# QIUMING ZHU

Department of Computer Science
College of Information Science and Technology
University of Nebraska at Omaha, Omaha NE 68182-0500
Telephone: (402) 554-3685, E-mail: qzhu@unomaha.edu

## EDUCATION

| | | |
|---|---|---|
| **Ph. D.** | Computer and Systems Engineering, | May 1986 |
| | Rensselaer Polytechnic Institute, Troy, New York, U.S.A. | |
| **B. E.** | Computer Engineering, | January 1982 |
| | Nanjing Institute of Technology, Nanjing, China | |

## ACADEMIC EXPERIENCES

**Department Chair** — May 2007 – present,
Department of Computer Science
University of Nebraska at Omaha, Nebraska, U.S.A.

**Professor** — August 1995 - present
Department of Computer Science
University of Nebraska at Omaha, Nebraska, U.S.A.

**Associate professor** — August 1990 - August 1995
Department of Computer Science
University of Nebraska at Omaha, Nebraska, U.S.A.

**Assistant Professor** — August 1986 - August 1990
Department of Computer Science and Engineering
Oakland University, Rochester, Michigan, U.S.A.

**Postdoctoral Researcher** — January 1986 - August 1986
Center for Computer Aids for Industrial Productivity
Rutgers University, New Brunswick, New Jersey, U.S.A.

**Research Assistant** — September 1985 - December 1985
Center of Manufacturing Productivity & Technology Transfer
Rensselaer Polytechnic Institute, Troy, New York, U.S.A.

**Teaching Assistant** — September 1984 - September 1985
Department of Electrical, Computer and Systems Engineering
Rensselaer Polytechnic Institute, Troy, New York, U.S.A.

**Research Assistant** — May 1984 - August 1985
Image Processing Laboratory
Rensselaer Polytechnic Institute, Troy, New York, U.S.A.

**Assistant Lecturer** — January 1982 - August 1983
Department of Computer Science and Engineering
Nanjing Institute of Technology, Nanjing, China.

## PROFESSIONAL HONORS

Union Pacific Professorship 2011
Kayser Professorship 2010
Kayser Professorship 2002
Distinguished Research or Creative Activity Award 2001
Kayser Professorship 1999

## PROFESSIONAL SPECIALTIES

- Digital Image Processing and Computer Vision
- Pattern Recognition, Fuzzy Logics, and Neural Networks

**RESEARCH GRANTS AWARDED**

1. H. Sharif, M. Hempel, **Q. Zhu**, D. Su, "*Reducing Food Wastage: Researching novel methods blending Smart Food Inventory Monitoring, Behavioral Influencing and Gamification: Planning Grant Application*," University of Nebraska Food for Health Collaboration Initiative, **$20,000**, March 1, 2016 – February 28, 2017.

2. P. Chundi, M. Subramaniam, E. Margalit, **Q. Zhu**, et al, "A Tablet-based System to Gain Insights into the Visual Impairments of AMD Patients," Nebraska Research Initiative (NRI), **$99,726**, July 2015-June 2017.

3. **Q. Zhu**, H. Siy, J-H. Youn, and Brain Dorn, "Approaches for Improving the Effectiveness of the UNO Teaching and Learning Coding (TLC) Laboratory, 2nd year," Kelly Fund, University of Nebraska, $**10,000**, 2015-2016.

4. H. Siy, **Q. Zhu**, J-H. Youn, Brian Dorn, and Neal Grandgenett, "Strategies: Strategic Problem-Based Approach to Rouse Computer Science (SPARCS)," NSF, Innovative Technology Experiences for Students and Teachers (ITEST) Program, **$1,144,418**, 2015-2018.

5. M. Subramaniam, P. Chundi, **Q. Zhu**, et al, "Drsti: Distortion Repair and Sight Improvement for Low Vision Age-Related Macular Degeneration Patients," Fund for Investing in the Research Enterprise (FIRE), Office of Research and Creative Activity (ORCA), University of Nebraska at Omaha, **$40,380**, July 2014-June 2015.

6. **Q. Zhu**, H. Siy, J-H. Youn, Brian Dorn, and Neal Grandgenett, "Online Master of Science Degree in Computer Science Education (MS-CSE)," Online World Wide (OWW) fund, University of Nebraska, $**35,000**, 2014-2015.

7. **Q. Zhu**, H. Siy, J-H. Youn, and Brian Dorn, "Peer-lead Team Learning to Improve the Effectiveness of the UNO Teaching and Learning Coding (TLC) Laboratory," Student Technology Fee Projects, University of Nebraska, $**23,000**, 2014-2015.

8. **Q. Zhu**, H. Siy, J-H. Youn, and Brain Dorn, "Approaches for Improving the Effectiveness of the UNO Teaching and Learning Coding (TLC) Laboratory, 1st year," Kelly Fund, University of Nebraska, $**10,670**, 2014-2015.

9. D. Peng, H. Sharif, M. Hempel, and **Q. Zhu**, "Multi-Domain Media Rendering: A Paradigm for Effective Systematic Removal of Secret Data to Prevent Malicious Information Sharing," Nebraska Research Initiative (NRI), **$99,908**, 2012-2014.

10. M. Subramaniam, P. Chundi, **Q. Zhu**, et al, "Adaptive Retina Encoders for Vision Restoration," Fund for Investing in the Research Enterprise (FIRE), Office of Research and Creative Activity (ORCA), University of Nebraska at Omaha, **$33,828**, July 2012-June 2013.

11. **Q. Zhu**, "Joint online course development with International Partner at the Technik FH Mainz – University of Applied Sciences," Grants for Strengthening and Elevating International Partnerships across Disciplines: India, China, Germany and Norway, The University of Nebraska Foundation, **$4,500**, 2012.

12. **Q. Zhu**, H. Siy, J-H. Youn, "Research Experiences for Teachers (RET) in Engineering and Computer Science: Infusing Mobile Platform Applied Research into Teaching (IMPART)," NSF, Research Experiences For Teachers Sites (RET) Program, $**449,775**, February 2012 - February 2015.

13. **Q. Zhu** and Spring Yinchun Guo "Quality Measurement of Satellite Remote Sensing Image Data: Compression and Optimization," NASA Nebraska Space Grant & EPSCoR Research Mini-Grant, **$25,003,** 2011-2012.

14. S. Bhowmick, P. Chundi, **Q. Zhu**, R. Gandhi, V. Rykov, and C. Augeri, "Modeling Changes in Dynamic Networks," Fund for Investing in the Research Enterprise (FIRE), Office of Research and Creative Activity (ORCA), University of Nebraska at Omaha, **$24,627**, 2011-2012.

15. J. Youn and **Q. Zhu**, "REU Site for Extensive and Collaborative Undergraduate Research Experience (SECURE)," NSF, Research Experiences For Undergraduate Sites (REU) Program, **$348,114**, 2011-2014.

16. **Q. Zhu**, R. Gandhi, and W. Mahoney, "SCADA Hawk – An Integrated Anti-Tamper Technology," DoD STTR OSD09-T003 Improving Software and Data Security in SCADA Systems, Proposal # O09B-003-1010, Award Contract #: FA8650-10-M-1880, Total budget **$99,923** (UNO portion **$40,546**), June 2010–December 2010.

17. O. Wu, **Q. Zhu**, et al., "Dynamical, Distributive Network Intrusion Modeling and Analysis," Chinese Natural Science Foundation (CNSF), Chinese **$313,000**, 2010-2013.

