactions on 19 (2), 818-825

6. Advanced topics in Shannon sampling and interpolation theory - 176* citations, 1993 , RJ Marks : Springer Texts in Electrical Engineering, New York, Berlin: Springer,— c1993 ...
7. Review of computational intelligence: imitating life - 168 citations, 1995 , JM Zurada, RJ Marks, J Robinson : IEEE TRANSACTIONS ON NEURAL NETWORKS 6 (6), 1563
8. Query-based learning applied to partially trained multilayer perceptrons - 160 citations, 1991 , JN Hwang, JJ Choi, S Oh, RJ Marks : Neural Networks, IEEE Transactions on 2 (1), 131-136
9. Minimum power broadcast trees for wireless networks: integer programming formulations - 156 citations, 2003 , AK Das, RJ Marks, M El-Sharkawi, P Arabshahi, A Gray : INFOCOM 2003. Twenty-Second Annual Joint Conference of the IEEE Computer and ...
10. Swarm intelligence for routing in communication networks - 153 citations, 2001 , I Kassabalidis, MA El-Sharkawi, RJ Marks, P Arabshahi, AA Gray : Global Telecommunications Conference, 2001. GLOBECOM'01. IEEE 6, 3613-3617
11. Training connectionist networks with queries and selective sampling - 152 citations, 1990 , L Atlas, D Cohn, R Ladner, MA El-Sharkawi, RJ Marks II : Advances in neural information processing systems 2, 566-573
12. Power system security assessment using neural networks: feature selection using Fisher discrimination - 122 citations, 2001 , C Jensen, M El-Sharkawi, RJ Marks : Power Systems, IEEE Transactions on 16 (4), 757-763
13. An adaptively trained neural network - 119 citations, 1991 , DC Park, M El-Sharkawi, RJ Marks : Neural Networks, IEEE Transactions on 2 (3), 334-345
14. A performance comparison of trained multilayer perceptrons and trained classification trees - 118 citations, 1990 , L Atlas, R Cole, Y Muthusamy, A Lippman, J Connor, D Park, ... : Proceedings of the IEEE 78 (10), 1614-1619
15. Fuzzy logic technology and applications - 117 citations, 1994 , RJ Marks :
16. Dynamic security border identification using enhanced particle swarm optimization - 112 citations, 2002 , IN Kassabalidis, M El-Sharkawi, RJ Marks, LS Moulin, AP Alves da Silva : Power Systems, IEEE Transactions on 17 (3), 723-729
17. Artificial Neural Networks with Applications to Power Systems: Video Tutorial Course - 99* citations, 1996 , R Fischl, W Hoffmann, KY Lee, RJ Marks II, H Mori, A Papalexopoulos, ... : Institute of Electrical and Electronics Engineers
18. Inversion of snow parameters from passive microwave remote sensing measurements by a neural network trained with a multiple scattering model - 96 citations, 1992 , L Tsang, Z Chen, S Oh, RJ Marks, ATC Chang : Geoscience and Remote Sensing, IEEE Transactions on 30 (5), 1015-1024
19. Similarities of error regularization, sigmoid gain scaling, target smoothing, and training with jitter - 94 citations, 1995 , R Reed, RJ Marks, S Oh : Neural Networks, IEEE Transactions on 6 (3), 529-538
20. Optimization of intensity modulated beams with volume constraints using two methods: Cost function minimization and projections onto convex sets - 85 citations, 1998 , PS Cho, S Lee, RJ Marks II, S Oh, SG Sutlief, MH Phillips : Medical Physics 25 (4), 435-443
21. Intelligence: Computational versus artificial - 83* citations, 1993 , RJ Marks : IEEE Transactions on Neural Networks 4 (5), 737
22. Handbook of Fourier analysis & its applications - 71 citations, 2009 , RJ Marks : Oxford University Press, USA
23. Computational intelligence: a dynamic system perspective - 70* citations, 1995 , M Palaniswami, Y Attikiouzel, DB Fogel, T Fukuda : IEEE
24. Minimum power broadcast trees for wireless networks: optimizing using the viability lemma - 69 citations, 2002 , RJ Marks, AK Das, M El-Sharkawi, P Arabshahi, A Gray : Circuits and Systems, 2002. ISCAS 2002. IEEE International Symposium on 1, I ...
25. Recovery of image blocks using the method of alternating projections - 68 citations, 2005 , J Park, DC Park, RJ Marks, M El-Sharkawi : Image Processing, IEEE Transactions on 14 (4), 461-474
26. Iris recognition using wavelet features - 67 citations, 2004 , J Kim, S Cho, J Choi, RJ Marks

Ii : Journal of VLSI signal processing systems for signal, image and video ...

27. Towards static-security assessment of a large-scale power system using neural networks - 65 citations, 1992 , S Weerasooriya, MA El-Sharkawi, M Damborg, RJ Marks : IEE proceedings C (generation, transmission and distribution) 139 (1), 64-70

28. Preliminary results on using artificial neural networks for security assessment (of power systems) - 65 citations, 1989 , M Aggoune, MA El-Sharkawi, DC Park, MJ Dambourg, RJ Marks : Power Industry Computer Application Conference, 1989. PICA'89, Conference ...

29. Signal synthesis in the presence of an inconsistent set of constraints - 62 citations, 1985 , M Goldburg, RJ Marks : Circuits and Systems, IEEE Transactions on 32 (7), 647-663

30. Performance comparisons between backpropagation networks and classification trees on three real-world applications - 61 citations, 1990 , L Atlas, R Cole, J Connor, M El-Sharkawi, RJ Marks II, Y Muthusamy, ... : Advances in neural information processing systems 2, 622-629

31. Ambiguity function display: an improved coherent processor - 61 citations, 1977 , RJ Marks, JF Walkup, TF Krile : Applied optics 16 (3), 746-750

32. Inversion of feedforward neural networks: Algorithms and applications - 58 citations, 1999 , C Jensen, RD Reed, RJ Marks, M El-Sharkawi, JB Jung, RT Miyamoto, ... : Proceedings of the IEEE 87 (9), 1536-1549

33. Computational intelligence: imitating life - 58* citations, 1994 , JR JM Zurada, RJ Marks : IEEE Press

34. Fast cross-projection algorithm for reconstruction of seeds in prostate brachytherapy - 56 citations, 2002 , S Narayanan, PS Cho, RJ Marks II : Medical physics 29, 1572

35. Holographic representations of space-variant systems using phase-coded reference beams - 56 citations, 1977 , TF Krile, RJ Marks, JF Walkup, MO Hagler : Applied optics 16 (12), 3131-3135

36. The minimum power broadcast problem in wireless networks: an ant colony system approach - 55 citations, 2002 , AK Das, RJ Marks, M El-Sharkawi, P Arabshahi, A Gray : proceedings of the IEEE Workshop on Wireless Communications and Networking

37. MDLT: a polynomial time optimal algorithm for maximization of time-to-first-failure in energy constrained wireless broadcast networks. - 53 citations, 2003 , AK Das, RJ Marks, M El-Sharkawi, P Arabshahi, A Gray : GLOBECOM, 362-366

38. Restoring lost samples from an oversampled band-limited signal - 53 citations, 1983 , RJ Marks : Acoustics, Speech and Signal Processing, IEEE Transactions on 31 (3), 752-755

39. Bandwidth Reduction for Controller Area Networks using Adaptive Sampling. - 52 citations, 2004 , IA Gravagne, JM Davis, JJ Dacunha, RJ Marks II : IEEE International Conference on Robotics and Automation 5, 5250-5255

40. Hardware-sensitive optimization for intensity modulated radiotherapy - 52* citations, 2000 , PS Cho, RJM II : Physics in medicine and biology 45, 429

41. Adaptive-SDR: Adaptive swarm-based distributed routing - 51 citations, 2002 , I Kassabalidis, MA El-Sharkawi, RJ Marks, P Arabshahi, AA Gray : Neural Networks, 2002. IJCNN'02. Proceedings of the 2002 International Joint ...

42. Adaptive routing in wireless communication networks using swarm intelligence - 51 citations, 2001 , P Arabshahi, A Gray, I Kassabalidis, A Das, S Narayanan, ME Sharkawi, ... : Proc. 19th AIAA Int. Communications Satellite Systems Conf., 17-20 April ...

43. Elliptical novelty grouping for on-line short-turn detection of excited running rotors - 49 citations, 1999 , SE Guttrmsson, RJ Marks, MA El-Sharkawi, I Kerszenbaum : Energy Conversion, IEEE Transactions on 14 (1), 16-22

44. Detection of shorted-turns in the field winding of turbine-generator rotors using novelty detectors-development and field test - 49* citations, 1996 , RJ Streifel, RJ Marks II, MA El-Sharkawi, I Kerszenbaum : IEEE transactions on energy conversion 11 (2), 312-317

45. Imaging sampling below the Nyquist density without aliasing - 49 citations, 1990 , KF Cheung, RJ Marks : JOSA A 7 (1), 92-105

46. Three-dimensional seed reconstruction from an incomplete data set for prostate brachytherapy - 48 citations, 2004 , S Narayanan, PS Cho, RJ

MarksII : Physics in medicine and biology 49 (15), 3483

47. r-shrink: A heuristic for improving minimum power broadcast trees in wireless networks - 48 citations, 2003 , AK Das, RJ Marks, M El-Sharkawi, P Arabshahi, A Gray : Global Telecommunications Conference, 2003. GLOBECOM'03. IEEE 1, 523-527
48. Space-variant processing of 1-D signals - 48 citations, 1977 , RJ Marks II, JF Walkup, MO Hagler, TF Krile : Applied Optics 16 (3), 739-745
49. Kernel synthesis for generalized time-frequency distributions using the method of alternating projections onto convex sets - 46 citations, 1994 , S Oh, RJ Marks, LE Atlas : Signal Processing, IEEE Transactions on 42 (7), 1653-1661
50. Some properties of the generalized time frequency representation with cone-shaped kernel - 46 citations, 1992 , S Oh, RJ Marks : Signal Processing, IEEE Transactions on 40 (7), 1735-1745
51. Fuzzy control of backpropagation - 46 citations, 1992 , P Arabshahi, JJ Choi, RJ Marks, TP Caudell : Fuzzy Systems, 1992., IEEE International Conference on, 967-972
52. A sampling theorem for space-variant systems - 45 citations, 1976 , RJ Marks II, JF Walkup, MO Hagler : JOSA 66 (9), 918-921
53. Artificial neural networks for power system static security assessment - 43 citations, 1989 , ME Aggoune, LE Atlas, DA Cohn, MJ Damborg, MA El-Sharkawi, ... : Circuits and Systems, 1989., IEEE International Symposium on, 490-494
54. Detection in Laplace noise - 42 citations, 1978 , R Internationar : IEEE Transactions on Aerospace and Electronic Systems 14 (6), 866
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149. Restoration of continuously sampled band-limited signals from aliased data - 10 citations, 1982 , RJ Marks : . Acoustics, Speech and Signal Processing, IEEE Transactions on 30 (6), 937-942

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11.6 Selected Citation Quotes

11.6.1 The Piecewise Isoplanatic Approximation

R.J. Marks II and T.F. Krile, "Holographic representations of space-variant systems: system theory," Applied Optics, vol. 15, pp.2241-2245 (1976).

1. B.E.A. Saleh and Mark O. Freeman, "Optical Transformation," in Optical Signal Processing, edited by Joseph L. Horner, Academic Press, Inc. San Diego, CA, 1987,p.315

   > "Techniques have been developed by Walkup, Marks, and their coworkers whereby a shift-invariant transformation can be separated into a number of discrete operations. These include approximating the shift-variant kernel by a piecewise isoplanatic function (*i.e.* piecewise shift-invariant), expanding the input function on an orthonormal basis, and a technique based on shift-variant sampling theory."

11.6.2 Space Variant Sampling Theory

1. A. VanderLugt, "Optimum Sampling of Fresnel Transforms," Applied Optics, Vol. 29, No. 23, pp.3352-3361, 1990;

   > "Little attention was given ... until the 1970's. Marks *et al.* [9] subsequently applied similar analysis to space-variant systems."

2. B.E.A. Saleh and Mark O. Freeman, "Optical Transformation," in *Optical Signal Processing*, edited by Joseph L. Horner, Academic Press, Inc. San Diego, CA, 1987, p.315;

   > "Marks *et.al.* have derived a generalized sampling theorem that gives the analogous rate necessary for dealing with shift-variant operations. Briefly, for the 1-D case, if the input has bandwidth W_1 and the shift variant kernel has a variational bandwidth of W_v, then if the input is sampled at points spaced by $1/2W$ where $W = W_1 + W_v$, then a shift variant transform takes on the form "

3. Shing-Hong Lin, *et.al.*, "Piecewise isoplanatic modeling of space-variant linear systems," Journal of the Optical Society of America A, Vol. 4, No. 3, pp.481-487, 1987

   > "...for bandlimited inputs, a space-variant linear system can exactly be characterized by knowledge of the sampled system point spread function and the corresponding sampled input [1-2].' ...the relationship of the *variation bandwidth* [1] to the new measure of invariance is mentioned to support the validity of the new measure."

4. A.J. Jerri, "The Shannon Sampling Theorem - Its Various Extensions and Applications: A Tutorial Review," Proceedings of the IEEE, vol.65, no.11, pp.1565-1596 (1977)

   > "Marks, Walkup and Hagler [187] developed a sampling expansion which is applicable to the class of linear space-variant systems characterized by sufficiently slowly varying line-spread functions. They showed that the desired sampling rate is determined by both the system and the input and that the corresponding output is band-limited."

5. R.F. Carson *et al.*, "Incoherent optical processing: a tristimulus-based method," Applied Optics, vol.23, no.18, pp.3138-3143 (1984)

   > "Sampling techniques for space variant systems developed Marks *et al.*

allow these integrals to be approximated in sampled form as $\cdots$"

11.6.3 Ambiguity Function Display

R.J. Marks II, J.F. Walkup and M.O. Hagler, "Ambiguity function display: an improved coherent processor," Applied Optics, vol. 16, pp.746-750 (1977).

1. Gary K. Froehlich *et al.*, "A Set of Optical Information Processing Experiments," IEEE Transactions on Education, Vol. E-21, No. 1, 4-7, 1978;

   " *An Example Project: Ambiguity Function Display.* As an example of the type of project included in this report, this recently developed application of a one-dimensional coherent optical processor is presented [15].