18. **Q. Zhu** and Y. Guo, "A Novel Technique of Video Quality Improvement for Public Safety," University Committee on Research and Creative Activity (UCRCA), University of Nebraska at Omaha, **$4,500**, 2010-2011.

19. **Q. Zhu**, "Using Disjunctive Combinatorial Mechanism (DCM) for Quantitative Evaluation of Imprecise and Inexact Measurements in Lab Experiments and Clinical Trials," UNeMed & UNO College of Information Science and Technology Innovation Grant, **$10,000**, 2009-2010.

20. **Q. Zhu**, "HICIN–A Hybrid Intrinsic Cellular Inference Network Approach for Hybrid Inference System for Data Fusion and Decision Support," DoD ONR, STTR N04-T025 Phase II, Contract number: N00014-05-C-0368, Total budget **$1,099,923** (UNO portion **$360,140**), June 2006–December 2009.

21. **Q. Zhu** and A. Fruhling, "Command and Control Software Engineering Support –C2SES," DoD STRATCOM, Subcontract through Northrop Grumman, **$555,519**, Oct. 2005–Sept. 2009.

22. **Q. Zhu** and H. Guo, "Early Indicator Surveillance Model: Algorithm Design," State of Nebraska through PKI TDC, Total budget **$24,000**, August 1, 2007 – July 31 2008.

23. **Q. Zhu**, "Collective Agents Interpolative Integral (CAII)," DoD ONR, STTR N05-T019 Phase I, Contract number: N00014-05-M-0206, Total budget **$99,998** (UNO portion **$45,000**), 2005.

24. **Q. Zhu**, "HICIN–A Hybrid Intrinsic Cellular Inference Network Approach for Hybrid Inference System for Data Fusion and Decision Support," DoD ONR, STTR N04-T025 Phase I, Contract number: N00014-04-M-0274, Total budget **$99,900** (UNO portion **$45,000)**, 2004.

25. **Q. Zhu**, "On the Pattern Discrimination in Micro-array Data Analysis," UNMC (NIH), Subcontract for summer research, **$3,000**, 2004.

26. **Q. Zhu**, "Eigen-Similarity Integral: A new approach for Detecting and Extracting Image Similarities, Differences and Target Patterns," DoD AFOSR, STTR AF03-008 Phase I, Contract number: F49620-03-C-0073, Total budget **$100,000** (UNO portion **$44,749**), 2003.

27. J. Huff, **Q. Zhu**, Z Chen, and Y. Shi, "Proactive and predictive Information Assurance for Next Generation Systems (P2INGS)," DoD AFRL through Northrop Grumman, BAA-03-10-IFKA, Total budget **$800,000** (UNO portion about **$400,000**), 2003-2004.

28. E. Jones and **Q. Zhu**, "NSF/USDOT: ICSST: Towards a Systems Integration Urban Network Performance Measure – Saclability and Data Issues of the Two-Fluid Model," NSF, $**115,875**, 2001-2002.

29. **Q. Zhu** and Z. Chen, "Equipment Grand for Data Mining and Decision Support Systems (DMDSS) Laboratory," NSF-Nebraska EPSCoR, **$10,000**, 2001.

30. **Q. Zhu**, H. Sharif, and A. Stoyen, "Creation of a multimedia hub to broadcast real-time SCOLA TV Channels over Internet2," NSF, $**498,295**, 2000 – 2002.

31. E. Jones, **Q. Zhu**, and H. Sharif "Acquisition of Basic Instrumentation for a Prototype Intelligent Transportation Systems Information and Infrastructure Laboratory," Nebraska Research Initiative, $**747,182**, 2000-2004.

32. **Q. Zhu** and Z. Chen, "Non-monotonic Extrapolation of Causal Relations for Knowledge-based Decision Support Using a Goal-driven Approach," DoD US Air Force Office of Scientific Research (AFOSR), F49620-99-1-0211, **$407,927,** 1999-2002.

33. G. Dalrymple, **Q. Zhu**, *et. al*., "Development of a WEB Site to Support New NHS Cardiac Catheterization Laboratory," Toshiba Corp., through University of Nebraska Medical Center, **$37,571**, 2000.

34. **Q. Zhu**, H. Sharif, and A. Stoyen, "Creation of a Multimedia Information Hub to Broadcast Real-time SCOLA TV Programs on Internet2 at the Peter Kiewit Institute," Omaha World Herald Collaborative Research Grants, **$25,000**, 2000.
35. **Q. Zhu** and H. Sharif, "High-Quality Data Transmission on Internet-2," General Funded Research Competition, Center for Management Information Technology, University of Nebraska at Omaha, CMIT99-1, **$18,000**, 1999-2000.
36. Z. Chen, and **Q. Zhu**, "Establishing a Database Mining Systems Laboratory," General Funded Research Competition, Center for Management Information Technology, University of Nebraska at Omaha, CMIT99-1, **$28,000**, 1999-2000.
37. **Q. Zhu** and H. Sharif, "Study of Innovative Approaches for High Quality Video Transmission on the Next Generation Internet," Omaha World Herald Collaborative Research Grants, **$22,000**, 1999.
38. G. Dalrymple, **Q. Zhu**, *et. al*., "Pilot Project to Demonstrate the Feasibility of Using the Internet for Acquisition and Review of Diagnostic Images for American Board of Radiology Examination Item Pools" American Board of Radiology, **$43,316**, 1999.
39. **Q. Zhu**, "Developing a Prototypic Intelligent Agent," University Committee on Research, University of Nebraska at Omaha, **$3,300**, Fall 1997 - Spring 1998.
40. **Q. Zhu**, "Reliable Object Recognition by a Desk Top Personal Computer Using Dempster-Shafer Reasoning," University Committee on Research, University of Nebraska at Omaha, **$8,954**, Fall 1992 - Spring 1994.
41. **Q. Zhu**, "Development of computer programs for color image processing and integrated object recognition," University Committee on Research, **$8,690**, Fall 1991.
42. **Q. Zhu**, "Development and Implementation of a Desk-top Intelligent Computer Imaging and Vision System," University Committee on Research, University of Nebraska at Omaha, **$9,785**, Fall 1990.
43. **Q. Zhu**, and N. Loh, "Data Compression for Visual Guidance of Remotely Controlled Vehicle", General Dynamics Land Systems Division, Warren, MI, Amount: **$8,700**, 1989.
44. **Q. Zhu**, and N. Loh, "Dynamic Obstacle Avoidance in Visual Guidance of Mobile Robot," Central Engineering Laboratory, FMC Corporation, Santa Clara, CA, **$12,000**, 1989.
45. N. Loh, **Q. Zhu**, *et al*, "3D Computer Vision and its Application to Automotive Parts Non-destructive Inspection", Research Excellence Grant, State of Michigan, **$250,000**, 1988-1989.
46. **Q. Zhu**, "A Fast Algorithm for Collision Avoidance in Visual Guidance of Robot Motion," Faculty Research Excellence Award, Oakland University, MI, **$4,600**, 1987.

## PATENTS

1. **Q. Zhu,** U.S. patent # 6,332,037, Issue Date: December 18, 2001.
   "*An Invariant, Eigenvalue Based, Non-degenerate Data Structure Characterization, Storage and Retrieval Indexing Method*," The present invention relates generally to methods of data structure characterization, storage and retrieval; and more particularly is a method which enables easy characterization, storage and retrieval of multi-dimensional data structures, such as digital images and videos, compromising use of a translation, rotation and scaling invariant index which results from concatenating a series of Eigenvalue calculation mediated index elements, determined at a plurality of hierarchical data depth levels.

2. **Q. Zhu,** U.S. patent # 6611609, Issue Date: August 26, 2003.
   "*Method Comprising Intensity and/or Color Gradient Based Pre-selection of Pixels Utilized in Spatial Moment Calculations in Data Structure Characterization, Indexing, Storage and Retrieval*," The present invention relates generally to methods of data structure characterization, indexing, storage and retrieval; and more particularly comprises a method which pre-selects pixels in data structures which have associated therewith significant intensity and/or color gradient(s) with

respect to surrounding pixels, then utilizes said pre-selected pixels in data structure characterizing spatial first and second central moment calculations.

**3. Q. Zhu,** U.S. patent # 6625311, Issue Date: September 23, 2003.
"*Methodology for Data Structure Characterization, Indexing, Storage and Retrieval*," The present invention relates generally to methods of data structure characterization, indexing, storage and retrieval; and more particularly comprises a method for enabling easy characterization, storage and retrieval of multi-dimensional data structures involving use of a translation, rotation and scaling invariant index which results from concatenating a series of Eigenvalue calculation mediated index elements determined at a plurality of hierarchical data depth levels. A variation thereof pre-selects pixels in data structures which have associated therewith significant intensity and/or color gradient(s) with respect to surrounding pixels, in, for instance, "X" and/or "Y" and/or "Z" direction(s), then utilizes said pre-selected pixels in the data structure characterizing spatial first and second central moment calculations. Data structure characterizing vector(s) are constructed from spatial data structure first central moment values, and non-degenerate parameter(s) determined from second central moment calculations, as well as from, when applicable, frequency-of-occurrence integer counts of said pre-selected pixels.

## **PUBLICATIONS**

REFEREED JOURNAL PAPERS
1. M. Gong, H. Wang, M. Chen, D. Bao, and **Q. Zhu**, "A newly discovered ubiquitin-conjugating enzyme E2 correlated with the cryogenic autolysis of *Volvariella volvacea*," *Gene*, ISSN:0378-1119, http://www.journals.elsevier.com/gene/, Accepted 2015.
2. J. Yao, B. Yang, **Q. Zhu**, "Near-Duplicate Image Retrieval Based on Contextual Descriptor," *IEEE Signal Processing Letters*, Volume: 22, Issue: 9, pp. 1404-1408, Print ISSN: 1070-9908, Online ISSN: 1558-2361, Digital Object Identifier: 10.1109/LSP.2014.2377795, September 2015.
3. N. Hemmatazad, **Q. Zhu**, R. Gandhi, and S. Bhowmick, "The Intelligent Data Brokerage: A Utility-Enhancing Architecture for Algorithmic Anonymity Measures," *International Journal of Privacy and Health Information Management* (IJPHIM), ISSN: 2155-5621|EISSN: 2155-563X, Doi: 10.4018/IJPHIM, Volume 2, Issue 1. pp. 22-33, January 2015.
4. M. Gong, M. Chen, H. Wang, **Q. Zhu** and Q. Tan, "A specific type of cyclin-like F-box domain gene is involved in the cryogenic autolysis of *Volvariella volvacea*," *Mycologia,* Print ISSN: 0027-5514 Online ISSN: 1557-2536, doi: 10.3852/14-159, 107(2):313-318, *December 2014.*
5. Sharma, R. Gandhi, **Q. Zhu**, W. Mahoney, and W. Sousan, "A Social Dimensional Cyber Threat Model with Formal Concept Analysis and Fact-Proposition Inference," The *International Journal of Information and Computer Security*, Volume 5, Number 4, pp. 301-333, 2013.
6. R. Gandhi, A. Sharma, W. Mahoney, W. Sousan, and **Q. Zhu**, and P. Laplante, "The Social, Political, Economic, and Cultural Dimensions of Cyber Attacks," *IEEE Technology and Society*, Vol. 30, No. 1, pp.28-38, 2010.
7. W. Mahoney, P. Hospodka, W. Sousan, R. Nickell, Q. **Zhu**, "A Coherent Measurement of Web Search Relevance," *IEEE Transactions on Systems, Man, and Cybernetics,* A, Vol. 39, No. 6, pp. 1176-1187, November, 2009.
8. W. Sousan, Q. **Zhu**, R. Nickell, W. Mahoney, P. Hospodka, "Collecting Open Source Intelligence via Tailored Information Delivery Systems," *Journal of Information Warfare*, Vol. 7, Issue 2, pp. 1-10, September 2008.
9. Q. Kong and **Q. Zhu**, "Incremental Procedures for Partitioning Highly Intermixed Multi-class Datasets into Hyper-spherical and Hyper-ellipsoidal Clusters," *Journal of Data and Knowledge Engineering,* Vol.63, Issue 2, pp. 457-477, November 2007.

10. R. Corbin, C. B Dunbar, and **Q. Zhu**, "A Three-tier Knowledge Management Scheme for Software Engineering Support and Innovation" *Journal of Systems and Software*, Vol. 80, issue 9, pp. 1494-1505. September 2007.

11. K. Cao and **Q. Zhu**, "The Weed-out Trend Analysis for Micro-array Gene Expression Patterns," *Journal of Pattern Recognition Letters*, Volume 28, Issue 12, Pp. 1472-1482, September 2007.

12. **Q. Zhu**, S. Aldridge, and T. Resha, "Hierarchical Collective Agent Network (HCAN) for Efficient Fusion and Management of Multiple Networked Sensors," *Journal of Information Fusion*, Volume 8, Issue 3, pp. 266-280, July 2007.

13. S. Sarasamma, and **Q. Zhu**, "Min-Max Hyper-Ellipsoidal Clustering for Anomaly Detection in Network Security," *IEEE Transactions on Systems, Man, and Cybernetics,* B, Vol. 36, No. 4, pp.887-901, August 2006.

14. **Q. Zhu**, "Topologies of agents interactions in knowledge Intensive multi-agent systems for networked information services," *International Journal of Advanced Engineering Informatics*, Vol. 20, No. 1, pp. 31-45, January 2006.

15. S. Sarasamma, **Q. Zhu**, J. Huff, "Hierarchical Kohonen Net for Anomaly Detection in Network Security," *IEEE Transactions on Systems, Man, and Cybernetics,* B, Vol. 35, No. 2, pp.302-312, April 2005.

16. **Q. Zhu**, H. Cui, K, Cao, and J. Chan, "Algorithmic Fusion of Gene Expression Profiling for Diffuse Large B-cell Lymphoma Outcome Prediction," *IEEE Transactions on Information Technology in Biomedicine*, Vol. 8, No. 2, pp.79- 88, June 2004.

17. J. Iqbal, W. Sanger, D. Horsman, A. Rosenwald, D. Pickering, K. Cao, **Q. Zhu**, J. Chan, *et. al.*, "BCL2 translocation defines a unique tumor subset within the germinal center B-cell-like diffuse large B-cell lymphoma" *American Journal of Pathology*, 165(1), pp. 159-166, July 2004.

18. X. Huang and **Q. Zhu**, "A Pseudo Nearest-Neighbor Substitution Approach for Missing Data Recovery on Gaussian Random Data Sets," *Pattern Recognition Letters*, Vol. 23, No. 13, pp. 1613-1622, 2002.

19. Y. Sun, and **Q. Zhu**, "An Iterative Initial-points Refinement Algorithm for Categorical Data Clustering," *Pattern Recognition Letters*, Vol. 23, No. 7, pp. 875-884, 2002.