2. Cristóbal, Gabriel, Consuelo Gonzalo, and Julián Bescós. "Image filtering and analysis through the Wigner distribution." Advances in Electronics and Electron Physics Series 80 (1991): 309-397.

   "(Marks 1977) developed a very simple processor which displays simultaneously all values of the AF corresponding to 1-D signals. This processor is shown in Figure 3.8. It requires two identical 1-D transparencies of the temporal signal $f(t)$ in the plane P1, each rotated 45 in such a manner as to form the product

   $$s(t) = f[(t+\tau)/\sqrt{2}]f^*[(t-\tau)/\sqrt{2}]$$

   where t is the time variable and τ represents a time shift. Then, the lens L1 performs the 1-D Fourier transform of the coherently illuminated transmittance in the horizontal direction, and imaging this transform along the vertical direction. In this way, the squared modulus of the AF is displayed in the plane P2."

   "The optical setup is based in that presented by Marks et al.(1977) (Fig. 3.8). Since in this case the filtered image is retrieved, the replication of that scheme is required. Some of the results obtained through this setup are shown in the Figure 4.1. The input test is a square wave signal, the filters used are shown in the middle part of the figure, and, in the lower part, the two filtered images are presented. These retrieved images have been obtained by applying the inverse property in the output plane. This method cannot be generalized to 2-D images."

11.6.4 Phase Coded Reference Beams

T.F. Krile, R.J. Marks II, J.F. Walkup and M.O. Hagler, "Holographic representations of space - variant systems using phase-coded reference beams," Applied Optics, vol. 16, pp.3131-3135 (1977).

1. W.T. Rhodes, "Space-Variant Optical Systems and Processing," in Applications of Optical Fourier Transforms, (Academic Press, 1982), pp.333-369

   "An alternate holographic multiplexing method [26] that overcomes this limitation on 2D space variant processing exploits the associative memory characteristics of holograms. As before, a multiple exposure hologram is recorded $\cdots$"

11.6.5 Shift Variant Sampling Theory

R.J. Marks II, J.F. Walkup and M.O. Hagler, "Sampling theorems for linear shift-variant systems," IEEE Transactions on Circuits and Systems, vol. CAS-25, pp.228-233 (1978).

1. David C. Munson, Jr., "Minimum Sampling Rates for Linear Shift-Variant Discrete-Time Systems," IEEE Transactions on Acoustics, Speech and Signal Processing, Vol. ASSP-33, No. 6, pp.1556-1561, 1985

   "An important consideration in implementing a linear shift-variant discrete time system is the required sampling rate $\cdots$ Marks *et al.* have derived sampling theorems for shift-variant systems and their work provides sufficient sampling rates [4,5]."

11.6.6 Optimal Detection in Laplace Noise

R.J. Marks II, G.L. Wise, D.G. Haldeman and J.L. Whited, "Detection in Laplace noise," IEEE Transactions on Aerospace and Electronic Systems, vol. AES-14, pp.866-872 (1978).

1. M. W. Thompson, D. R. Halverson and G. L. Wise. "Robust Detection in Nominally Laplace Noise." IEEE Transactions on Communications, Volume 42 Issue 2-4, pp. 16511660, FebApr. 1994

   > "Marks, Wise, Haldeman and Whited have derived exact expressions for the test statistic distribution functions, and thus were able to analyze the performance of the optimal detector for given values of signal strength and sample size."

2. C.W. Helstrom, "Detectability of signals in Laplace noise," IEEE Transactions on Aerospace and Electronic Systems, Vol.AES-25, no.2, pp.190-196 (1989)

   > " Marks, Wise, Haldeman and Whited [2] derived a closed-form expression for the complementary cumulative probability distribution Their formula involves a triple summation, the number of terms of which increase with n like n^3, and the terms alternate in sign.

3. S. Tantaratana and J.B. Thomas, "Relative efficiency of the sequential probability ratio test in signal detection," IEEE Transactions on Information Theory, vol.IT-24, no.1, pp.22-31 (1978)

   > "Recently, the distribution for the sum of the outputs of an amplifier-limiter (18) $\cdots$ has been derived [by Marks *et al.*] [10]."

4. Kotz, Samuel, Tomasz Kozubowski, and Krzysztof Podgorski. The Laplace distribution and generalizations: a revisit with applications to communications, exonomics, engineering, and finance. No. 183. Springer Science & Business Media, 2001.

   > "In order to solve the detection problem completely, it remains to find the distribution of the statistic
   >
   > $$t = \sum_{i=1}^{N} g_{opt}(x_1).$$
   >
   > This problem was solved in Marks et al. (1987) and results in the following c.d.f."

11.6.7 Single Input Ambiguity Function

R.J. Marks II and M.W. Hall, "Ambiguity function display using a single one-dimensional input," Applied Optics, vol. 18, pp.2539-2540 (1979).

1. Richard Bamler and Josef Hofer-Alfeis, "2D Linear Space-Variant Processing by Coherent Optics: A Sequence Convolution Approach," Optics Communications, Vol. 43, No. 2, pp.97-102, 1982

   > "The method of using one transparency (to evaluate the ambiguity function)... has already been developed [15,8,19]."

2. M.J. Bastiaans, "Wigner distribution functions display: a supplement to ambiguity function using a single 1-D input," Applied Optics, vol.19, no.2, pp.192-193 (1980);

   > "Recently, Marks and Hall introduced a coherent optical processor for ambiguity function display using a single 1-D input." "Because of the dual nature (of the ambiguity function and Wigner distribution), almost the same practical setup that was used in [1] to display the ambiguity function can be used to display the Wigner distribution function of a real 1-D signal."

11.6.8 Temporal Holography

R.J. Marks II, "Two-dimensional coherent space-variant processing using temporal holography." Applied Optics, vol. 18, pp.3670-3674 (1979).

1. B.E.A. Saleh and Marks O. Freeman, "Optical Transformation," in *Optical Signal Processing*, edited by Joseph L. Horner, Academic Press, Inc. San Diego, CA, 1987,p.317

> "Marks [59] proposed a number of processors based on temporally multiplexing the impulse response terms of Eq.(52). Rather than one impulse response being recorded on one hologram, each impulse response is separately introduced into a shift-invariant processing system, and each input sample is processed sequentially in time. The summation is achieved by using the sequential outputs as object beams to expose a single hologram. Thus the crosstalk is eliminated at the expense of time."

2. W.T. Rhodes, "Space-Variant Optical Systems and Processing," in *Applications of Optical Fourier Transforms*, (Academic Press, 1982), pp.333-369

> "Finally, we mention a scheme based on a time integration synthesis of the desired output distribution [27]. A holographic recording system is used to record a multiple exposure hologram where the nth contributing recording of the distribution is ..."

11.6.9 Light Speed Extrapolation

R.J. Marks II, "Coherent optical extrapolation of two-dimensional signals: processor theory," Applied Optics, vol. 19, pp. 16701672 (1980)

1. Henry Stark and Yongyi Yang, *Vector Space Projections: A Numerical Approach to Signal and Image Processing, Neural Nets, and Optics,* Wiley-Interscience,(1998), p.281.

> "While many problems in optics can be solved by projections, it is difficult to solve such problems using all-optical methods. A notable exception is Marks' all-optical implementations of the convex projection algorithm for implementing super-resolution."

2. Noel, R.R. Khan and H.S. Dhadwai, "Optical Implementation of a Regularized Gerchberg Iterative Algorithm for Super-Resolution," Optical Engineering, vol. 32, no.11, pp.2866-2871 (1993)

> " ··· investigation of the optical implementation of the Gerchbergs algorithm was by Marks [28-29] and (his student) Smith [30]."

3. Y. Yamakoshi and T. Sato, "Iterative image restoration from data available in multiple restricted regions," Applied Optics, vol.21, no.24, pp.4473-4479 (1982)

> "Marks [7] showed the convergence properties of the (Gerchberg) iterative method when data are available in rectangular regions and the spatial spectrum is bandlimited."

4. J. Maeda and K. Murata, "Digital restoration of incoherent bandlimited images," Applied Optics, vol.21, no.12, pp.2199-2204 (1982)

> "The iterative (Gerchberg) extrapolation algorithm was generalized in two dimensions and implemented on a coherent processor by Marks [11-12]."

5. M.A. Fiddy and T.J. Hall, "Nonuniqueness of superresolution techniques applied to sampled data," Journal of the Optical Society of America, vol.71, no.11, pp.1406-1407 (1981)

> "If no theoretical model is available, two approaches might be successful in overcoming this nonuniqueness The second might be to avoid sampling and compute the extrapolated function optically. Such a procedure would seem feasible and has been proposed by Marks [11]."

6. M. Ibrahim Sezan, Henry Stark and Shu-Jen Yeh, "Projection method formulations of Hopfield-type associative memory neural networks," Applied Optics, Vol. 29, No. 17, pp.2616-2622, 1990

> "An optical implementation of image extrapolation using a special case of POCS, the Gerchberg algorithm, was achieved by Marks [18]."

11.6.10 Differintegral Interpolation

R.J. Marks II and M.W. Hall, "Differintegral interpolation from a bandlimited signal's samples," IEEE Transactions on Acoustics, Speech and Signal Processing, vol. ASSP-29, pp.872-877 (1981).

1. K.C. McGill and L.J. Dorfman, "High resolution Alignment of Sampled Waveforms," IEEE Transactions on Biomedical Engineering, vol.BME-31, no.6, pp.462-466 (1984)

> "This (frequency term) S has a particular significance: it is the DFT of the N-point (m-1)st order *differentiator kernel* [introduced by Marks and Hall] [14]."

11.6.11 Tomographic Posedness

R.J. Marks II, "Posedness of a bandlimited image extension problem in tomography," Optics Letters, vol. 7, pp.376-377 (1982).

1. S. Darenfed and P.V. Farrell, "Internally iterative improvement of optical tomographic reconstructions," Applied Optics, vol.10,no.5, pp.203-205 (1985)

> "Tomographic reconstruction of path-length integral data is necessary for the reconstruction of asymmetric phase objects using holographic interferometry. For the case of limited viewing angles, the reconstruction is, in general, considered to be an ill-posed problem [1]."

11.6.12 Restoring Lost Samples

R.J. Marks II, "Restoring lost samples from an oversampled bandlimited signal," IEEE Transactions on Acoustics, Speech and Signal Processing, vol. ASSP-31, pp.752-755 (1983)

1. Boche-H. Protzmann-M., "Algorithm for reconstructing lost samples from oversampled signals," AEU-INTERNATIONAL JOURNAL OF ELECTRONICS AND COMMUNICATIONS, Vol. 51, no. 6, NOV 1997, p.304-308

> "A bandlimited signal sampled at a rate higher than the Nyquist rate can be reconstructed from its samples even when a finite number of samples Is lost This paper gives a solution to this problem which partially originates from Marks [1]"

11.6.13 Derivative Interpolation Noise Sensitivity

R.J. Marks II, "Noise sensitivity of bandlimited signal derivative interpolation," IEEE Transactions on Acoustics, Speech and Signal Processing, vol. ASSP-31, pp.1029-1032 (1983)

1. B. Carlsson and M. Sternad, "Optimal Differentiation Based on Stochastic Signal Models," IEEE Transactions on Signal Processing, vol.39, no.2, pp.341-353 (1991)

> " $\cdots$ lower bounds on the noise level of the (differentiation) filter output have been derived in [10-12]"

11.6.14 Ill-Posed Sampling Theorems

K.F. Cheung and R.J. Marks II, "Ill-posed sampling theorems," IEEE Transactions on Circuits and Systems, vol. CAS-32, pp.829-835 (1985).

1. John L. Brown, Jr. and Sergio D. Cabrera, "On Well-Posedness of the Papoulis Generalized Sampling Expansion," IEEE Transactions on Circuits and Systems, pp.554-556, 1991

> "Cheung and Marks have shown recently that if least one of the interpolation functions used in the generalized sampling expansion of Papoulis is not square integrable, then the problem is ill-posed in the sense that the variance of the error is unbounded when noisy samples are used. We show here..., essentially a converse of the Cheung-Marks result." "In a recent paper [3], Marks and Cheung have investigated the stability or 'well-posedness' of the input reconstruction when independent, identically distributed zero-mean noise samples are added to each of the original samples. They proved that if at least one of the interpolation functions is not square integrable, then the generalized sampling problem is ill-posed, concluding that "such sampling theorems should be avoided. Here, we consider a converse to the Cheung-Marks result and sufficient conditions for the problem to be well posed."

2. John L. Brown, Jr. and Sergio D. Cabrera, "Multi-Channel Signal Reconstruction Using Noisy Samples," Proceedings of the International Conference on Acoustics, Speech and Signal Processing, pp.1233-1236, 1990

"*Cheung-Marks Theorem.* ... A reformulation of the Cheung-Marks result is as follows:
C-M Theorem: Assume $H_1(\omega)$ exists a.e. on $(-\sigma, -\sigma+c)$; so that the (spectra of the interpolation functions) are defined *a.e.* on $(-\sigma, \sigma)$. Then if any one of the (spectra of the interpolation functions) is not square integrable on $(-\sigma, \sigma)$, the reconstruction problem is ill-posed."

3. Unser, Michael, and Josiane Zerubia. "Generalized sampling: Stability and performance analysis." Signal Processing, IEEE Transactions on 45, no. 12 (1997): 2941-2950

"In principle, a consistent signal recovery is possible for almost any set of analysis functions provided that some invertibility condition is met (cf., Sect. II-C). Unfortunately, the method will not always yield a reconstruction algorithm that is stable numerically. This fact had already been pointed out by Marks and Cheung, who identified special instances of derivative sampling where the reconstruction is ill-posed [4], [9]."

4. Seidner, Daniel, and Meir Feder. "Noise amplification of periodic nonuniform sampling." IEEE transactions on signal processing 48, no. 1 (2000): 275-277.