20. M. Chen, **Q. Zhu**, and Z. Chen, "An Integrated Interactive Environment for Knowledge Discovery from Heterogeneous Data Resources," *Journal of Information & Software Technology*, Vol. 43, pp. 487-496, 2001.

21. **Q. Zhu,** Y. Cai, and L. Liu, "A Multiple Hyper-ellipsoidal Subclass Model for an Evolutionary Classifier," *Journal of Pattern Recognition*, Vol. 34, No. 3, pp. 547-560, 2001.

22. **Q. Zhu,** "Multi-subclass Modeling for Pattern Recognition in Complex Spaces," *Recent Research Developments in Pattern Recognition*, Vol. 1, Part II, Trans-World Research Network Publishing, pp. 237-246, 2000.

23. **Q. Zhu,** Y. Cai, and L. Liu, "A Global Learning Algorithm for a RBF Network," *Journal of Neural Networks*, Vol. 12, No. 3, pp. 527-540, 1999.

24. **Q. Zhu**, "On the Geometries of Conic Section Representation of Noisy Object Boundaries," *Journal of Visual Communication and Image Representation*, Vol. 10, pp. 130-154, 1999.

25. **Q. Zhu,** and L. Peng "A new Approach to Conic Section Approximation of Object Boundaries," *Journal of Image and Vision Computing*, Vol. 17, No. 9, pp. 645-658, 1999.

26. **Q. Zhu,** "Minimum Cross-entropy Approximation for Modeling Highly Intertwining Data Set at Subclass Levels," *Journal of Intelligent Information Systems*, Vol. 11, No. 2, pp. 139-152, 1998.

27. **Q. Zhu,** and Y. Cai "A Subclass Model for Nonlinear Pattern Classification," *Journal of Pattern Recognition Letters,* Vol. 19, No. 1, pp. 19-29, February 1998.

28. Z. Chen and **Q. Zhu**, "Query construction for user-guided knowledge discovery in databases," *Journal of Information Sciences*, No. 109, pp. 49-64, 1998.

29. **Q. Zhu,** "Efficient Evaluations of Edge Connectivity and Width Uniformity," *Journal of Image and Vision Computing*, Vol. 14, No. 1, pp. 21-34, 1996.

30. **Q. Zhu**, M. Payne, and V. Riordan, "Edge Linking by a Directional Potential Function (DPF)," *Journal of Image and Vision Computing*, Vol. 14, No. 1, pp. 59-70, 1996.
31. **Q. Zhu,** and A. Tawfik, "Quantitative Object Motion Prediction by an ART2 and Madaline Combined Neural Network: Concepts and Experiments," *Journal of Engineering Applications of Artificial Intelligence*, Vol. 8, No. 5, pp. 569-578, 1995.
32. **Q. Zhu,** and A. Tawfik, "Quantitative Object Motion Prediction by an ART2 and Madaline Combined Neural Network," *Journal of Neural Processing Letters*, Vol. 2, No. 1, pp. 19-21, January 1995.
33. **Q. Zhu,** "Probabilistic Reasoning in an Augmented Fact-Proposition Space and its Applications," *Journal of Engineering Applications of Artificial Intelligence*, Vol. 7, No. 6, pp. 627-637, 1994.
34. **Q. Zhu,** and D. Shi, "Skill Augmentation Via Interactive Learning for Visual Guidance of Mobile Robots," *Journal of Engineering Applications of Artificial Intelligence*, Vol. 5, No. 2, pp. 101-112, 1992.
35. **Q. Zhu,** Y. Hung, S. Tang, and D. Shi, "An Optical Technique and Digital Processing Combined Method for Real-time Edge Extraction," *International Journal on Spatial Vision*, Vol. 5, No. 4, pp. 253-268, 1991.
36. **Q. Zhu,** "Hidden Markov Model for Visual Guidance of Robot Motion in Dynamic Environment," *IEEE Transactions on Robotics and Automation*, Vol. 7, No. 3, pp. 390-397, 1991.
37. **Q. Zhu,** "Virtual Edges, Viewing Faces, and Boundary Traversal in Line Drawing Representation of Objects with Curved Surfaces," *International Journal of Computers and Graphics*, Vol. 15, No. 2, pp. 161-173, 1991.
38. **Q. Zhu,** "On the Minimum Probability of Error of Classification with Incomplete Patterns," *Journal of Pattern Recognition,* Vol.23, No.11, pp. 1281-1290, 1990.
39. **Q. Zhu,** "Pattern Classification in Dynamic Environment: Tagged Feature Class Space and the Classifiers," *IEEE Transactions on Systems, Man, and Cybernetics*, Vol 19, No.5, pp.1203-1210, September/October 1989.
40. **Q. Zhu,** and H. Freeman, "A Symbolic Approach to the Fast Design of Industrial Piping Systems," *Transactions of SAE (Society of Automotive Engineers)*, Vol. 96, Section II, pp. 1293-1297, 1988.

BOOK CHAPTERS
1. W. Sousan, **Q. Zhu**, R. Gandhi, and W. Mahoney, "Smart Grid Tamper Detection using Learned Event Patterns," *Systems and Optimization Aspects of Smart Grid Challenges*, Panos Pardalos (ed), ISBN 978-3-642-38133-1, Springer-Verlag, pp. 99-115, 2013.
2. **Q. Zhu,** "Face Recognition," Book chapter, *The IEBM Handbook of Information Technology in Business,* International Thomson Business Press**,** pp. 538-545, 1999.
3. **Q. Zhu,** "Voice Recognition," Book chapter, *The IEBM Handbook of Information Technology in Business*, International Thomson Business Press, pp.634-640, 1999.
4. **Q. Zhu,** "Computer Vision," Book chapter, *The IEBM Handbook of Information Technology in Business*, International Thomson Business Press, pp. 472-479, 1999.
5. **Q. Zhu,** and Z. Chen, "Knowledge Discovery from Databases with the Guidance of a Causal Network," *Foundations of Intelligent Systems,* Z. Ras and A. Skowron (eds.), pp. 401-410, Oct. 1997.
6. **Q. Zhu,** "A Two-phase Fast Hidden-line Removal Algorithm," *Computer Graphics 1987*, Tosiyasu L. Kunii (Ed.), Springer-Verlag, Japan, pp. 59-72, 1987.

CONFERENCE PAPERS AND PRESENTATIONS
1. J. Yao, and **Q. Zhu**, "Rejecting Mismatches of Visual Words by Contextual Descriptors," *13ᵗʰ International Conference on Control, Automation, Robotics and Vision*, ICARCV 2014, December 10~12, 2014, Singapore.
2. **Q. Zhu**, H. Siy, J. Youn, N. Grandgenett, and E. Ostler, "Enhancing CS Education in High School STEM Curricula," *Proceedings of the 5ᵗʰ Annual International Conference on Computer*

*Science Education: Innovation and Technology* (CSEIT 2014), September, 22-23, 2014, Singapore, pp. 55-63.

3. W. Sousan, R. Gandhi, **Q. Zhu** and W. Mahoney, "*Using Anomalous Event Patterns in Control Systems for Tamper Detection,*" Annual Cyber Security and Information Intelligence Research Workshop, CSIIRW 2011, Oak Ridge, Tennessee, Oct. 15, 2011.

4. W. Sousan, **Q. Zhu**, R. Gandhi, W. Mahoney, W., Sharma, A., "Using Term Extraction Patterns to Discover Coherent Relationships from Open Source Intelligence," *Proceedings of the International Symposium on Secure Computing (SecureCom-10) In conjunction with The Second IEEE International Conference on Privacy, Security, Risk and Trust*, Session B22, Minneapolis, MN, August 2010.