"We use the analysis of white additive noise in GSE systems as developed in [5]. In this analysis, we found that

$$\begin{aligned} A_\epsilon &= \frac{1}{c}\int_{-B}^{-B+c}\sum_{k=1}^{M}\sum_{\ell=1}^{M}\left|T_{k\ell}^{-1}(\omega)\right|^2 d\omega \\ &= \frac{1}{c}\int_{-B}^{-B+c}\operatorname{tr}\left\{\mathbf{T}(\omega)^{-1^T}\mathbf{T}(\omega)^{-1^*}\right\} d\omega \end{aligned}$$

where $\mathbf{T}(\omega)$ is Papoulis GSE matrix, which is an $M \times M$ matrix whose (k, ℓ)th component is given by

$$T_{k\ell}(\omega) = K_k(\omega + (\ell - 1)c)$$

where $c = 2B/M$. A similar expression has been derived by Cheung and Marks [6]"

5. Pawlak, Miroslaw, and Ewaryst Rafajlowicz. "On restoring band-limited signals." Information Theory, IEEE Transactions on 40, no. 5 (1994): 1490-1503.

"This result is caused by the presence of the noise in the data. The problem of the reduction of the noise level in the representation (1.1) has been discussed in the literature [15], and it has been recommended to employ the oversampling version of (1.1), i.e.,

$$f(t) = \sum_{k=-\infty}^{\infty} f(kh)\operatorname{sinc}\left(\frac{\pi}{h}(t-kh)\right),$$

6. Sideris, Michael G. "Fourier geoid determination with irregular data."Journal of Geodesy 70, no. 1-2 (1995): 2-12

"The set of lost samples is then defined as $M = \{m_1, m_2, m_3\}$. For this case, equation (13) can be written (Marks II, 1991) as

$$f_c(x) = \left[\sum_{m\notin M} + \sum_{m\in M}\right] f_c(Qm)g(x-Qm)$$

7. Seidner, Daniel, and Meir Feder. "Vector sampling expansion." Signal Processing, IEEE Transactions on 48, no. 5 (2000): 1401-1416

"The first issue is well posedness. In GSE, this problem was initially discussed by Cheung and Marks [17], who found a suf- ficient condition for ill-posedness of the system. Under their definition, an ill-posed GSE system produces a reconstruction error with unbounded variance when a bounded variance noise is added to the samples."

"We now derive, using (72), a test that checks whether a VSE system is ill posed or well posed. This test is similar to the one suggested by Cheung and Marks [17] and Brown and Cabrera [18] for GSE systems."

> "As noted above, a well posed VSE system is such that $E\{|v_i^r(t)|^2\}$ is bounded for every bounded σ_v^2. From (75), we conclude, similarly to [17] and [18], that a necessary condition for the well posedness of a VSE system is that all reconstruction filters have a finite energy."

11.6.15 Derivative Noise Sensitivity

R.J. Marks II, "Noise sensitivity of bandlimited signal derivative interpolation," IEEE Transactions on Acoustics, Speech and Signal Processing, vol. ASSP-31, pp.1029-1032 (1983).

1. Unser, Michael, and Josiane Zerubia. "Generalized sampling: Stability and performance analysis." Signal Processing, IEEE Transactions on 45, no. 12 (1997): 2941-2950

> "In general, the situation become less favorable as the order of the derivative increases. In the case of the second derivative (data not shown here), a strong singularity occurs for, which again is consistent with the report of Marks for the bandlimited case."

11.6.16 Nonintersecting Convex Set POCS

M.H. Goldburg and R.J. Marks II, "Signal synthesis in the presence of an inconsistent set of constraints," IEEE Transactions on Circuits and Systems, vol. CAS-32 pp. 647-663 (1985).

1. Dante C. Youla and V. Velasco, "Extensions of a Result on the Synthesis of Signals in the Presence of Inconsistent Constraints," IEEE Transactions on Circuits and Systems, Vol. CAS-33, No. 4, Pp. 465-468, 1986

> "In a recent interesting paper [4], Goldburg and Marks have used a method of convex projection described in [2] to derive the following interesting and useful result:..."

2. Amir Dembo, "Signal Reconstruction from Noisy Partial Information of Its Transform," IEEE Transactions on Acoustics, Speech, and Signal Processing, Vol. 37, No. 1, pp.65-72, 1989

> "The proof...is a special case of the general technique of [Goldburg and Marks]."

3. Hui Peng and Henry Stark, "Signal recovery with similarity constraints," Journal of the Optical Society of America A, Vol 6, No.6, pp.844-851, 1989

> "What happens when the constraints are inconsistent, i.e. when C_0 is the empty set, was investigated [by Goldburg and Marks]"

4. Khan, Muhammad Aqeel Ahmad, and Ulrich Kohlenbach. "Quantitative image recovery theorems." Nonlinear Analysis: Theory, Methods & Applications 106 (2014): 138-150.

> "However, the classical image recovery problem lacks any information on how a δ-fixed point of T relates to being in the intersection $C_{0,\epsilon}$, of ϵ-neighborhoods $C_{i,\epsilon}$ of C_i. Moreover, the problem of image recovery is often and seriously dealt with the inconsistent constraints i.e., when the intersection of the sets $C_1, C_2, , C_r$ is empty (see e.g. [Goldburg & Marks] $\cdots$."

5. Mayer MM, Feichtinger HG, Grosser M. POCS-Methoden. Reason. 2002 Sep 12

> "Im Fall zweier disjunkter Mengen (wie immer wird angenommen, daβ beide Mengen sowohl abgeschlossen als auch konvex sind) gilt der folgende Satz, welcher auf Goldburg und Marks [48] zurucükgeht, aber von Youla und Velasco [112] auf komplexe Hilberträume erweitert wurde."

6. Chen, Zhiwu, and Peter J. Knez. "Measurement of market integration and arbitrage." Review of financial studies, 8, no. 2 (1995): 287-325.

> "Having established the nonexpansiveness of $T(\cdot)$, we need only to use the results from Browder (1965) and Goldburg and Marks (1985) to show that the repeated applications of the composite mapping $T(\cdot)$ will converge to a fixed point in D_A and a corresponding point in D_B."

> "The convergence of $T^I(\hat{d})$ to a point in F_T is proven in Goldburg and Marks (1985)."

11.6.17 Sample Dependency at Nyquist Rates

R. J. Marks II, Multidimensional-signal sample dependency at Nyquist densities, J. Opt. Soc. Am. A 3, 268273 (1986).

1. Bones, Philip J., Nawar Alwesh, T. John Connolly, and Nicholas D. Blakeley. "Recovery of limited-extent images aliased because of spectral undersampling." JOSA A 18, no. 9 (2001): 2079-2088.

> "Marks et al.5,6 studied image sampling below the Nyquist limit. They showed how in two and higher dimensions the gaps between the spectral replicates of a bandlimited image can be exploited to allow certain image samples to be recovered from the rest. While the roles of image and spectrum are reversed in our study, we are exploiting redundancy in an analogous manner."

> "Marks et al.5,6 showed how overall sampling density, in relation to the size of limited support in the other domain, affected recovery."

11.6.18 Matched Filter Error Correction

K.F. Cheung, L.E. Atlas, J.A. Ritcey, C.A. Green and R.J. Marks II, "A comparison of conventional and composite matched filters with error correction," Applied Optics, vol. 26, pp.4235-4239 (1987).

1. B.V.K. Vijaya Kumar, "Tutorial survey of composite filter designs for optical correlators," Applied Optics, vol.31, #23, pp.4773-4801

> "The (7-4) Hamming Code maps each four-bit word to a unique seven bit word so that if even one of the bits in the seven bit work is incorrect, we can still determine the correct four-bit message word. Using this concept, we can design seven SDF's to produce the appropriate seven-bit code word for every input. Thus, every input must go through seven filters. Even if one of the filters produces a 1 instead of a zero (or visa versa), this phenomenon would not affect the final decision process. This idea was suggested by Cheung *et al.*"

11.6.19 Detector Relative Efficiencies

M.I. Dadi and R.J. Marks II, "Detector relative efficiencies in the presence of Laplace noise," IEEE Transactions on Aerospace and Electronic Systems, vol. AES-23, pp.568-582 (1987).

1. M.W. Thompson and H.S. Chang, "Coherent Detection in Laplace Noise," IEEE Transactions on Aerospace and Electronic Systems, volume 30, no.2, pp.452-461 (1994)

> "Additionally, a comparison of the asymptotic performance of the Neyman-Pearson optimal detector and the matched filter detector ... was given in [2] [by Dadi and Marks]."

2. S.A. Kassam, *Signal Detection in Non-Gaussian Noise*, (Springer-Verlag, 1988)

> "More recently, Dadi and Marks (1987) have studied further the relative performances of the linear, sign, and optimum detectors for double-exponential noise pdfs"

3. Kotz, Samuel, Tomasz Kozubowski, and Krzysztof Podgorski. The Laplace distribution and generalizations: a revisit with applications to communications, exonomics, engineering, and finance. No. 183. Springer Science & Business Media, 2001.

> "The importance of the explicit formula for the test statistic in the above problem is due to the fact that the asymptotic Gaussian approximation is not usually very accurate for small and moderate sample sizes. For example, it was shown in Dadi and Marks (1987) that for samples size in the range from 5 to 50 the Gaussian approximation can be quite conservative, some yielding the t_α-value substantially larger then its exact value..."

11.6.20 Hopfield: Synchronous Versus Asynchronous

K.F. Cheung, L.E. Atlas and R.J. Marks II, "Synchronous versus asynchronous behavior of Hopfield's content addressable memory," Applied Optics, vol. 26, pp.4808-4813 (1987).

1. Reprinted in Artificial Neural Networks: Concepts & Control Applications, IEEE Computer Society Press, pp. 142-147, 1992.
2. Reprinted in Optical Neural Networks edited by Suganda Jutamulia (The Society of Photo-Optical Instrumentation Engineers, Bellingham, WA), pp. 188-193, 1994.

11.6.21 Associative Memories With Nonlinearities in the Correlation Domain

R.J. Marks II, L.E. Atlas, J.J. Choi, S. Oh, K.F. Cheung and D.C. Park, "A performance analysis of associative memories with nonlinearities in the correlation domain," Applied Optics, vol. 27, pp.2900-2904 (1988)

1. G.Lu, M. Lu and F.T.S. Yu, "Multilayer Associative Memory and Its Hybrid Optical Implementation," Applied Optics, vol.34, no.23, pp.5109-5117 (1995)

> "Marks et.al. [14] and Chiueh and Goodman have shown that exponential nonlinear operations can indeed sufficiently remove the interpattern cross talk; thus the exponential associative memory could possibly retrieve the desired exemplar with only one iteration."

11.6.22 Optical POCS

R.J. Marks II, L.E. Atlas and K.F. Cheung, "Optical processor architectures for alternating projection neural networks," Optics Letters, vol. 13, pp.533-535 (1988)

1. Reprinted in SPIE Milestone Series: Selected Papers in Optical Neural Networks edited by Suganda Jutamulia (The Society of Photo-Optical Instrumentation Engineers, Bellingham, WA, 1994)
2. M. Ibrahim Sezan, Henry Stark and Shu-Jen Yeh, "Projection method formulations of Hopfield-type associative memory neural networks," Applied Optics, Vol. 29, No. 17, pp.2616-2622, 1990

> "To the best of our knowledge, Marks was the first to establish the relationship between a particular ACAM network and POCS [4,19]. He proposed an ACAM network which extrapolated partially specified, continuous valued memory patterns by alternating orthogonal projections onto two constraint sets."

11.6.23 Algebraic Optical Processors Error Correction

S. Oh, D.C. Park, R.J. Marks II and L.E. Atlas "Error detection and correction in multilevel algebraic optical processors," Optical Engineering, vol. 27, #4, pp.289-294 (1988).

1. S.A. Ellet *et al.*, "Error correction coding for accuracy enhancement in optical matrix-vector multipliers," Applied Optics, vol.31, no.26, pp.5642-5653 (1992)

> "However, OMVMs (optical matrix-vector multipliers) can also operate on nonbinary data. Oh *et al.* have proposed a generalization of the binary (7,4) Hamming code that can be used to provide error correction for OMVMs by using nonbinary data [5]." "...decoding can be performed optically also [5]. Optical decoders are preferred for maintaining the high speed and parallelism of optics."

11.6.24 Alternating Projection Neural Networks

R.J. Marks II, S. Oh and L.E. Atlas, "Alternating projection neural networks," IEEE Transactions on Circuits and Systems, vol.36, pp.846-857 (1989)

1. V.V. Vinod, S.Ghose and P.P. Chakrabarti, IEEE Transactions on Systems, Man & Cybernetics, Part B: Cybernetics, vol.26, no.4, Aug 1996, pp. 509-521

> "In this paper we propose a neural network based on the idea of projection onto convex sets (POCS)

for solving OPIC. The POCS technique has earlier been used in artificial neural networks for perfect memory recall by Marks *et al.* [1], [20]. They proposed alternating projection neural networks based on repeated sequential projections onto the closure of stored vectors and the partial vector which has to be completed."

2. S. Jankowski, A. Lozowski and J.M. Zurada, "Complex-Valued Multistage Neural Associateive Memory," IEEE Transactions on Neural Networks, vol.7, no.6, pp.1491-1496, (1996)

> "Multivalued pattern storage can also be obtained by using a continuous state classified that performs matching of an input to some "library patterns. As has been shown in in [9] [by Marks *et al.* that] projecting in a signal space between constraint sets corresponding to the patterns can serve as a content addressable multivalued memory with linear capacity."

11.6.25 Sampling Below Nyquist Without Aliasing

K.F. Cheung and R.J. Marks II, "Image sampling below the Nyquist density without aliasing," Journal of the Optical Society of America A, vol.7, pp.92-105 (1990).

1. T.R. Gardos and R.M. Mersereau, "FIR filtering of images on a lattice with periodically deleted samples," Proceedings of the International Conference on Acoustics, Speech and Signal Processing, Toronto, 1991

> "Cheung and Marks [1] have shown that for circularly band-limited images, the Nyquist density is not the minimum density which allows perfect reconstruction. In [1] is given an elegant proof indicating this suboptimality based on the fact that there are still band gaps when circular spectrums are maximally packed. Cheung and Marks then presented a method for deleting samples and subsequently reconstructing them."

> "In this section, we present a theorem that permits us to periodically delete samples from an image with no loss of information and the procedure by which we reconstruct the deleted samples [1]. First, $\cdots$ " "We now state the PSD (periodic sample deletion) theorem based on [1]. Theorem 4: Let $x_c(t)$ be a bandlimited continuous signal and $s(t)$ be $x_c(t)$ sampled on an arbitrary sampling lattice where there is no spectral overlap. If the Fourier transform of $s(t)$ is such that there are band gaps in the spectrum, then there exists at least one of the signal cosets may be deleted and reconstructed from the remaining units."

2. Berman, Lihu, and Arie Feuer. "Robust patterns in recurrent sampling of multiband signals." Signal Processing, IEEE Transactions on 56, no. 6 (2008): 2326-2333.

> "Utilizing the generalized sampling formulation, it was shown in [3] that recurrent nonuniform sampling can be used to lower the sampling density required for perfect reconstruction of 2-D bandlimited signals below the Nyquist rate. Whereas the Nyquist rate corresponds to the highest frequencies in the signal spectral support, the aforementioned sub-Nyquist rate can asymptotically achieve the Landau rate [4] [also known as the minimum-rate sampling (MRS)] corresponding to the Lebesgue measure of the signal spectral support."

11.6.26 Cone Shaped Kernels: Zamograms

Y. Zhao, L.E. Atlas and R.J. Marks II, "The use of cone-shaped kernels for generalized time-frequency representations of nonstationary signals," IEEE Transactions on Acoustics, Speech and Signal Processing, vol. 38, pp.1084-1091 (1990).[18]

1. The cone-shaped distribution' introduced in this paper was first commercially distributed

[18] Referenced as the *Zhao, Atlas and Marks (ZAM) GTFR* and *cone shaped kernel*

by National Instruments' Joint Time-Frequency Analysis software toolkit in 1995. It is also in the MATLAB toolbox.

2. Zeng, Deze, Xuan Zeng, G. Lu, and B. Tang. "Automatic modulation classification of radar signals using the generalised time-frequency representation of Zhao, Atlas and Marks." IET radar, sonar & navigation 5, no. 4 (2011): 507-516.

   > "We have studied mechanisms of the generalised timefrequency representation of Zhao, Atlas and Marks (ZAMGTFR) [14, 15]. The ZAMGTFR simultaneously preserves the property of finite time support, strengthens spectral peaks and smoothes cross-terms. It is shown that ZAMGTFR has advantage over most of the other TFRs under conditions of low SNR and some characteristic features are easy to be extracted from the 2-D time-frequency plane, such as the negative peaks with respect to the phase changes of PSK. We analyse the ZAM-GTFRs of five types of radar signals and obtain four characteristic features.
   >
   > The remainder of this paper is organised as follows. Section 2 gives the ZAM-GTFRs of the referred signals. In Section 3, we obtain the characteristic features from the frequency ridges of the ZAM-GTFRs and the negative peaks. In Section 4, we detail the signal recognition flow. Section 5 shows the PSRs and Section 6 provides conclusions."

3. B. Boashash, "Estimation and interpreting the instantaneous frequency of a signal - Part 2: Algorithms and Applications," Proceedings of the IEEE, vol.80, no.4, pp.540-568, 1992

   > "The Zhao-Atlas-Marks Distribution, for example, seems to have good time-frequency localization and good noise performance [72], making it a useful prospect for IF estimation."

4. R.G. Baraniuk and D.L. Jones, "A signal-dependent time-frequency representation: optimal kernel design," IEEE Transactions on Signal Processing, vol. 41, no.4, pp.1603-1617, (1993)

   > "The generating kernel for the cone-kernel distribution is shown in Fig.4(a). The time-frequency representation of the cone-kernel is excellent for pulse-like signals whose AF autocomponents lie near the θ axis ..."

5. Leon Cohen, "Introduction: a primer on time-frequency analysis," in *Time-Frequency Signal Analysis, B. Boashash, Editor*

   > "5.3. Zhao-Atlas-Marks distribution. A new time-frequency distribution with many attractive features has been developed by Zhao, Atlas and Marks [18]. Their distribution significantly enhances the time and frequency resolution and suppresses the cross terms. Furthermore, they have examined the basic conditions which a distribution must satisfy to have good time and frequency resolution. For the ZAM distribution r(t;) as defined by ... There are two dramatic differences between the spectrogram and the ZAM. First note how sharp and discernable the time of transition at the frequency jumps in the ZAM distributions. Secondly note how much sharper the frequency resolution is in the ZAM... The ZAM distribution has been applied to speech with very impressive results."

6. R.N. Czerwinski and D.L. Jones, "An adaptive time-frequency representation using a cone-shaped kernel," Proceedings of the International Conference on Acoustics, Speech and Signal Processing, Minneapolis (April 27-30, 1993), IEEE, pp.IV404-IV407;

   > "The CKD is characterized by a kernel used by Zhao et.al. [3] ... In creating an adaptive CKD, we seek to select the parameter T, which is the cone length."

7. M.G. Amin, "Time-Frequency Distributions in Statistical Signal and Array Processing," IEEE Signal Processing Magazine, (September 1998), pp.32-34

> "Choi and Williams [62] and Zhao, Atlas and Marks [465] have proposed t-f kernels which make identification (of cross-terms introduced from the bilinear nature of TDF's) much more feasible than attainable using the WD. The distributions using these two kernels have come to be known as the Choi-Williams (CW) and the ZAM TFD's. In both distributions, the kernel is characterized by one parameter whose value can be adjusted to achieve a tradeoff between resolution and cross-term suppression."

8. Zeng, D., X. Zeng, G. Lu, and B. Tang. "Automatic modulation classification of radar signals using the generalised time-frequency representation of Zhao, Atlas and Marks." IET radar, sonar & navigation 5, no. 4 (2011): 507-516.

> "We have studied mechanisms of the generalised time- frequency representation of Zhao, Atlas and Marks (ZAM- GTFR) [14, 15]. The ZAM-GTFR simultaneously preserves the property of finite time support, strengthens spectral peaks and smoothes cross-terms. It is shown that ZAM-GTFR has advantage over most of the other TFRs under conditions of low SNR and some characteristic features are easy to be extracted from the 2-D time-frequency plane, such as the negative peaks with respect to the phase changes of PSK."

9. Vaidya, Vinay G., and Robert M. Haralick. "The use of GTFR with cone shaped kernel for motion estimation." In Time-Frequency and Time-Scale Analysis, 1992., Proceedings of the IEEE-SP International Symposium, pp. 535-538. IEEE, 1992.

> "In this paper we have shown a successful application of the GTFR with cone kernel. The results presented clearly show that this new method can detect object location even under extreme noise conditions."

10. Dongmei, Jiang, and Zhao Rongchun. "Speaker normalization based on the generalized time-frequency representation and Mellin transform." In Signal Processing Proceedings, 2000. WCCC-ICSP 2000. 5th International Conference on, vol. 2, pp. 782-785. IEEE, 2000.

> "For vocal tract length normalization in speaker-independent speech recognition, a novel feature extraction method is carried out on the generalized time-frequency representation with cone-shaped kernel (CK-GTFR) and Mellin transform. The GTFR is superior to other representations in suppressing cross terms and producing good time and frequency resolution simultaneously."

11. Tran, Q. T., and P. M. Moore. "Application of the generalized time-frequency representation cone-shaped kernel to structural acoustics data." The Journal of the Acoustical Society of America 90, no. 4 (1991): 2341-2341.

> "Here, the cone-shaped kernel is compared to the spectrogram and Wigner distribution, and shown to provide and improved tool for understanding the backscattering phenomena."

12. Rosser, Daniel Mark. "Time frequency analysis of a noisy carrier signal." PhD diss., Monterey, California. Naval Postgraduate School, 1995.

> "...the signal detection problem is addressed using time frequency processing of a carrier signal embedded in additive white gaussian noise (AWGN). A TFR (time frequency representation) performance measure based on a mean and variance analysis is proposed and used to estimate the center frequency of a carrier. Through computation of the discrete-time TFR, our results show that this measure provides a means to determine the presence of a carrier signal in noise even when the TFR itself becomes quite obscured by the noise.The cone kernel-TFR is seen to yield the highest

frequency resolving capability compared with the Wigner-Ville distribution and the Choi-Williams distribution."

13. CHI, Huanzhao, Cai LIU, Xuanlong SHAN, Dian WANG, and Qi LU. "Application of spectral decomposition technology in shallow gas detection based on Wigner-Ville distribution." Global Geology 17, no. 4 (2014): 243-246.

    "The cone-shaped kernel function used to reduce the cross-term interference is proposed by Zhao et al. (1990). The expression is

    $$\varphi_k(\tau) = \frac{\sin\left(\frac{\tau\nu}{2}\right)}{\frac{\tau\nu}{2}} \exp\left(\frac{-\tau^2}{\alpha}\right)$$

    Where τ is time delay, ν is deviation and α is a constant used to control the shape of the kernel function.

    "Fig 1 shows that the process of spectral decomposition technology based on the Wigner-Ville. Fig 2 shows that cone-shaped kernel function can suppress the ambiguity of the signals in the time delay axis and outside the coordinate axis."

14. ZENG, Xiaodong, Bin TANG, and Ying XIONG. "Interception Algorithm of S-cubed Signal Model in Stealth Radar Equipment." Chinese Journal of Aeronautics 25, no. 3 (2012): 416-422.

    "First, the generalized time-frequency representation of Zhao, Atlas, and Marks (ZAM-GTFR) and Hough transforms (HT) are applied to detecting the signal, and then the initial frequency and modulation slope of LFM are estimated from the ZAM-GTFR. On the basis of LFM information, the reconstructing signal is generated. Finally, the code rate of discrete phase code is extracted from the negative peaks of the ZAM-GTFR. Simulation results show that the proposed algorithm has higher estimation accuracy when the signal to noise ratio (SNR) is above 3 dB."

15. G.X. Chena and Z.R. Zhou, "Timefrequency analysis of friction-induced vibration under reciprocating sliding conditions," Wear, Volume 262, Issues 12, 4 January 2007, Pages 110

    " ZhaoAtlasMarks distribution produces a good resolution in time and frequency domains. The ZAMD method reduces the interference resulting from the cross-terms present in multi-component signals. It is useful in resolving close spectral peaks and capturing non-stationary and multi-component signals."

16. Lokenath Debnath, *Wavelet transforms and their applications,* Birkhäuser Boston, (2001) p.355

    "[T]he Zhao-Atlas-Marks time-frequency distribution ... significantly enhances the time and frequency resolution and eliminates all undesirable cross terms. // The ZAM distribution has been applied to speech with remarkable results."

17. P. A. Karthick and Shankar Ramakrishnan. "Analysis of surface Electromyography signals using ZAM based quadratic time frequency distribution." 2014 40th Annual Northeast Bioengineering Conference (NEBEC), pp. 1-2. IEEE, 2014.

    In this work, the variation of IMDF and IMNF of sEMG signals are studied during dynamic muscle contraction. sEMG signals are recorded from biceps brachii muscles of 50 healthy volunteers. ZAM based QTFD is used to analysis the signal. IMDF and IMNF are extracted from the time-frequency spectrum of recorded signal. It is found that IMDF and IMNF are higher in non-fatigue conditions. The result shows a negative slope for linear regression fit for all subjects.

18. Rajagopalan, Satish, José Restrepo, José M. Aller, Thomas G. Habetler, and Ronald G. Harley. "Nonstationary motor fault detection using recent quadratic timefrequency representations." IEEE Transactions on Industry Applications, 44, no. 3 (2008): 735-744.

    "While the emphasis on development of distributions such as the

CWD was to meet marginal conditions and other properties [10], the development of ZAM cone-kernel was intended to introduce finite time support and reduce cross-terms [5]. The kernel to be used in (1) to obtain a ZAM distribution is

$$\varphi(\xi,\tau) = \varphi_1(\tau)\frac{\sin(\xi|\tau|/a)}{\xi/2}$$

where $\varphi_1(\tau)$ is a function to be specified (usual-ly taken to be equal to one) and a is greater than or equalto two. The cone-shaped kernel function suppresses the cross terms away from the vertical axis and the origin of the ambiguity function plane. The BJ distribution is similar to the ZAM distribution.

19. Satish Rajagopalan, José Restrepo, José M. Aller, Thomas G. Habetler, and Ronald G. Harley. "Selecting time-frequency representations for detecting rotor faults in BLDC motors operating under rapidly varying operating conditions." In Industrial Electronics Society, 2005. IECON 2005. 31st Annual Conference of IEEE, pp. 6-pp. IEEE, 2005.

    "The ZAM ... is a newer distribution that significantly enhances the time and frequency resolution while suppressing the cross-terms [12]."

    "The ZAM distribution ... shows good energy concentration (low frequency smear), excellent cross-term suppression and much better frequency resolution than the STFT."

20. M. Alemu, Dinesh Kant Kumar, and Alan Bradley. "Time-frequency analysis of SEMG with special consideration to the interelectrode spacing." Neural Systems and Rehabilitation Engineering, IEEE Transactions on 11, no. 4 (2003): 341-345.

    "Linear JTFR techniques such as STFT do not satisfy time or frequency marginal property. TF techniques such as WVD offer a higher resolution compared to STFT and the drawback of WVD of cross terms is overcome by techniques such as CWD and ZAM."

21. Sean A. Fulop and Sandra F. Disner. "Advanced time-frequency displays applied to forensic speaker identification." In Proceedings of Meetings on Acoustics, vol. 6, no. 1, p. 060008. Acoustical Society of America, 2009.

    "Other time-frequency representations besides the spectrogram have been promoted occasionally. These are generally members of the quadratic distribution family based on the Wigner-Ville distribution, which technically includes the spectrogram, but many other candidates have been found which have better time-frequency uncertainty relations than the spectrogram. One of the best overall performers in this family is the Zhao-Atlas-Marks (ZAM) distribution.

22. Rosero, Javier, Luis Romeral, Juan Ortega, and Esteban Rosero. "Short-circuit detection by means of empirical mode decomposition and WignerVille distribution for PMSM running under dynamic condition." IEEE Transactions on Industrial Electronics, 56, no. 11 (2009): 4534-4547.

    "Another TF distribution for fault detection in motor drives that improves TF resolution while providing cross-term suppression is the ZhaoAtlasMarks (ZAM) distribution [21]. ZAM has been recently proposed [22] for rotor fault detection in BLDC motors under rapid changes in motor operation. The authors of the proposals use an adaptive filter driven by a PLL to filter the fundamental frequency, because the fault frequency components are small and could be masked by it. Also, this filtering reduces the occurrence of cross-terms when using quadratic TF distributions."