5. A. Sharma, R. Gandhi, W. Mahoney, W. Sousan, **Q. Zhu**, "Building a Social Dimensional Threat Model from Current and Historic Events of Cyber Attacks," *Proceedings of the International Symposium on Secure Computing (SecureCom-10) In conjunction with The Second IEEE International Conference on Privacy, Security, Risk and Trust*, Session B22, Minneapolis, MN, August 2010.

6. B. Walenz, R. Gandhi, W. Mahoney, **Q. Zhu**, "Exploring Social Contexts along the Time Dimension: Temporal Analysis of Named Entities," *Proceedings of the International Symposium on Social Intelligence and Networking (SIN-10), In conjunction with The Second IEEE International Conference on Social Computing (SocialCom2010)*, Session A27, Minneapolis, MN, August 2010.

7. W. Sousan, R. Nickell, **Q. Zhu**, P. Hospodka, "Tailored Information Delivery Services for Open Source Intelligence," *Proceedings of the 3rd International Conference on Information Warfare and Security*, pp. 345-352, April 2008.

8. P. Hospodka, **Q. Zhu**, W. Sousan, and R. Nickell, "Network Security Assessment through a Fact-Proposition Space Model," *Proceedings of the 3rd International Conference on Information Warfare and Security*, pp.195-202, April 2008.

9. K. Cao and **Q. Zhu**, "Belief Combination for Uncertainty Reduction in Microarray Gene Expression Pattern Analysis," *Proceedings of Computational Science - ICCS2007\4489, Lecture Notes in Computer Science*, Volume 4489, Springer Berlin / Heidelberg, ISSN 0302-9743 (Print) 1611-3349 (Online), ISBN 978-3-540-72587-9, pp.844-851, July 14, 2007.

10. R. D. Corbin, C. B. Dunbar, and **Q. Zhu**, "Tailored Information Delivery and Service for Network-Centric C2 Support," *DoD 12th International Command and Control Research and Technology Symposium* (ICCRTS), New Port, RI, June 19-21, 2007.

11. E. Lindahl, S. O'Hara, and **Q. Zhu**, "A Multiagent System of Evidential Reasoning for Intelligence Analyses," *The Sixth International Joint Conference on Autonomous Agents and Multi-agent Systems* (AAMAS 2007), Honolulu, Hawaii, USA May 14-18, 2007.

12. **Q. Zhu**, S. O'Hara, M. Simon, and E. Lindahl, "Collective agents interpolative integral (CAII) for asymmetric Threat Detection." *SPIE Defense and Security Symposium*, DSS07-DS22-4, Multisource, Multisensor Information Fusion and Knowledge Discovery Technologies, Orlando, FL, April 9–13, 2007.

13. S. O'Hara and **Q. Zhu**, "Toward distributed ATR using subjective logic combination rules with a Network of Smart Sensors," *SPIE Defense and Security Symposium*, DSS07-DS47-11, Unmanned Systems Technology IX (DS47), Orlando, FL, April 9–13, 2007.

14. W. Sousan, M. Payne, and **Q. Zhu**, "Metadata (Ontology) Incremental Building/Refinement Agents" *International conference: Integration of Knowledge Intensive Multi-Agent Systems*, KIMAS'07, Boston, MA, April 29-May 3, 2007, paper #1100.

15. W. Sousan, M. Payne, and **Q. Zhu**, "Semantics-Based Web Data Filtering Agents" *International conference: Integration of Knowledge Intensive Multi-Agent Systems*, KIMAS'07, Boston, MA, April 29-May 3, 2007, paper #1096.

16. E. Lindahl and **Q. Zhu**, "A Hybrid Cellular Inference Network for Multi-Agent System Organization," *International conference: Integration of Knowledge Intensive Multi-Agent Systems*, KIMAS'07, Boston, MA, April 29-May 3, 2007, paper #1123.

17. E. Lindahl and **Q. Zhu**, "Epistemic Belief Frames in Distributed Effects-based Reasoning," *International conference: Integration of Knowledge Intensive Multi-Agent Systems*, KIMAS'07, Boston, MA, April 29-May 3, 2007, paper # 1124.

18. S. O'Hara and **Q. Zhu**, "A Language for Describing the Events in Video Streams – An Initial Exploration into the Image Semantics," *International conference: Integration of Knowledge Intensive Multi-Agent Systems*, KIMAS'07, Boston, MA, April 29-May 3, 2007.

19. R. D. Corbin, C. B. Dunbar, and **Q. Zhu, "**A Three-tier Knowledge Management Scheme for C2 Software Engineering Support and Innovation," DoD *Command and Control Research and Technology Symposium* (CCRTS), San Diego, Paper #C-064, June 20-22, 2006.

20. M. Payne, J. Renard, and **Q. Zhu**, "VIS – <u>V</u>isual <u>I</u>nference <u>S</u>ervice for Web-Collaborative Data Analysis and Knowledge Discovery," *C2 technology Summit*, US STRATCOM, Belleuve, NE, March 14-15, 2006.

21. **Q. Zhu**, and J. Hicks, "Synergetic Human-System Integration for Reliable and Efficient C2 Operations," *10th International Command and Control Research and Technology Symposium* (ICCRTS 2005), McLean, VA., Paper #066, June 2005.

22. E. Lindahl, **Q. Zhu**, J. Hicks, et al., "Actionable Knowledge Guided HTC Visualization," *10th International Command and Control Research and Technology Symposium* (ICCRTS 2005), McLean, VA., Paper #094, June 2005.

23. Y. Zhang, P. Shi, E. Jones, and **Q. Zhu**, "Robust Background Image Generation and Vehicle 3D Detection and Tracking," Proceedings of *the IEEE Intelligent Transportation Systems Conference*, pp. 12-16, CD # MoC1.3, Washington D.C., October, 2004.

24. G. Kou, Y. Peng, N. Yan, Y. Shi, Z. Chen, **Q. Zhu, Q**., J. Huff, and S. McCartney (2004), "Network Intrusion Detection by Using Multiple-Criteria Linear Programming," in J. Chen, ed., *Proceedings of 2004 International Conference on Service Systems and Service Management*, pp. 806-809, July 19 -21, Beijing, China.

25. K. Cao, **Q. Zhu**, J. Iqbal, J. Chan, "On the Alleviation of the effect of outliers in micro-array data analysis," *Proceedings of the International Conference on Mathematics and Engineering Techniques in Medical and Biological Sciences, METMBS*'04, pp. 263-269, June 2004.

26. **Q. Zhu**, and J. D. Hicks, "Collective Evolutionary Agent Networks for Autonomous Operations," *Presentation to the Second Annual SWARM Conference Held at the Crystal Gateway Marriott*, Arlington, VA, 14 - 15, June 2004.

27. **Q. Zhu**, and R. A. Flanagan, "Snap-Card: A Dynamic System Construct of Rapid Information Gathering and Integration for C2 Effectiveness in Homeland Security," *The 2004 International Command and Control Research and Technology Symposium* (ICCRTS 2004), San Diago CA. CD # 161, June 2004.

28. **Q. Zhu**, and J. D. Hicks, "Bayesian-Game Modeling of C2 Decision Making in Submarine Battle-Space Situation Awareness," *The 2004 International Command and Control Research and Technology Symposium* (ICCRTS 2004), San Diago CA. CD#160, June 2004.