    "ZAM distribution achieves a very good tradeoff between suppression of cross-terms and loss in TF resolution. For this reason, ZAM is a very promising technique to monitor fault condition in nonstationary working conditions, even if it has higher computational burden than simple WVD."

11.6.27 Neural Networks Versus CART

L.E. Atlas, R. Cole, Y. Muthusamy, A. Lippman, G. Connor, D.C. Park, M. El-Sharkawi & R.J. Marks II, "A performance comparison of trained multi-layer perceptrons and classification trees," Proceedings of the IEEE, vol.78, pp.1614-1619 (1990).

1. Reprinted in Neural Networks, Theoretical Foundations and Analysis, C. Lau, editor, IEEE Press (1992).

11.6.28 Load Forecasting

D.C. Park, M.A. El-Sharkawi, R.J. Marks II, L.E. Atlas & M.J. Damborg, "Electric load forecasting using an artificial neural network," IEEE Transactions on Power Engineering, vol.6, pp.442-449 (1991)

1. Reprinted in Artificial Neural Networks, E. Snchez-Sinencio & C. Lau, editors, pp.516-522, IEEE Press (1992).
2. C.N. Lu, H.T. Wu and S. Vemuri, "Neural Network Based Short Term Load Forecasting," IEEE Transactions on Power Systems, vol. 8, no.1, pp.336-342 (1993)

   > "Park et.al. [11] proposed a neural network with three layers and a delta rule for training the network. The network provided accurate forecasts for hourly, peak and daily total loads. Tests were conducted over one winter season and the average errors were lower than 2% for all forecasts."

3. Azzam-ul-Asar and J.R. McDonald, "A Specification of Neural Network in the Load Forecasting Problem," IEEE Transactions on Control Systems Technology, vol.2, no.2, June 1994, pp.135-141

   > "Park *et al.* [10] investigated the ANN methodology for STLF using three main forecasting targets, namely peak load, daily load and hourly load. The ANN was used to learn the relationship between past, current and future temperatures and loads. The focus was on normal weekday prediction."

11.6.29 Neural Smithing

Russell D. Reed and Robert J. Marks. *Neural smithing: supervised learning in feedforward artificial neural networks.* Mit Press, 1998.

1. Cerrada, Mariela, René Vinicio Sáchez, Diego Cabrera, Grover Zurita, and Chuan Li. "Multi-Stage Feature Selection by Using Genetic Algorithms for Fault Diagnosis in Gearboxes Based on Vibration Signal." Sensors 15, no. 9 (2015): 23903-23926.

   > Given the dataset with m samples (x_i, y_i), the algorithm for training an NN for classification purposes is widely known, and it is summarized [by Reed and Marks] as follows, [34]:
   >
   > (1) Randomly initialize the weights of each layer $W^l, l = 1, ...L$, where w_{ji} is the weight from the neuron $n^{(l1)i}$ to the neuron n_{lj}.
   >
   > (2) Compute the feedforward propagation to obtain $h_W(x^i)_k$.
   >
   > (3) Compute the cost function $J(W)$.
   >
   > (4) Run the backpropagation algorithm to compute $\frac{\partial}{\partial w^l_{ji}} J(W)$.
   >
   > (5) Use the gradient descent method for adjusting the weights wlij according to the equation $w^l_{ij} := w^l_{ij} - \alpha \frac{\partial}{\partial w^l_{ji}} J(W)$.

11.6.30 APNN's

R.J. Marks II, S. Oh, L.E. Atlas and J.A. Ritcey, "Homogeneous and layered alternating projection neural networks," in Real-Time Signal Processing for Industrial Applications, edited by Bahram Javidi (SPIE Optical Engineering Press, Bellingham, WA. 1989), pp. 217-232.

1. Shu-jeh Yeh and Henry Stark, "Learning in neural nets using projection methods," Optical Computing and Processing, Vol. 1, No. 1, pp.47-59, 1991

   > "To the best of our knowledge the first to use projection methods in neural networks was Marks and his coworkers. For example, he used projection methods in designing a

net to solve the signal extrapolation problem [14] and used such methods in designing more elaborate Hopfield-type nets and nets involving a hidden layer [15]."

2. Branko Soucek, *Neural and Concurrent Real-Time Systems: The Sixth Generation*, (John Wiley & Sons, 1989)

   Marks *et al.*17,18 suggested a new class of neural networks called alternating projection neural networks (APNN). APNN's perform by alternately projecting between two or more constraint sets, see Fig 3.8. The single point intersection between convex sets is a derived steady-state solution."

11.6.31 Kernel Synthesis

S.Oh, R.J. Marks II, L.E. Atlas and J.W. Pitton, "Kernel synthesis for generalized time-frequency distributions using the method of projection onto convex sets," SPIE Proceedings 1348, Advanced Signal Processing Algorithms, Architectures, and Implementation, F.T. Luk, Editor, pp.197-207, San Diego, July 10-12, 1990.50

1. Leon Cohen, "Introduction: a primer on time-frequency analysis," in *Time-Frequency Signal Analysis*, B. Boashash, Editor

   "A very important contribution to this problem has recently been made by Oh, Marks, Atlas and Pitton [20]. They observed that functions satisfying a particular constraint form a convex set... Perhaps most significantly the development of Oh *et al.* will help clarify the fundamental issue of whether there is one 'absolute best' distribution to be used as is for all applications or whether different distributions should be used for different circumstances. The perspective of Oh et.al. clarifies this issue considerably because we can now ask what is the best distribution for a given set of constraints ... a very often stated argument why we should always use only one distribution is that there is no procedure for finding a context independent distribution; the work of Oh et.al. does precisely that."

2. Leon Cohen, *Time-Frequency Analysis*, Prentice Hall (1995), p.166;

   "11.4. Projection Onto Convex Sets. Finding a kernel with all the properties we have enumerated may not be straightforward The method called "projection onto convex sets" automatically picks out the functions, if they exist, that satisfy all of the conditions. Furthermore, if such a function does not exist then the method picks out the best function in the mean square sense. This method was devised by Oh, Marks II, Atlas and Pitton [408]."

11.6.32 Shorted Winding Detection

S. Guttormsson, R.J. Marks II, M.A. El-Sharkawi and I. Kerszenbaum, "Elliptical novelty grouping for on-line short-turn detection of excited running rotors," IEEE Transactions on Energy Conversion, IEEE Transactions on Volume: 14 1 , March 1999 , pp. 1622

1. M.E. El-Hawary, *Fuzzy System Theory in Electrical Power Engineering,* (IEEE Press, 1998), p.xxiv

   "[Their diagnostic test performs] detection and localization of shorted turns in the DC field winding of turbine-generator rotors using novelty detection and fuzzified neural networks. Use of neural networks with fuzzy logic outputs and traveling wave techniques ... is an accurate locator of shorted turns in turbo-generator rotors"

11.6.33 Sub-Nyquist Sampling

K.F. Cheung and R.J. Marks II, "Image sampling below the Nyquist density without aliasing," Journal of the Optical Society of America A, vol.7, pp. 92105 (1990)

1. Cormac Herley and Ping Wah Wong, "Minimum Rate Sampling and Reconstruction of Signals with Arbitrary Frequency Support," IEEE Transactions on Information Theory, Vol 45, No. 5, July 1999, pp. 15551564.

"[Their] very interesting multidimensional construction ... exploit[s] the [required] spectral gaps that occur when sampling multidimensional signals. Their approach is to slice the spectrum into narrow bands, and handle separately those bands which contain signal energy and those which do not."

11.6.34 Shannon Sampling Book

R.J. Marks II, Introduction to Shannon Sampling and Interpolation Theory, (Springer-Verlag, 1991, ISBN 0-387-7391-5 and 3-540-97391-5).

1. Listed as suggested reading' in IEEE Signal Processing Magazine, special issue on education, October 1992, p. 50.
2. Seidner, Daniel, and Meir Feder. "Noise amplification of periodic nonuniform sampling." IEEE transactions on signal processing 48, no. 1 (2000): 275-277.

   "We define the noise amplification factor A_ϵ as

   $$A_\epsilon \frac{\overline{E\{|v^r(t)|^2\}}}{\sigma_v^2}$$

   where $\overline{E\{|v^r(t)|^2\}}$ is the time average of $E\{|v^r(t)|^2\}$ and A_ϵ is equal to Marks normalized interpolation noise variance (NINV) [2]"
3. Seidner, Daniel, and Meir Feder. "Vector sampling expansion." Signal Processing, IEEE Transactions on 48, no. 5 (2000): 1401-1416

   The VSE Interpolation Formula. In this section, we provide the explicit interpolation formula for the case where is an integer, and reconstruction is possible. This derivation resembles the technique used in [4] and [6]."
4. Bissantz, Nicolai, Hajo Holzmann, and Axel Munk. "Testing parametric assumptions on band-or time-limited signals under noise." Information Theory, IEEE Transactions on 51, no. 11 (2005): 3796-3805.

   "In this situation, we can use the estimator (4) with $\tau = 1/n$. Notice that except for the normalization, this estimator corresponds to a kernel regression estimator with kernel $K(x) = \sin(x)/(\pi x)$ and inverse bandwidth Ω. This kernel is sometimes referred to as the sinc-kernel. Note that, in contrast to the setting in Sec- tion III, the signal cannot be band-limited, except if $f = 0$ (see [24], [38])."

11.6.35 Radiotherapy

P.S. Cho and R.J. Marks II, "Hardware-sensitive optimization for intensity modulated radiotherapy," Phys. Med. Biol, 2000 (pp. 429-440)

1. Inokuchi, Haruo, Takashi Mizowaki, Yoshiki Norihisa, Kenji Takayama, Itaru Ikeda, Kiyonao Nakamura, Mitsuhiro Nakamura, and Masahiro Hiraoka. "Clinical effect of multileaf collimator width on the incidence of late rectal bleeding after high-dose intensity-modulated radiotherapy for localized prostate carcinoma." International journal of clinical oncology (2015): 1-6.

   "The multileaf collimator (MLC) is an important component of IMRT delivery, because it facilitates delivery of irregularly shaped or intensity-modulated treatment fields. The development of treatment-planning software coupled with integration of MLC, a type of mechanized radiation beam-shaping device, has enabled the introduction of a more conformal intensity distribution [5, 6]."

11.6.36 ZAM Distribution Properties

S. Oh and R.J. Marks II, "Some properties of the generalized time frequency representation with cone shaped kernels," IEEE Transactions on Signal Processing, vol.40, No.7, pp.1735-1745, 1992.

1. Deze Zeng, Xuan Zeng, G. Lu, and B. Tang. "Automatic modulation classification of radar signals using the generalised time-frequency representation of Zhao, Atlas and Marks." IET Radar, Sonar & Navigation 5, no. 4 (2011): 507-516.

   "We have studied mechanisms of the generalised timefrequency representation of Zhao, Atlas and Marks

(ZAMGTFR) [14, 15]. The ZAMGTFR simultaneously preserves the property of finite time support, strengthens spectral peaks and smoothes cross-terms. It is shown that ZAMGTFR has advantage over most of the other TFRs under conditions of low SNR and some characteristic features are easy to be extracted from the 2-D time-frequency plane, such as the negative peaks with respect to the phase changes of PSK."

2. James R. Bulgrin, Bernard J. Rubal, Theodore E. Posch, and Joe M. Moody. "Comparison of binomial, ZAM and minimum cross-entropy time-frequency distributions of intracardiac heart sounds." Conference Record of the Twenty-Eighth Asilomar Conference on Signals, Systems and Computers, 1994. vol. 1, pp. 383-387. IEEE, 1994.

   "The ZAM-TFD has been shown to be effective in tracking frequency-hopping signals and representing signals in the presence of white noise [14]."

3. Christos Skeberis, Zaharias D. Zaharis, Thomas D. Xenos, and Dimitrios Stratakis. "ZAM distribution analysis of radiowave ionospheric propagation interference measurements." International Conference on Telecommunications and Multimedia (TEMU), 2014 , pp. 155-161. IEEE, 2014.

   "The cone-shaped kernel ... provides cross-term suppression and higher resolution in the derived spectrum. Compared to the standard signal processing methods, such as the Fourier transform or the fast Fourier transform, as well as more contemporary ones, such as the wavelet analysis and the Hilbert-Huang Transform (HHT), ZAMD exhibits significant advantages. First, it is highly applicable to nonlinear and nonstationary signal processing producing spectra with an emhpasis on frequency resolution. Although it lacks the filtering capabilities of HHT it provides strong cross-term suppression."

   "By processing the signals with the ZAMD method and producing the relevant spectra, an accentuation of the disturbances can be provided and attributed to seismic precursor phenomena."

4. A. Trochidis, L. Hadjileontiadis, and K. Zacharias. "Analysis of Vibroacoustic Modulations for Crack Detection: A Time-Frequency Approach Based on Zhao-Atlas-Marks Distribution." Shock and Vibration 2014 (2014).

   "...the following expression can be obtained that defines the ZAM distribution:

$$\mathrm{ZAM}_X(t,f) = \int_{-\infty}^{\infty} \left[h(\tau) \int_{t-|\tau|/2}^{t+|\tau|/2} X\left(s+\frac{t}{2}\right) \times X^*\left(s-\frac{t}{2}\right)\right] \times e^{-j2\pi f\tau} d\tau.$$

   ZAM distributionwas selected among RIDs due to its advantage of significantly reducing cross-terms between signal components, through its cone-shaped kernel function (4)."

5. Hadjidimitriou, Stelios, and Leontios Hadjileontiadis. "EEG-based discrimination of music appraisal judgments using ZAM time-frequency distribution." Proceedings of the 12th International Conference on Music Perception and Cognition and the 8th Triennial Conference of the European Society for the Cognitive Sciences of Music, July 23-28, 2012, Thessaloniki, Greece. Cambouropoulos E, Tsougms C, Mavromatis P,Pastiadis K. (Editors)

   Subsequent feature extraction was based on the Zhao-Atlas-Marks (ZAM) time-frequency distribution (TFD). The latter distribution belongs to the quadratic TF representations and adopts a cone-shaped kernel function in order to significantly reduce interferences between signal components (Zhao, Atlas, & Marks, 1990)."

6. Z Xiaodong, T Bin, Y XIONG "Interception Algorithm of S-cubed Signal Model in Stealth Radar Equipment." Chinese Journal of Aeronautics 25, no. 3 (2012): 416-422.

> "In this paper, a novel detection and parameter estimation approach for the reconnaissance S-cubed radar signal is presented. First, the generalized time-frequency representation of Zhao, Atlas, and Marks (ZAM-GTFR) and Hough transforms (HT) are applied to detecting the signal, and then the initial frequency and modulation slope of LFM are estimated from the ZAM-GTFR. On the basis of LFM information, the reconstructing signal is generated. Finally, the code rate of discrete phase code is extracted from the negative peaks of the ZAM-GTFR. Simulation results show that the proposed algorithm has higher estimation accuracy when the signal to noise ratio (SNR) is above 3 dB."

7. Martinez-de-Juan, J. L., F. J. Saiz, J. L. Ponce, and M. Meseguer. "Retrieval of the small intestinal pressure from time-frequency analysis of the electroenterogram." Proceedings of the 20th Annual Engineering in Medicine and Biology Society, 1998. vol. 3, pp. 1505-1508. IEEE, 1998.

> "The reduced interference distributions (RID) are obtained for removing cross-terms [9,10]. A large number of distributions are in the RID, but at the present study only CWD and ZAM have been calculated (see figure 2, traces (b) y (c)). Both are suitable for displaying and explaining the electroenterogram in time and in frequency. For example, slow wave is below 2 Hz, clarifying controversy on it [4,5,8]."

8. Climente-Alarcon, Vicente, José A. Antonino-Daviu, Francisco Vedreno-Santos, and Rubén Puche-Panadero. "Vibration transient detection of broken rotor bars by PSH sidebands." Industry Applications, IEEE Transactions on 49, no. 6 (2013): 2576-2582.

> "The ZhaoAtlasMarks distribution (ZAM) is proposed as the TFD tool. The reason is that it shows an adequate reduction of interferences called cross-terms between parallel evolving harmonics."

9. Stelios K. Hadjidimitriou and Leontios J. Hadjileontiadis. "Toward an EEG-based recognition of music liking using time-frequency analysis." IEEE Transactions on Biomedical Engineering,59, no. 12 (2012): 3498-3510.

> "ZAM distribution was selected among RIDs due to its advantage of significantly reducing cross terms between signal components, through its cone-shaped kernel function."

11.6.37 Fuzzy control of backpropagation

P. Arabshahi, J.J. Choi, R.J. Marks II and T.P. Caudell, "Fuzzy control of backpropagation," Proceedings of the First IEEE International Conference on Fuzzy Systems (FUZZ-IEEE '92), San Diego, pp. 967-972, March 1992.

1. Dragojlovic, Zoran, Deborah A. Kaminski, and Juntaek Ryoo. "Tuning of a fuzzy rule set for controlling convergence of a CFD solver in turbulent flow." International journal of heat and mass transfer 44, no. 20 (2001): 3811-3822.

> "Algorithms for controlling algorithms have been recently introduced as a new discipline in soft computing [8] and [9].

2. Pham, D. T., and A. A. Fahmy. "Neuro-fuzzy modelling and control of robot manipulators for trajectory tracking." In 16th IFAC WORLD CONGRESS, pp. 4-8. 2005.

> "In (Arabshahi et al., 1992), fuzzy control of the learning rate *eta* is suggested. The idea behind fuzzy control of the learning rate is the implementation of the heuristics used for faster convergence in terms of fuzzy IF-THEN rules."

3. Fahmy, Ashraf Ahmed, and AM Abdel Ghany. "Adaptive functional-based neuro-fuzzy PID incremental controller structure." Neural Computing and Applications (2015): 1-16.

> "In [Arabshahi et. al., 1992], fuzzy control of the learning rate η is suggested. The central idea behind fuzzy control of the BP algorithm is the implementation of the heuristics used for faster convergence in terms of fuzzy 'If-Then'

rules. In this study, the fuzzy PID-like feed-back controller along with a fixed learning rate provides the general non-linear policy of the controller and learning signal as well. It can be seen that the proposed neuro-fuzzy PID controller is designed in a way that makes the controller tuning achievable using any algorithm due to the contentious differentiable membership functions selected and the differentiable fuzzification and defuzzification methods applied in the network."

11.6.38 r-shrink Wireless Communication

A.K. Das, R.J. Marks II, M.A. El-Sharkawi, Payman Arabshahi and Andrew Gray, "r -shrink: A Heuristic for Improving Minimum Power Broadcast Trees in Wireless Networks," IEEE Global Telecommunications Conference 2003. GLOBECOM '03. ,Volume: 1, 1-5 Dec. 2003, pp.523 - 527.

1. Bhukya, Wilson Naik, and Alok Singh. "An effective heuristic for construction of all-to-all minimum power broadcast trees in wireless networks." In Advances in Computing, Communications and Informatics (ICACCI, 2014 International Conference on, pp. 74-79. IEEE, 2014.

   "Das et al. [4] have proposed the r-shrink procedure, which is a simple heuristic that performs local search to improve the broadcast trees in wireless networks."

11.6.39 Fuzzy Fusion & Annihilation

B.G. Song, R.J. Marks II, S. Oh, P. Arabshahi, T.P. Caudell and J.J. Choi, "Adaptive membership function fusion and annihilation in fuzzy if-then rules," Proceedings of the Second IEEE International Conference on Fuzzy Systems (FUZZ-IEEE '93), San Francisco, March 1993, vol II. pp.961-967.

1. DERUGO, Piotr, Jarosław KACERKA, Marcin JASTRZĘBSKI, and Krzysztof SZABAT. "Sterowanie silnikiem liniowym z wykorzystaniem adaptacyjnej struktury sterowania z regulatorem rozmytym typu PID." PRZEGLĄD ELEKTROTECHNICZNY, ISSN 0033-2097, R. 91 NR July 2015, pp.93-96

   "Jedną z możliwości ograniczania kosztów implementacji jest zmniejszenie bazy reguł przez zastosowanie różnych metod redukcji jej rozmiaru [11], [12]. Klasycznie przeprowadza się to przez łczenie poszczególnych obszarów. Prowadzi to jednakże do pogorszenia jakości regulacji. Innym rozwizaniem, rozpatrywanym w niniejszej pracy, jest zastosowanie warstwy tranzycji Petriego. Jej implementacja powoduje znaczce obniżenie liczby operacji matematycznych koniecznych do wyznaczenia wartości wyjściowej, a tym samym skutkuje skróceniem czasu wykonania si pojedynczej iteracji algorytmu (nawet o 30%) szczególnie dla przypadków regulatora rozmytego o dużej liczbie reguł."

11.6.40 Intelligence: Computational Versus Artificial

R.J. Marks, II, "Intelligence: Computational Versus Artificial." IEEE Transactions on Neural Networks 4: 737-739 (1993).

1. Cinar, Ali. "Control of nonlinear and hybrid process systems, Panagiotis D. Christofides and Nael H. El-Farra, Springer, New York, NY, 2005." International Journal of Robust and Nonlinear Control 17, no. 4 (2007): 349-351.

   "However, the most decisive step in formulating the term Computational Intelligence was made during the 1994 IEEE World Congress on Computational Intelligence (WCCI) [2]. At that time, R. J. Marks, in his Editorial Note to the IEEE Transactions on Neural Networks [3], pointed out that, although seeking similar goals, computational intelligence has emerged as a sovereign field distinct from artificial intelligence. Since that time the WCCI has become a regular event."

2. Slany, Wolfgang. "Fuzzy scheduling. Christian Doppler Laboratory for Expert Systems," Dissertation, 1994.

   "In both cases, artificial intelligence as well as fuzzy logic, one tries in some sense to imitate life in its problem-solving capability. The ways how

> to achieve this goal are different in many respects, but there are also many common points where the two fields overlap: Robert Marks [268] counted 4811 entries on fuzzy logic in the INSPEC data base from 1989 to 1993, containing citations from over 4000 selected journals, books, conference proceedings and technical reports - "22% of them [were] cross categorized in the expert system category, and 12% with neural networks." Based on various 'bean countings', Marks concludes that the overlapping areas cover, depending on the way to count, from 14% to 33%."

3. *Introduction to Computational Intelligence.* John Wiley, (2013).

> " Marks (1993) clearly outlined the distinction between CI and AI, although both CI and AI seek similar goals."

4. A. Joshi, N. Ramakrishman, E.N. Houstis, J.R. Rice, " On Neurobiological, Neuro-Fuzzy, Machine Learning and Statistical Pattern Recognition Techniques," Neural Networks, IEEE Transactions on, v.8 , #1, 1997, pp.18 - 31

> "WE begin this paper, to paraphrase the popular song, at the very beginning in consideration of the interdisciplinary audience that is the target of this issue. Neural N etvvorks (NN) represent a computational [1] approach to intelligence, as contrasted with the traditional, more symbolic approaches."

5. Zadeh, L. A., D. Tufis, F. G. Filip, and I. Dzitac. "Soft Computing for Intelligent Systems." in *From Natural Language to Soft Computing: New Paradigms in Artificial Intelligence.* Lotfi Zadeh, *et al.*, Editors, Editing House of Romanian Academy (May, 2008)

> "In [14], one of the pioneering publications on computational intelligence, Marks defined CI by listing the building blocks being neural nets, genetic algorithms, fuzzy systems, evolutionary programming, and artificial life. Note that in more recent terminology genetic algorithms and evolutionary programming are called by the common name evolutionary computing."

11.6.41 Vulnerability Indices

Mingoo Kim, M. El-Sharkawi, M., R.J. Marks II, "Vulnerability Indices of Power Systems, Intelligent Systems Application to Power Systems," 2005. Proceedings of the 13th International Conference on Nov. 6-10, 2005, pp. 335 - 341.

1. Haidar, Ahmed, Azah Mohamed, Majid Al-Dabbagh, and Aini Hussain. 11Vulnerability assessment and control of large scale interconnected power systems using neural networks and neuro-fuzzy techniques." In Power Engineering Conference, 2008. AUPEC'08. Australasian Universities, pp. 1-6. IEEE, 2008.

> "The growth of power systems and the increase in their complexity requires careful assessment of their vulnerability under different conditions. The purpose of vulnerability assessment is to determine the ability of a power system to continue providing service under any unforeseen catastrophic contingency such as equipment failures, natural calamity, failures in protection operation, faults, human errors, heavy loading conditions and intrusion by external agents [1]."

2. Haidar, Ahmed MA, Azah Mohamed, Aini Hussain, and Norazila Jaalam. "Artificial Intelligence application to Malaysian electrical powersystem." Expert Systems with Applications 37, no. 7 (2010): 5023-5031.

> "Security of electricity supply networks has always been a key point in the development of the power industry. Several cascading failures and large area blackouts occurring in the USA, some European and Asian countries highlighted the need for vulnerability assessment of power systems. Nowadays, power systems have evolved through continuing growth in interconnection, use of new technologies and controls. Due to the increased operations which may cause power

> system to be in highly stressed conditions, the need for vulnerability assessment of power systems is important so as to determine its ability to continue proving service in case of any unforeseen catastrophic contingency such as power system component failures, communication system failures, human operator error and natural calamity (Kim, El-Sharkawi, & Marks, 2005)."

3. Haidar, Ahmed, Zulkeflee Khalidin, and Ibrahim Abdulrab Ahmed. "Probabilistic neural network for vulnerability prediction on a practical power system." In Electronics and Information Engineering (ICEIE), 2010 International Conference On, vol. 1, pp. V1-146. IEEE, 2010.

> "The rapid development of economy and the deregulation of power industry increase the demand of power supply and grow the complexity of power grid. Since September 11, 2001 the security of major national infrastructures has become a critical concern to government and industry of any country. Power system is responsible for the continuous power supply but when some unpredicted disasters happen, especially earthquake, flood or terrorism attacks, operators have to guarantee the safety of the main part of the system and the power supply of some important infrastructures, such as transportation, communication etc. So vulnerability prediction is made by assessing system conditions for credible contingencies, and how they are affected by the changes in a critical system parameter [1]."

4. Haidar, Ahmed M., Azah Mohamed, and Aini Hussain. "New method vulnerability assessment of power system." Journal of Applied Sciences 7 (6): pp.841-847 (2007).

> "Vulnerability assessment method based on anticipated loss of load: The Anticipated Loss of Load (ALL) index is the ammmt of loads shed due to a contingency in order to avoid a cascading outage. Since the purpose of vulnerability assessment is to avoid a catastrophic power outage, the vulnerability index should reflect the loads that may be lost at such times (Kim et al.. 2005)."

> "The system frequency is governed by this equilibrium and consequently any rmbalance in loads can result in frequency excursions that may lead to loss of synchronism. Excess of load results in a drop of system frequency and load shedding has to be employed in order to rapidly balance the demand and generation. To avoid system rmbalance, load shedding has to be implemented in which the amormt of load shed is considered as a vulnerability index (Kim et al . 2005)."

11.6.42 Time Scale Nonregressivity

Robert J. Marks II, Ian A. Gravagne, John M. Davis, and Jeffrey J. DaCunha. "Nonregressivity in switched linear circuits and mechanical systems." Mathematical and Computer Modelling 43, no. 11 (2006): 1383-1392

1. Bartosiewicz, Zbigniew, Ewa Piotrowska, and Magorzata Wyrwas. "Stability, stabilization and observers of linear control systems on time scales." In Decision and Control, 2007 46th IEEE Conference on, pp. 2803-2808. IEEE, 2007.

> "[The] Baylor Time Scales Research Group is working on both theoretical and practical aspects of time-scales models. In particular, they use time-scales language for description of hybrid systems (see e.g. [6], [7])"

11.6.43 Protector, Refugee and Aggressor Swarms

I.A. Gravagne and R.J. Marks II, "Emergent Behaviors of Protector, Refugee and Aggressor Swarm," IEEE Transactions on Systems, Man and Cybernetics, Part B: Cybernetics, Volume 37, Issue 2, April 2007, pp. 471 - 476.

1. Purta, Rachael, Saurabh Nagrecha, and Gregory Madey. "Multi-hop Communications in

a Swarm of UAVs." In Proceedings of the Agent-Directed Simulation Symposium, p. 5. Society for Computer Simulation International, 2013.

> "A description and evaluation of some of this models properties can be found in [5], which analyzes the proper ties of clustering, drifting, and explosion that emerge from the model."