29. A. Dhulipala, **Q. Zhu**, "Lost-packet Recovery for Multi-media Wireless Communications using Geometric Coding," *The 31th Annual Midwest Information Technology Expo & Conference (INFOTEC2004)*, SW14, April 2004.

30. P. Shi, **Q. Zhu**, E. Jones, "Median model for background subtraction in intelligent transportation system," *Proceedings of SPIE-IS&T Electronic Imaging*, SPIE Vol. 5298 (*Image Processing: Algorithms and Systems III*, edited by Edward R. Doughty, Jaakko T. Astola, Karen O. Egiazarian), pp.168-176, 18-22 January 2004.

31. **Q. Zhu**, R. A. Flanagan, J. D. Hicks, "Cellular Inference Network for Learning and Control of Multi-Agents Cooperation," *Proceedings of the IEEE Knowledge Intensive Multi-Agent Systems Conference (KIMAS'03),* Cambridge MA, USA. pp.151-156, October 2003.

32. **Q. Zhu**, J. D. Hicks, "The Topologies of Knowledge Intensive Multi-Agents Cooperation," *Proceedings of the IEEE Knowledge Intensive Multi-Agent Systems Conference (KIMAS'03),* Cambridge MA, USA, pp.741-746, October 2003.

33. J. Sun and **Q. Zhu**, "Probability Based Semantic Query Optimization," *The IEEE International Conference on Systems, Man, and Cybernetics*, MP1D5, Hammamet, Tunisia, October 6-9, 2002.

34. **Q. Zhu** and J. Sun, "Building Bayesian-Games-Theoretic Decision Support Agents," *The IEEE International Conference on Systems, Man, and Cybernetics*, TP105, Hammamet, Tunisia, October 6-9, 2002.

35. **Q. Zhu**, J. D. Hicks, "A Hierarchical Collective Agents Network for Real-time Sensor Fusion and Decision Support" *The AAAI/KDD/UAI-2002 Joint Workshop on Real-time Decision Support and Diagnosis Systems*, pp. 73-74, Edmonton, Alberta, Canada, July 2002.

36. J. D. Hicks, **Q. Zhu**, "Consolidated situational awareness for aircraft carrier decision centers," *The 2002 International Command and Control Research and Technology Symposium* (ICCRTS 2002), Monterey CA. June 2002.

37. J. D. Hicks, **Q. Zhu**, "Intelligent Agent-Based Software Architecture for Tactical Decision Aid under Overwhelming Information Inflow and Uncertainty," *The 2002 International Command and Control Research and Technology Symposium* (ICCRTS 2002), Monterey CA. June 2002.

38. X. Huang, **Q. Zhu**, "Whole Word Handwritten Numerals Recognition Using Word-pattern Statistics," Proceedings of the *2002 International Conference on Imaging Science, Systems, and Technology*, ICSST 2002, pp.180-186, Las Vegas, June 24-27, 2002.

39. P. Shi, E. Jones, **Q. Zhu**, "Adaptive Median Filter for Street Traffic Scene Background Generation – A heuristic approach," Proceedings of the *2002 International Conference on Imaging Science, Systems, and Technology*, ICSST 2002, pp. 173-179, Las Vegas, June 24-27, 2002.

40. X. Wu, **Q. Zhu**, "A Hierarchical Algorithm for Clustering Class-imbalanced Datasets," Proceedings of the *International Conference on Artificial Intelligence*, IC-AI 2002, pp. 457-463, Las Vegas, June 24-27, 2002.

41. H. Cui, **Q. Zhu**, Kajia Cao, John Chan, "Adaptive classifier integration for lymphoma gene expression pattern analysis recognition," Proceedings of the *International Conference on Artificial Intelligence*, IC-AI 2002, pp. 471-477, Las Vegas, June 24-27, 2002.

42. **Q. Zhu**, and J. Hicks, "Annotative Reasoning in AEDGE$^{TM}$ – an Agent Architecture for Decision Aid Under Uncertainty," Proceedings of the *International Conference on Artificial Intelligence*, IC-AI 2002, pp. 478-484, Las Vegas, June 24-27, 2002.

43. **Q. Zhu**, H. Cui, K. Cao, and W. C. Chan, "Cross-projection Pursuit for Identifying Genes predictive of Patient Survival from Gene Expression Profiling Data," NCI Director's Challenge Analytical Workshop, Albuquerque, New Mexico, May 14 – 17, 2002.

44. A. Dhulipala, **Q. Zhu**, H. Sharif, "Security Issues for Mobile Networks and Wireless Communications," *The 29th Annual Midwest Information Technology Expo & Conference (INFORTEC2002)*, SW18, April 2002.

45. L. Xiao, Z. Chen, **Q. Zhu**, "Finding causal patterns from frequent item sets," Proceedings of the 6th *Joint Conference on Information Systems* (JCIS2002), pp. 442-445, Research Triangle Park, North Carolina, March 8-13, 2002.

46. Y. Yan, Z. Chen, **Q. Zhu**, "An approach for query optimizing in a mobile environment," Proceedings of the 6th *Joint Conference on Information Systems* (JCIS2002), pp. 507-510, Research Triangle Park, North Carolina, March 8-13, 2002.

47. X. Zhang, Z. Chen, **Q. Zhu**, "Mining influential association rules," Proceedings of the 6th *Joint Conference on Information Systems* (JCIS2002), pp. 490-493, Research Triangle Park, North Carolina, March 8-13, 2002.

48. J. Hicks, **Q. Zhu**, "Intelligent Agent-based Software Architecture for Combat Performance under Overwhelming Information Inflow and Uncertainty," Seventh *IEEE International Conference on Engineering of Complex Computer Systems,* pp.200-210, June 2001.

49. M. Pauley, **Q. Zhu**, G. Dalrymple, *et. al.*, "Acquisition and review of diagnostic images for use in medical research and for medical testing examinations via the Internet" *Proceedings of the Internet Imaging II, the IS&T/SPIE's 13ᵗʰ International Symposium: Electronic Imaging 200*, pp.333.-340, San Jose, CA, 21 - 26 January 2001.

50. **Q. Zhu,** "Bayesian Reasoning in an Annotated Probability Space for Decision Support with Incomplete Data Set," *IPMU2000: The 8th International Conference on Information Processing and Management of Uncertainty in Knowledge-Based Systems*, pp. 827-834, Madrid, Spain, 2000.

51. **Q. Zhu**, "Eigen-Parameters in Image Identification," *Proceedings of the 2000 International Conference on Imaging Science, Systems, and Technology (CISST2000),* pp. 23-30, Las Vegas, USA, June 2000.

52. W. Sousan and **Q. Zhu**, "Invariant Shape Descriptions based on a Principle Axis Model," *Proceedings of the 2000 International Conference on Imaging Science, Systems, and Technology (CISST2000),* pp. 7-14, Las Vegas, USA, June 2000.

53. W. Sousan and **Q. Zhu**, "Image Searching and Retrieving by Invariant Shape Descriptions," *Proceedings of the 2000 International Conference on Imaging Science, Systems, and Technology (CISST2000),* pp. 15-22, Las Vegas, USA, June 2000.

54. M. Chen, **Q. Zhu,** and Z. Chen, "An Informed Interactive Query Approach for Knowledge Discovery from Heterogeneous Databases," *Proceedings of the 2000 International Conference on Artificial Intelligence (IC-AI'2000),* pp. 15-22, Las Vegas, USA, June 2000.

55. Y. Sun, **Q. Zhu**, and Z. Chen, "A Modified K-means Algorithm for Categorical Data Clustering," *Proceedings of the 2000 International Conference on Artificial Intelligence (IC-AI'2000),* pp. 31-37, Las Vegas, USA, June 2000.