2. Purta, Rachael, Mikolaj Dobski, Artur Jaworski, and G. Madey. "A testbed for investigating the UAV swarm command and control problem using DDDAS." Procedia Computer Science 18 (2013): 2018-2027.

> "The swarm model we have chosen to use is based on the Icosystem swarm game, partially described on their website, http://www.icosystem.com/labsdemos/the-game/, and investigated for predictability in [24]."

11.6.44 Active Information

William A. Dembski and Robert J. Marks II, "Conservation of Information in Search: Measuring the Cost of Success," IEEE Transactions on Systems, Man and Cybernetics A, Systems and Humans, vol.39, #5, September 2009, pp.1051-1061

1. Garca-Martnez, Carlos, Francisco J. Rodriguez, and Manuel Lozano. "Arbitrary function optimisation with metaheuristics." Soft Computing 16, no. 12 (2012): 2115-2133.

> "In fact, most general-purpose solvers usually make the previous assumption, i.e., they assume that similar solutions (similar codings in practise, at least under a direct encoding (Garca-Martnez et al. 2011a,) are often expected to lead to similar objective values. In particular, in Dembski and Marks II (2009) it is pointed out that '...problem-specific information is almost always embedded in search algorithms. Yet, because this information can be so familiar, we can fail to notice its presence'. As some typical examples, we may annotate that knowledge may come from the encoding of solutions or the preference for exploring the neighbourhood of previous good solutions."

> "General-purpose search algorithms really apply common problem knowledge This is a fact that other authors had pointed out previously (Dembski and Marks II 2009). However, it was still unproven if that problem knowledge was effective on large sets of common problem classes. According to our experience, there are two sources of knowledge, not to be underestimated, that general-purpose algorithms may effectively apply (at least on the set of interesting binary problems):"

2. Mishra, Mohit, Utkarsh Chaturvedi, and K. K. Shukla. "Heuristic algorithm based on molecules optimizing their geometry in a crystal to solve the problem of integer factorization." Soft Computing (2015): 1-9.

> "To quantify the quality of an objective function, we analyze our objective functions based on conservation of information in search theory (Dembski and Marks 2009). "

3. Meyer, Stephen C. *Signature in the Cell.* The Blackwell Companion to Science and Christianity (2012): 270-282.

> "As Robert Marks has shown, scientists can now even measure the effect that intelligence produce in these experiments. Recall that Marks himself quantified the amount of active information that a computer program imparts into a system with each iteration as the result of the knowledge provided to it *by the programmer.* Clearly, ribozyme engineering and prebiotic simulations were also making use of informational input (Marks's "active information") as the experimenters made choices about which molecules to preserve and discard based upon their own knowledge of the desired outcomes."

11.6.45 Transmitters for spectral conformity

Baylis, Charles, Lingfeng Wang, Matthew Moldovan, J. Martin, H. Miller, Lawrence Cohen, and Jean De Graaf. "Designing transmitters for spectral conformity: power amplifier design issues and strategies." IET radar, sonar & navigation 5, no. 6 (2011): 681-685.

1. Griffiths, Hugh, Shannon Blunt, Lawrence Cohen, and Laurent Savy. "Challenge problems in spectrum engineering and waveform diversity." In Radar Conference (RADAR), 2013 IEEE, pp. 1-5. IEEE, 2013.

> *E. Co-Design of Transmitter and Waveforms*
>
> "As follow-on to addressing transmitter effects there arises the possibility to jointly design the transmitter hardware and associated waveforms [13]. Such a strategy is a departure from traditional design methodology in which either the transmit hardware is fixed with the waveforms modified to suit or a class of waveforms is defined and the system specifications determined to meet the requirements."

11.6.46 Handbook of Fourier Analysis

R.J. Marks II, *Handbook of Fourier Analysis and Its Applications*, Oxford University Press, (2009).

1. Rowe, Barnaby, Christopher Hirata, and Jason Rhodes. "Optimal linear image combination." The Astrophysical Journal 741, no. 1 (2011): 46.

> "In the analysis of astronomical images, ensuring the adequate spatial sampling of data by pixels of finite size and spacing is a key concern. Ideally, images should be sampled at or above the NyquistShannon sampling rate for the band limit set by the optical response of the system (see, e.g., Marks 2009), so that the full continuous image can be determined from the discrete pixel samples."
>
> "The MTF is defined as the Fourier transform of the telescope PSF. The function $G_i(u)$ therefore represents the MTF conjugate $G_i(r)$, and themagnitude of this complex object can be seen in Figure 2 for the two corresponding PSFs of Figure 1. As can be seen from Figure 2, the system is bandlimited at the fundamental frequency corresponding to $D/\lambda = 6.3026$ cycles arcsec^1. Therefore, a sampling interval of $\lambda/2D = 0.079333$ arcsec in the output image H_α is the requirement of critical sampling according to the sampling theorem (Marks 2009)."

2. Holighaus, Nicki, Monika Dorfler, Gino Angelo Velasco, and Thomas Grill. "A framework for invertible, real-time constant-Q transforms." Audio, Speech, and Language Processing, IEEE Transactions on 21, no. 4 (2013): 775-785.

> "In the present contribution, we are interested in inversion in the sense of perfect reconstruction; to this end, we investigate a new approach to constant-Q signal processing. The presented framework has the following core properties:
>
> 1 Relying on concepts from frame theory, [Marks 15], we suggest the implementation of a constant-Q transform using the nonstationary Gabor transform (NSGT), which guarantees perfect invertibility. This perfectly invertible constant-Q transform is subsequently called constant-Q nonstationary Gabor transform (CQ-NSGT).
>
> 2 We introduce a preprocessing step by slicing the signal to pieces of (usually uniform) finite length. Together with FFT-based methods, this allows for bounded delay and results in linear processing time. Thus, our algorithm lends itself to real-time processing and the resulting transform is referred to as sliced constant-Q transform (sliCQ).

3. Zuntz, Joe, Tomasz Kacprzak, Lisa Voigt, Michael Hirsch, Barnaby Rowe, and Sarah Bridle. "im3shape: a maximum likelihood galaxy shear measurement code for cosmic gravitational lensing." Monthly Notices of the Royal Astronomical Society 434, no. 2 (2013): 1604-1618.

> "However, representing the convolution of telescope PSFs with analytic, continuous, non-band-limited functions such as the Sérsic profile requires careful numerical approximation, as can (if the PSF is also not band limited) the subsequent rendering of convolved profiles into pixellated images (see e.g. Marks 2009). Decisions must be made about how and where to make approximations in the representation of these profiles, balancing precision against computational cost."

4. Rowe, Barnaby, David Bacon, Richard Massey, Catherine Heymans, Boris Huler, Andy Taylor, Jason Rhodes, and Yannick Mellier. "Flexion measurement in simulations of Hubble Space Telescope data." Monthly Notices of the Royal Astronomical Society 435, no. 1 (2013): 822-844.

> "Since shapelet models are no longer being used to describe galaxies after shear or flexion is applied, the convolution must be performed numerically using a pixelized image of this PSF. As a shapelet model PSF such as that in Fig. 3 is not formally band-limited (see e.g. Marks 2009), this therefore requires another empirical investigation into the effects of finite sampling."

5. Gö, Andreas, Helmut Seibert, and Dietmar Hildenbrand. "Registration of Multichannel Images using Geometric Algebra." In Workshop Proceedings: Computer Graphics, Computer Vision and Mathematics, pp. 07-10. 2010.

> "**3.2 Fourier-Mellin Transform**
>
> "In this Section we briefly introduce the application of the Fourier-Mellin Transform for registration of grayscaled images. All theorems and proofs according to the Fourier-Transform can be found in [10]. As in [10], we use the following definition of the Fourier-Transform of a function $f : \mathbb{R}^2 \to \mathbb{C}^2$"

6. Seshadri, Suresh, Charles Shapiro, Timothy Goodsall, Jason Fucik, C. Hirata, J. D. Rhodes, B. T. P. Rowe, and R. M. Smith. "Initial results from a laboratory emulation of weak gravitational lensing measurements." Publications of the Astronomical Society of the Pacific 125, no. 931 (2013): 1065-1086.

> "These distortions arise due to the fact that both Swarp and Drizzle combine images via interpolation (with optional additional smoothing) across the input data: if these data are undersampled, the interpolated output will necessarily contain errors due to aliasing (Marks 2009). "

7. Wu, Li-Chung, Chia Chuen Kao, Tai-Wen Hsu, Yi-Fung Wang, and Jong-Hao Wang. "Spatial and temporal features of regional variations in mean sea level around Taiwan." Open Journal of Marine Science 2, no. 02 (2012): 58.

> "For the low frequency information from the wavelet scalogram, the time resolu- tion is poor but frequency resolution is high. When it is shifted toward high frequencies, the time resolution in- creases but the frequency resolution decreases. This is very similar to the Heisenberg Uncertainty Principle [16]"

8. Gallardo, Daniele, Riccardo Bevilacqua, and Onkar Sahni. "Data-based hybrid reduced order modeling for vortex-induced nonlinear fluidstructure interaction at low Reynolds numbers." Journal of Fluids and Structures 44 (2014): 115-128.

> "For the frequency model,an understanding of the time evolution of the dominant frequency in the force signal is needed. Identifying the dominant frequency at anytime point requires data from a local time window,i.e.,some steps before and after the time of interest,containing $S+1$ samples.In this time window, the energy spectral density (ESD) is obtained through fast Fourier transformation (Marks, 2009) and performed with the purpose of determining the dominant force frequency ...."

9. Gallardo, Daniele, Riccardo Bevilacqua, and Onkar Sahni. "Data-based hybrid reduced order modeling for vortex-induced nonlinear fluidstructure interaction at low Reynolds numbers." Journal of Fluids and Structures 44 (2014): 115-128.

> "For minimizing the truncation error the kernel $s(t)$ must decrease rapidly when $t \to \infty$. The sinc function does not belong even to L_1. Therefore using the kernels in form $s(t) = \theta(t) \operatorname{sinc} t$ where $\theta(t)$ is some window function (see [11]), is well-known."

11.6.47 Search for the Search

William A. Dembski. and Robert J. Marks II, "The Search for a Search: Measuring the Information Cost of Higher Level Search," Journal of Advanced Computational Intelligence and Intelligent Informatics, Vol.14, No.5, 2010, pp. 475-486.

1. Garca-Martnez, Carlos, Francisco J. Rodriguez, and Manuel Lozano. "Arbitrary function optimisation with metaheuristics." Soft Computing 16, no. 12 (2012): 2115-2133.Garca-Martnez, Carlos, Francisco J. Rodriguez, and Manuel Lozano. "Arbitrary function optimisation with metaheuristics." Soft Computing 16, no. 12 (2012): 2115-2133.

> "Interestingly, some publications argue the combination as a medium for escaping from the NFLs claws (and in some cases, the combination is not even analysed with regard to the sole application of one of the approaches). Recently, Dembski and Marks II (2010) showed that NFL theorems apply to the concept of higher-level searchers, and thus, to combinations of algorithms as well. As for the multi-objective case, designing new algorithms as the combination of previous ones that perform more effectively and efficiently is still a possibility when regarding just the set of problems with practical interest."

2. Thomas, George. "Biogeography-Based Optimization of a Variable Camshaft Timing System." PhD Dissertation, Cleveland State University, 2014.

> "The Vertical No Free Lunch Theorem given [by Dembski & Marks] in [35] states that the difficulty of a search increases exponentially as more and more nested levels of search are added, unless some information about the higher level search spaces is known. This means that a search for optimal EA parameters is only useful if some information is already known about the search space for these parameters. As EA researchers, we know what ranges of EA parameters work well for problems in general, and so we can incorporate this information into a meta search that may yield a better EA for a given problem."

3. Sheldon, Robert B. "The cometary biosphere and the origin of life." In SPIE Optical Engineering+ Applications, pp. 815213-815213. International Society for Optics and Photonics, 2011.

> "Even worse, the space of search algorithms is even larger than the space of genome solutions, so it is not even possible to evolve a better search algorithm. Consider a 3×3 checkerboard with one checker somewhere on it. We can classify efficient search algorithms as those that search every cell once. There are 9! = 362,000 possible efficient search algorithms, whereas there are 9 possible configurations for the information. The search for a search is far worse than the search for just the information.[22] So this calculation of 10^{120} is a firm upper limit on the capabilities of uninformed searches in our universe. Random chance just does not have the probabilistic resources to find a living sequence."

4. Ergezer, M., and D. Simon. "Probabilistic Properties of Fitness-based Quasi-reflection in Evolutionary Algorithms." Computers & Operations Research (2015).

"The presented results assume that the problem space is one-dimensional; however, they can be extended for higher dimensions. We assumed that the solution and the estimate have uniform distributions as in [32] and that the problem domain is symmetric such that $b = a$ to simplify the resulting mathematical expressions. As the algorithm converges, the distribution of the solution space may change. Thus, the next step should include studying the distribution of the search space and the corresponding opposition-based probabilities. As discussed in Algorithm 1, $\hat{x}_{Kr}$ applies opposition to the whole population. Future work should be made analyzing the effects of opposition on selected individuals. Finally, we limited the reflection weight to $K \in (0, 1)$ in this paper. Varying the range of K will create different opposition algorithms and can be a topic of further research."

11.6.48 EV Vivisection

George Montañez, Winston Ewert, William A. Dembski, and Robert J. Marks II, "Vivisection of the ev Computer Organism: Identifying Sources of Active Information," Biocomplexity, Vol. 2010, Issue 3, pp.1-6 (December 2010).

1. Meyer, Stephen C. *Signature in the Cell.* The Blackwell Companion to Science and Christianity (2012): 270-282.

Informational Accounting

Recently, the senior engineering professor Robert Marks, formerly of the University of Washington, Seattle and now at Baylor University in Texas, analyzed evolutionary algorithms such as EV. Marks shows that despite claims to the contrary by their overly enthusiastic creators, algorithms such as EV do not produce large amounts of functionally specified information "from scratch." Marks shows that, instead, such algorithms succeed in generating the information they seck either by providing information about the desired outcome (the target) from the outset, or by adding information incrementally during the computer program's search for the target. To demonstrate this, Marks distinguishes and defines three distinct kinds of information: exogenous information, endogenous information, and active information.

"Endogenous information" represents the inforn1arion present in the target. Tt al o provide a measure ofth.e difficulty of the search for that target - that is, the improbability of finding the specific sequence or target, among the exponentially large space of alternative possibilities. Recall that the amount of information present in a sequence or system is inversely proportional to the probability of the sequence or system arising by chance. If the probability of finding the largest is small the information required to find the target is correspondingly large. By calculating the size of the pace of alternative possibilities in which the target resides, the computer scientist can determine both the probability of finding d1e target in a random search and the information content of the target in question. Marks's analysis of evolutionary algorithm show that, in order to produce or find the (endogenous) information present in the target, a programmer must design a search algorithm that reduces the in formation requirement of the search to a manageable level. The information added is the "active information." The "exogenous information" is what is left after the active information is subtracted fron1 the endogenous information. It measures the difficulty of the residual search problem.

In his critique of EV as well as other evolutionary algorithms, Marks. how that each of the e putatively successful simulations of undirected

mutation and selection actually depends upon several sources of active information. The EV program, for example, uses active inforn1ation by applying a filter to favor sequences with the general profile of a nucleotide binding site. And it uses active information in each iteration of its evaluation algorithm or fitness function. The fitness function in EV uses information about the target sequence to assess degrees of difference between a prespecified target and the mutated sequence produced by the program. Those sequences that have the lowest error values - generate proximity to the prespecified functional sequence- are elected to replicate and mutate. Marks shows that each time the program uses knowledge of the target sequence to exclude some sequences and preserve others, it imparts a quantifiable amount of information in its selection. Marks quantifies these sources of active information and shows that they reduce the difficulty well below the 131 bits Schneider claims that EV can produce "from scratch." He also how that the endogenous information in even modestly difficult search problems usually cannot be generated (or the search problem solved) without added or "active" information to assist the search.

11.6.49 Going Nonlinear

Charles Baylis, Robert J. Marks II, Josh Martin, Hunter Miller, and Matthew Moldovan. "Going Nonlinear," IEEE Microwave Magazine, April 2011, pp.55-64

1. Yuanxiao Gou *et al.* "Analytical Reflection Coefficient Expressions Utilizing Load-Dependent X-Parameters." IEEE Transactions on Microwave Theory and Techniques, Year: 2015, Pages: 1 - 11, DOI: 10.1109/TMTT.2015.2470239

   "The matrix description of the X-parameter model is first applied in [Baylis *et al.*] [2]. It was originally employed to predict the performance of the amplifier under a well-defined multi-harmonic load condition. Specifically, the $X^(F)$ matrix gives the output spectrum phasor values at all combinations of the output port and harmonic. The $X^(S)$ and $X^(T)$ matrices represent the coupling or "cross-coupling" effects between the harmonic components of different ports. Moreover, because all the elements are correlated to the large-signal input A_{11} , the matrix representation will not damage the nonlinear features of the X-parameter model and the spectrum mapping relationships are still preserved."

2. Pelaez-Perez, A. M., S. Woodington, M. Fernandez-Barciela, Paul J. Tasker, and J. I. Alonso. "Large-signal oscillator design procedure utilizing analytical-parameters closed-form expressions." Microwave Theory and Techniques, IEEE Transactions on 60, no. 10 (2012): 3126-3136.

   "The main drawbacks of using computer-aided design (CAD) simulators are the time-consuming optimization steps, usually required in a fully numerical simulation-based circuit design. In order to speed up this design procedure, the availability of closed-form expressions would be convenient [3]. These allow for the direct computation of the nonlinear network performance, hence quickly providing an initial valid design solution. An example in this concept is the popular negative-resistance method for RF oscillator design, based mainly on -parameters. Although this approach gives acceptable insight, it cannot accurately predict oscillator behavior since it is only based on linear parameters."

3. Pelaez-Perez, A. M., S. Woodington, José Alonso, M. Fernandez-Barciela, and Paul J. Tasker. "X-parameters-based closed-form expressions for evaluating power-dependent fundamental negative and positive real impedance boundaries in oscillator design." Microwaves, Antennas & Propagation, IET 6, no. 8 (2012): 835-840.

   "The basic assumption is that, load-independent X-parameter coefficients

> can be used over a useable, extended, impedance region about the defined reference impedance to robustly predict large-signal response. The validity of this assumption is an obvious concern [8], hence will also be addressed in this paper."

4. Lee, Chie-In, Wei-Cheng Lin, and Yan-Ting Lin. "A 2.4 GHz high output power and high efficiency power amplifier operating at inductive breakdown in CMOS technology." Microelectronics Journal 45, no. 4 (2014): 449-453.

> "The X-parameter measurement can save time required to develop the nonlinear model [20], providing an alternative nonlinear circuit design approach. "

5. Kheirdoost, A., G. Moradi, and A. Abdipour. "An Analytical Formulation for Black Box Conversion Matrix Extraction." Microwave Theory and Techniques, IEEE Transactions on 60, no. 6 (2012): 1493-1499.

> "Here a simple methodology for extraction of the conversion matrix in nonlinear elements could be a valuable tool in microwave circuit design and analysis. The advent of Nonlinear Vector Network Analyzer (NVNA) and X Parameters concept [14] have made significant advances in design and modeling of nonlinear devices."

6. Urbina-Martinez, J. L., U. Malagon-Reyes, J. R. Loo-Yao, Pablo Moreno, and J. A. Reynoso-Hernandez. "X-parameters: The new tendency in the characterization of nonlinear RF devices."In Central America and Panama Convention (CONCAPAN XXXIV), 2014 IEEE, pp. 1-7. IEEE, 2014.

> "Los parámetros X se definen como un súper conjunto de parámetros S, los cuales simultáneamente están en función de la potencia, la frecuencia de la señal de entrada y el voltaje de operación en corriente directa (DC). El propósito principal de emplear los parómetros X, es el de obtener una caja negra que represente con exactitud al DBP, tanto en su región lineal como en la no lineal, evitando de esta manera el largo y complejo trabajo de desarrollar un modelo matemático no lineal que se ajuste al comportamiento del DBP, lo cual puede consumir varios meses [8]."

11.6.50 Radar chirp waveform selection

Josh Martin, Matthew Moldovan, Charles Baylis, Robert J.Marks II, Lawrence Cohen, Jean de Graaf, "Radar chirp waveform selection and circuit optimization using ACPR load-pull measurement," 2012 IEEE 13th Annual Wireless and Microwave Technology Conference (WAMICON), Florida, pp.1-4, 15-17 April 2012. doi: 10.1109/WAMICON.2012.6208465

1. Zenteno, Efrain, Magnus Isaksson, and Peter Handel. "Output Impedance Mismatch Effects on the Linearity Performance of Digitally Predistorted Power Amplifiers." Microwave Theory and Techniques, IEEE Transactions on 63, no. 2 (2015): 754-765.

> "..., under load impedance mismatch conditions, the linearized AB amplifier exhibits large variations of the in-band error (NMSE). However, due to its design, the same amplifier is robust to impedance mismatch conditions for the out-of-band error (ACPR). Therefore, AB amplifier architecture may be considered when out-of-band emissions and load impedance mismatches may occur. The minimization of the out-of-band error or any other metric can be done using load pull techniques [27]. These techniques can also provide, in the form of contours, the sensitivity to load impedance variations. For theDPD-linearized Doherty amplifier, both the NMSE and ACPR are vastly affected by load impedance mismatches, which is expected from the dynamic load modulation principle under which Doherty operates."

11.6.51 Chirp Waveform Selection

Josh Martin, Matthew Moldovan, Charles Baylis, Robert J.Marks II, Lawrence Cohen, Jean de Graaf, "Radar

chirp waveform selection and circuit optimization using ACPR load-pull measurement," 2012 IEEE 13th Annual Wireless and Microwave Technology Conference (WAMICON), Florida, pp.1-4, 15-17 April 2012.

1. Zenteno, Efrain, Magnus Isaksson, and Peter Handel. "Output Impedance Mismatch Effects on the Linearity Performance of Digitally Predistorted Power Amplifiers." Microwave Theory and Techniques, IEEE Transactions on 63, no. 2 (2015): 754-765.

> "Therefore, AB amplifier architecturemay be considered when out-of-band emissions and load impedance mismatches may occur. The minimization of the out-of-band error or any other metric can be done using load pull techniques [27]. These techniques can also provide, in the form of contours, the sensitivity to load impedance variations. For theDPD-linearized Doherty amplifier, both the NMSE and ACPR are vastly affected by load impedance mismatches, which is expected from the dynamic load modulation principle under which Doherty operates."

11.6.52 Spectrally Defined Reconfiguration

Charles Baylis, Josh Martin, Matthew Fellows, David Moon, Matt Moldovan, Lawrence Cohen, Robert J. Marks II, "Radar power amplifier circuit and waveform optimization for spectrally confined, reconfigurable radar systems," 2013 IEEE Radar Conference (RADAR), Ottawa, ON, Canada, April 29-May 3 2013, pp. 1-4.

1. Yuan-fang, Cao Si-yang Zheng. "Recent Developments in Radar Waveforms" Journal of Radars, Vol. 3, No. 5, Oct. 2014

> "[Baylis et al.] [79] study designing spectral disjoint radar waveforms (also known as sparse frequency or thinned spectrum radar waveform) for avoiding detection of the transmitted signal by the enemy or collision with other wireless communication mechanisms."

11.6.53 Unexpected Swarms Behavior

Jon Roach, Winston Ewert, Robert J. Marks II and Benjamin B. Thompson, "Unexpected Emergent Behaviors From Elementary Swarms," Proceedings of the 2013 IEEE 45th Southeastern Symposium on Systems Theory (SSST), Baylor University, March 11, 2013, pp. 41 - 50.

1. Wilkenfeld, Daniel A., and Jennifer K. Hellmann. "Understanding beyond grasping propositions: A discussion of chess and fish." Studies in History and Philosophy of Science Part A 48 (2014): 46-51.

> "One area where modeling is required for understanding is in the appreciation of swarm behavior. Typically, swarms involve autonomous agents following simple rules that together produce an emergent behavior. (Roach, Ewert, Marks,& Thompson, 2013) Termites, for example, are governed by the following simple rules (Roach et al., 2013, p. 42):
>
> 1) Walk randomly until you encounter a grain.
>
> 2) If you have a grain, drop it.
>
> 3) If you do not have a grain, pick one up.
>
> 4) Repeat.
>
> "The result is a remarkable ability to clear an area of wood chips and form mounds. The location and formation of such mounds is not something one understands simply in virtue of knowing the four rules in question, or the state of the system at any particular time (including the start). What is striking about the example is that other than the four rules in question and the facts about the states of the system, there is nothing else about the system to know. Understanding the emergent behavior then cannot consist merely in some bit of knowledge. Some degree of simulation and practice is required."
>
> "The termite case is the simplest, but there is an array of swarm like behavior wherein simulations reveal

complex emergent behavior arising from relatively simple rules governing individuals. For example, Roach et al. (2013) explore how trapping, cooperation, and confusion tactics can arise from very simple autonomous systems. None of these behaviors can be understood except by actually working through the models. Working through the model involves, at a minimum, grasping how the system evolved between any particular steps, but also being able to simultaneously simulate how the cumulative impact of such steps produced the end result."

11.6.54 Cognitive Radio Networks Using Game Theory

Liang Dong, Yanqing Liu and R.J. Marks II "Common Control Channel Assignment in Cognitive Radio Networks Using Potential Game Theory," IEEE Wireless Communications and Networking Conference (WCNC), Shanghai, China, 7-10 April 2013, pp. 315 - 320

1. Omar, Ankur. "Cache node determination, allocation and distribution in cognitive networks using game theory." In Telecommunication Networks and Applications Conference (ATNAC), 2014 Australasian, pp. 152-157. IEEE, 2014.

> "The normalization factor η is to ensure that the two utility criteria are approximately equally weighted when $\rho = 0.5$ [20]. We have:
>
> $$\eta = \frac{H\left[\sum_{j=1,j\neq i}^{N} I(f_i = f_j)\right]}{H\left[\theta_i(f_i)\right]} \quad (8)$$
>
> "Each SU sequentially updates its strategy to maximize its utility, and the potential function will reach a local maximum, and in finite steps will terminate to an NE [19], [20]."

11.6.55 Radar Power Amplifier Circuit and Waveform Optimization

Charles Baylis, Josh Martin, Matthew Fellows, David Moon, Matt Moldovan, Lawrence Cohen, Robert J. Marks II, "Radar power amplifier circuit and waveform optimization for spectrally confined, reconfigurable radar systems," 2013 IEEE Radar Conference (RADAR), Ottawa, ON, Canada, April 29-May 3 2013, pp. 1-4.

1. Gomez-Garcia, Roberto, Miguel-Angel Sanchez-Soriano, Kam-Weng Tam, and Quan Xue. "Flexible Filters: Reconfigurable-Bandwidth Bandpass Planar Filters with Ultralarge Tuning Ratio." Microwave Magazine, IEEE 15, no. 5 (2014): 43-54.

> "It is unquestionable that a great effort is currently being directed toward the implementation of fully reconfigurable and multipurpose radio-frequency (RF) systems, aimed at developing quasiuniversal high-frequency transceiver modules. Examples of modern applications demanding such vast RF frequency agility are manifold; they encompass emerging cognitive/software-defined radios and multifunction radars with dynamic spectrum access capabilities to optimize their operation [1][3]."

11.6.56 Solving the Spectrum Crisis

Baylis, Charles, Matthew Fellows, Lawrence Cohen, and Robert J. Marks. "Solving the Spectrum Crisis: Intelligent, Reconfigurable Microwave Transmitter Amplifiers for Cognitive Radar." Microwave Magazine, IEEE 15, no. 5 (2014): 94-107.

1. Feger, Reinhard, and Andreas Stelzer. "Millimeter-wave radar systems on-chip and in package: Current status and future challenges." In Wireless Sensors and Sensor Networks (WiSNet), 2015 IEEE Topical Conference on, pp. 32-34. IEEE, 2015.

> "Being able to reconfigure the radar system on the fly would allow to realize the vision of cognitive radars [5], [6]. Such systems adapt their behavior, like, e.g., its beampattern and probing signal to the environment. This allows to optimize the achievable measurement performance for diverse scenarios, to identify and suppress interfering signals from other radars and to minimize disturbance of other radars."