56. L. Xiao, Z. Chen and **Q. Zhu**, "Storing and Querying XML Data for Bayesian Network Inferences," *Proceedings of the 2000 International Conference on Artificial Intelligence (IC-AI'2000),* pp. 7-14, Las Vegas, USA, June 2000.

57. M. Khanijo, Z. Chen and **Q. Zhu**, "Spatial Data Access Methods Using Branch-grafted R-trees," *Proceedings of 12th International Conference on Systems Research, Informatics and Cybernetics,* August 2000.

58. X. Zhang, Z. Chen and **Q. Zhu**, "Imaginary ordering R-tree," *Proceedings of 12th International Conference on Systems Research, Informatics and Cybernetics,* August 2000.

59. M. Pauley, G. Dalrymple, **Q. Zhu**, et. al., "Demonstration of the Feasibility of Using the Internet for Acquisition and Review of Diagnostic Images for Medical Examination Item Pools," *Proceedings of the First IEEE Electro/Information Technology Conference*, EIT503, Chicago, June 2000.

60. L. Xiao, Z. Chen, and **Q. Zhu**, "A Bayesian Approach to Mining Causal Relationship Patterns from Frequent Data Sets" *PADD'2000: The Fourth International Conference and Exhibition on The Practical Application of Knowledge Discovery and Data Mining*, UK, April 2000.

61. M. Chen, **Q. Zhu**, and Z. Chen, "Informed Interactive Query for Knowledge Discovery from Heterogeneous Databases," *PADD'2000: The Fourth International Conference and Exhibition on The Practical Application of Knowledge Discovery and Data Mining*, UK, April 2000.

62. **Q. Zhu**, and Z. Chen, "Mining Multiple Databases by Cross-referencing and Interactive Queries," *ICICS'99, the second International Conference on Information, Communications and Signal Processing*, Session 3D4, #4, Dec. 1999.

63. H. Sharif and **Q. Zhu**, "A New Approach for Jitter Compensation in Internet-2 Distributed Multimedia Services and Applications," *ICICS'99, the second International Conference on Information, Communications and Signal Processing*, Session 1B1, #8, Dec. 1999.

64. **Q. Zhu,** "Dempster-Shafer Reasoning in Feature Integration for Object Recognition," *International Conference on Image Science, Systems, and Technology*, pp. 600-605, 1999.

65. **Q. Zhu,** "Building an Accretive Signature Authentication System Using a RBF Network" *International Joint Conference on Neural Networks*, IJCNN'99, #739, Session 9.1B, ISBN 0-7803-5532-6, 1999.

66. S. Giri, and **Q. Zhu,** "dbAgent: An Intelligent Web Agent for Database Mining," *International Conference on Computer and Informatics (CS&I'98),* pp. 466-470, 1998.

67. **Q. Zhu,** and L. Liu "A Competitive RBF (C-RBF) Network and its Application to Signature Recognition," *International Conference on Artificial Intelligence for Engineering*, pp. 338-342, June 1998.

68. **Q. Zhu,** and Z. Chen, "Goal-driven Reasoning for Knowledge Discovery Using Belief Networks," *International Conference on Artificial Intelligence for Engineering*, pp. 231-235, June 1998.

69. **Q. Zhu,** "A Minimum Cross-Entropy Model for Integration of Highly Intermixing Data Sets," *International Conference on Artificial Intelligence for Engineering*, pp. 521-525, June 1998.

70. **Q. Zhu,** and Z. Chen, "Query Construction for User-Guided Data Mining," The Fourth World Congress on Expert Systems, *Tenth International Symposium on Artificial Intelligence*, 1998.

71. Z. Chen and **Q. Zhu,** "Exploring Agent-based Data Mining Refinement Cycle," *The Second International Conference on the Practical Application of Knowledge Discovery and Data Mining*, London, U.K., 1998.

72. **Q. Zhu,** and Z. Chen, "Knowledge Discovery from Databases with the Guidance of a Causal Network," Z. Ras and A. Skowron (eds.), *Foundations of Intelligent Systems, Lecture Notes in Artificial Intelligence 1325*, pp. 401-410, Oct. 1997.

73. Y. Weng and **Q. Zhu**, "Nonlinear Shape Restoration for Document Images," *The IEEE Conference on Computer Vision and Pattern Recognition (CVPR96)*, pp. 568-573, San Francisco, CA, June 1996.

74. V. Riordan, V., and **Q. Zhu,** "Informed Edge Linking Using a Directional Potential Function," *The SPIE's 1993, International Symposium on Optical Tools for Manufacturing and Advanced Automation*, Boston, MA, pp. 381-392, Sept., 1993.

75. Tawfik, and **Q. Zhu**, "Neural Network Prediction of Short-term Motions of Mobile Objects in Noisy Environments," *The SPIE Conference on Applications of Artificial Neural Networks IV.,* pp.183-189, April 1993.

76. **Q. Zhu**, Y. Huang, and M. Payne, "Expanded Dempster-Shafer Reasoning Technique for Image color/feature Integration and Object Recognition," *The SPIE Conference on Neural and Stochastic Methods in Image and Signal Processing (1992),* pp. 36-47, July 1992.

77. M. Payne, **Q. Zhu**, and Y. Huang, "Using the Dempster-Shafer Reasoning Model to Perform Pixel-level Segmentation on Color Images," *The SPIE Conference on Neural and Stochastic Methods in Image and Signal Processing (1992),* pp. 26-35, July 1992.

78. **Q. Zhu**, and D. Shi, "An Interactive Learning Approach for Visual Guidance of Mobile Robot," *Proceedings of the 1992 IEEE/RSJ International Conference on Intelligent Robots and Systems*, Raleigh, NC., pp. 1829-1836, July 1992.

79. **Q. Zhu**, "Quantitative Object Motion Predication By an Adaptive Resonance Theory (ART) Neural Network," *The 1992 American Control Conference*, Chicago, IL., pp. 41 - 45, June 1992.

80. **Q. Zhu**, "Improving Edge Detection by an Objective Edge Evaluation," *The 1992 ACM/SIGAPP Symposium on Applied Computing*, Kansas City, MO. pp. 459-468, March 1992.

81. Y. Liu, and **Q. Zhu**, "A Model of N-Dimensional Target Motion Prediction," *The Twenty-second Annual Pittsburgh Modeling and Simulation Conference*, Vol. 22, Part 4, pp. 2129-2134, 1991.

82. **Q. Zhu**, "A Bi-Directional Artificial Neural Network for 3D Motion Prediction," *The VISION'90 Conference* of *the Society of Manufacturing Engineers*, Detroit, MI, pp. 15.45-15.58, November 1990.

83. **Q. Zhu**, "Visual Guidance and Dynamical Obstacle Avoidance of Robot Motion," *The VISION'90 Conference* of *the Society of Manufacturing Engineers*, Detroit, MI, pp. 9.11-9.30, November 1990.

84. **Q. Zhu**, "Target Motion Prediction and Tracking by Bi-Directional Dynamic Associative Neural Network," *The IEEE International Conference on Systems Engineering***,** Pittsburgh, PA, pp. 351-354, August, 1990.

85. **Q. Zhu,** "A Stochastic Algorithm for Obstacle Motion Prediction in Visual Guidance of Robot Motion," *The IEEE International Conference on Systems Engineering***,** Pittsburgh, PA, pp. 216-219, August 1990.

86. **Q. Zhu**, D. Shi, D., and S. Tang, "Knowledge Augmentation via Interactive Learning in a Path Finder," *CAD/CAM Robotics & Factories of the Future'90*, S. Dwivedi, A. Verma, and J. Sneckenberger (Ed.), Vol. 1, pp. 148-153, Springer-Verlag, 1990.

87. **Q. Zhu**, and J. Liu, "A Theory of Collision Avoidance on Visual Guidance of Robot Motion in Dynamic Environment," *CAD/CAM Robotics & Factories of the Future'90*, S. Dwivedi, A. Verma, and J. Sneckenberger (Ed.), Vol. 2, pp. 521-526, Springer-Verlag, 1990.

88. Y. Hung, **Q. Zhu,** D. Shi, and S. Tang, "Real Time Edge Extraction by Active Defocusing," *The SPIE International Symposium on Optical & Optoelectronic Applied Science & Engineering*, San Diego, CA., July 1990.

89. S. Tang, Y. Hung, and **Q. Zhu,** "A New Phase Measurement for Non-monotonic Fringe Patterns," *The SPIE International Symposium on Optical & Optoelectronic Applied Science & Engineering*, San Diego, CA, July 1990.

90. Y. Hung, S. Tang, and **Q. Zhu**, "3-D Surface Inspection Using Interferometric Grating and 2-D FFT Based Technique," *The SPIE International Symposium on Optical & Optoelectronic Applied Science & Engineering*, San Diego, CA, July 1990.

91. Y. Hung, S. Tang, G. Jin, and **Q. Zhu**, "A Synchronous Phase Extraction Technique and its Applications," *The SPIE International Symposium on Optical & Optoelectronic Applied Science & Engineering*, San Diego, CA, July 1990.

92. **Q. Zhu,** "Unsupervised Learning in a Gaussian Functional Neural Network," *The 21 Annual Modeling and Simulation Conference***,** Pittsburgh, PA, pp.515-519, May 1990.

93. **Q. Zhu,** and M. Zhody, "A New Neuro-controller with Hybrid Learning," *The 21 Annual Modeling and Simulation Conference***,** Pittsburgh, PA, May 1990.

94. **Q. Zhu**, and N. Loh, "Modeling and Control Strategies for Dynamic Obstacle Avoidance By Mobile Robots, *The 1989 Korean Automatic Control Conference***,** Seoul, Korea, October 1989.

95. N. Loh, **Q. Zhu**, A. Chang, and L. McTamaney, "Dynamic Obstacle Avoidance for Mobile Robots," *The Second Annual Mini-Symposium on Unmanned Ground Vehicles*, Sterling Heights, MI, September 1989.

96. **Q. Zhu**, and A. Elramisi, "Classification of the Incomplete Patterns with Neural Networks," *The Twentieth Annual Pittsburgh Conference on Modeling and Simulation*, Pittsburgh, PA, pp. 1959-1963, May 1989.

97. **Q. Zhu**, "Structural Pyramids for Visual Guidance of Robot Motion," *VISION'89, the 1989 VISION Conference* of *the Society of Manufacturing Engineers*, Rosemont, IL, pp. 2.23-2.36, April 1989.

98. **Q. Zhu**, and L. Poh, "A Transformation Invariant Recursive Subdivision Method for Shape Analysis," *The 9th International Conference on Pattern Recognition*, Rome, Italy, pp. 833-835, November 1988.

99. **Q. Zhu,** "Pattern Classifications in Dynamical Environments: Tagged Feature-Class Space and Univariate Classifier," *Lecture Notes in Computer Science - Pattern Recognition*, J.Kittler (Ed.), Springer-Verlag, Cambridge, UK, pp. 517-526, 1988.

100. Elramsisi, M. Zhody, and **Q. Zhu**, "On Model-Based Image Restoration and Performance Evaluation," *The AMSE 14th Annual Conference*, Plainfield, IN, October 1988.

101. **Q. Zhu**, "An Interactive Refutation Learning Structure for Skill Acquisition in Knowledge Based CAD Systems, *The 3rd International Conference on CAD/CAM Robotics & Factories of the Future,* Southfield, MI, Vol. 2, pp. 170-174, August 1988.

102. **Q. Zhu**, "A Modular Learning Structure for Intelligent CAD Systems," *The International Conference of Computers in Engineering,* San Francisco, CA, Vol. 1, pp. 293-299, August 1988.

103. **Q. Zhu**, and H. Freeman, "Combined Spatial-sorting and Model-Reference Approach for Fast Interference Detection," *The International Conference of Computers in Engineering,* San Francisco, CA, Vol.2, pp.403-409, August 1988.

104. **Q. Zhu**, and H. Freeman, "An Intelligent CAD System for Piping System Design," *The International Conference of Computers in Engineering,*, San Francisco, CA, Vol.2, pp. 55-59, August 1988.

105. **Q. Zhu**, "Learning Gaussian-Type Threshold Function in a Statistic Neural Network," *IEEE Annual International Conference on Neural Networks*, San Diego, CA, July 1988.

106. **Q. Zhu**, "Structure Pyramids for Representing and Locating Moving Obstacles," *IEEE Conference on Computer Vision and Pattern Recognition*, Ann Arbor, MI, pp. 832-837, June 1988.

107. **Q. Zhu**, C. Liu, and N. Loh, "A Non-determinate Controller with Learning from Experiments" *The 1988 IEE Control Conference*, London, UK, pp. 420-425, April 1988.

108. **Q. Zhu**, "Self-Learning Expert Systems," *The first ESD/SMI Expert System Conference*, Dearborn, MI, pp. 129-142, June 1987.

109. **Q. Zhu**, and H. Freeman, "A Symbolic Approach to the Fast Design of Industrial Piping Systems," *The SAE/ESD International Computer Graphics Conference*, Detroit, MI, pp. 69-73, April 1987.

110. **Q. Zhu**, "An Intelligent CAD System for the Industrial Piping System Design," *The Third IEEE Conference on Artificial Intelligence Applications*, Orlando, FL, February, 1987.

## COURSES TAUGHT

Graduate Courses
1. CSCI 8910 Capstone for Master's Degree Students – **new development and offering**
2. CSCI 8080 Design and Analysis of Algorithms
3. CSCI 8110 Advanced topics in Artificial Intelligence - Neural Networks – **new development and offering**
4. CSCI 8300 Digital Image Processing and Computer Vision – **new development and offering**
5. CSCI 8456 Introduction to Artificial Intelligence
6. CSCI 8476 Pattern Recognition – **new development and offering**
7. CSCI 8626 Computer Graphics
8. CSCI 9080 Research Directions in IT – **joint new development and offering**
9. CSCI 9810 Research Foundations of Theoretical Computing – **new development and offering**
10. CIST 9900 Special Topics in IT - Semantic Web and Internet Knowledge Management – **new development and offering**
11. CSE 556 Advanced Computer Graphics
12. CSE 580 Fuzzy Sets and Expert Systems

Undergraduate Courses
1. CSCI 2030 Mathematical Foundations of Computer Science
2. CSCI 1620 Introduction to Computer Science II
3. CSCI 1840 Advanced Topics in C
4. CSCI 2730 Assembly Language Programming
5. CSCI 3320 Data Structures
6. CSCI 4220 Programming Languages
7. CSCI 4450 Introduction to Artificial Intelligence
8. CSCI 4470 Pattern Recognition – **new development and offering**

9.  CSCI 4620 Computer Graphics
10. CSE 235 Digital Logic and Microprocessors