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TimothyHavens

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EDUCATION

University of Missouri, Columbia, MO
Ph.D., Electrical and Computer Engineering, 2010
Thesis: Clustering in relational data and ontologies (advisor: Prof. James M. Keller)
Michigan Technological University, Houghton, MI
M.S., Electrical Engineering, 2000
B.S., Electrical Engineering, 1999

PROFESSIONAL EXPERIENCE

Director, Great Lakes Research Center, **Michigan Tech University**	(2022 –)
Director, Institute of Computing and Cybersystems (ICC), **Michigan Tech University**	(2018 –)
William and Gloria Jackson Professor, Computer Science, **Michigan Tech University**	(2021 –)
Director, ICC Center for Data Sciences, **Michigan Tech University**	(2016 –)
Associate Dean for Research, College of Computing, **Michigan Tech University**	(2019 – 2021)
William and Gloria Jackson Associate Professor, CS / ECE, **Michigan Tech University**	(2016 – 2021)
Director, Data Science Program, **Michigan Tech University**	(2017 – 2018)
William and Gloria Jackson Assistant Professor, ECE / CS., **Michigan Tech University**	(2012 – 2016)
NSF / CRA Computing Innovation Fellow, **Michigan State University**	(2010 – 2012)
Research Associate, Center for Geospatial Intelligence, **University of Missouri**	(2010 – 2012)
Teaching Fellow, **University of Missouri**	(2007 – 2010)
Graduate Research Assistant, **University of Missouri**	(2007 – 2010)
NSF GK-12 Graduate Fellow, **University of Missouri**	(2006 – 2007)
Associate Technical Staff, **MIT Lincoln Laboratory**	(2000 – 2005)

TEACHING EXPERIENCE

Courses taught: Introduction to Data Sciences, Probability – Signal Analysis, Data Mining, Machine Learning, Introduction to Communication Theory, Computational Intelligence, Digital Logic and Lab
Short Course: Introduction to radar and forward-looking ground penetrating radar

As a Teaching Fellow at the University of Missouri, I was instructor of the following courses:
Microcomputer Architecture and Interfacing; Computing for Embedded Systems; Signals and Linear Systems; Real-Time Embedded Systems

TEACHING AWARDS

IEEE Eta Kappa Nu, Beta Gamma Chapter, Professor of the Year	(2015)
Jackson Creative Canvas Course Contest Award	(2014)

RESEARCH FUNDING

- SCC-CIVIC-FA Track B: Helping Rural Counties to Enhance Flooding and Coastal Disaster Reslience and Adaptation ($88,105/$999,932), NSF, 2021-2022, Co-PI (PI: Thomas Oommen)
- Algorithm Performance Evaluation with Low Sample Size ($49,995), NGA, 2021-2022, PI
- Redesign and Implementation of USDS-Proxy Language – Phase II+Option ($53,091/$509,997), ARiA, 2021-2023, Co-PI (PI: Charles Wallace)
- Continuation: Machine Learning and Artificial Intelligence Using Acoustic Sensors in Connected Vehicles and Roadside Units ($150,000), Ford Motor Company, 2021-2022
- SCC-CIVIC-PG Track B: Helping Rural Counties to Enhance Flooding and Coastal Disaster Resilience and Adaptation ($4,080/$49,999), NSF, 2021, Co-PI (PI: Thomas Oommen)
- Redesign and Implementation of USDS-Proxy Language ($17,231/$76,610), ARiA, 2020, Co-PI (PI: Charles Wallace)
- Modeling and Algorithm Development for Adaptive Adversarial AI for Complex Autonomy ($428,707), US Army ERDC, 2020-2022, PI
- DURIP: Acoustic Sensing System and High-Throughput Computing for Environment and Threat Monitoring in Naval Environments Using Machine Learning ($243,169), Office of Naval Research, 2020-

2021, PI
- Machine Learning and Artificial Intelligence Using Acoustic Sensors in Connected Vehicles and Roadside Units ($149,518), Ford Motor Company, 2020-2021, PI
- Defending the Nation's Digital Frontier: Cybersecurity Training for Tomorrow's Officers ($66,377/$248,517), Office of Naval Research, 2020-2021, Co-PI (PI: Andrew Barnard)
- Duty Cycle Aggregation, Warranty Mitigation, and Fleet Prognostics using Customer Usage Data (Part II) ($199,847), Ford Motor Company, 2020-2022, PI
- Algorithms for Look-Down Infrared Target Exploitation – Phase II ($399,994), NGA, 2020-2022, PI
- Machine Learning for Human-Based Visual Detection Metrics ($120,000), Signature Research Inc., 2020-2021, PI
- Localization, Tracking, and Classification of On-Ice and Underwater Noise Sources Using Machine Learning ($299,533), Naval Undersea Warfare Center, 2019-2022, PI
- Duty Cycle Aggregation and Warranty Mitigation using Customer Usage Data ($50,000), Ford Motor Company, 2019, PI
- Algorithms for Look-Down Infrared Target Exploitation ($99,998), NGA, 2018-19, PI
- Distributed Array Processing for Aperture Level STAR ($50,000), MIT Lincoln Laboratory, 2017-18, PI
- Self-Interference Modeling in Active Phased Arrays ($15,000), MIT Lincoln Laboratory, 2017, PI
- Multistatic GPR Phase II ($100,000), Akela, Inc. / US Army SBIR, 2017-19, PI
- Multisensor Analysis and Algorithm Development for Detection and Classification of Buried and Obscured Targets ($99,779), Army Research Office, 2016-2019, PI
- Implementation of Unmanned Aerial Vehicles (UAVs) for Assessment of Transportation Infrastructure ($87,620/$598,526), Michigan DOT, 2016-2019, Co-PI (PI: Colin Brooks)
- Multistatic GPR for Explosive Hazards Detection ($49,987), Akela, Inc. / US Army SBIR, 2016-2017, PI
- Heterogeneous Multisensor Buried Target Detection Using Spatiotemporal Feature Learning ($381,200), Army Research Office, 2015-2018, PI
- Improved Service Predictions for Multifunction Printers (MFP) ($8,625), Kyocera, 2015-2016, Co-PI (PI: R. Louks)
- Spatial Coherence Imaging and Machine Learning Approach for Standoff Detection Using Forward-Looking Ground-Penetrating Radar ($386,942), US Army, 2013-2105, PI
- Advanced Signal-Processing and Detection Algorithms for Handheld Explosive Hazard Detection ($227,016/$1,238,255), US Army, 2013-2015, Co-PI (PI: Joseph Burns)
- Evaluating the Use of Unmanned Aerial Vehicles for Transportation Purposes ($71,088/$240,889), Michigan Dept. Transportation (MDOT), 2013-2014, Co-PI (PI: Colin Brooks)
- REF-RS: Preliminary Development Towards Simultaneous Localization and Mapping Using Heterogeneous Clouds of Unmanned Aerial Vehicles (UAVs) ($26,000), MTU, 2013-2014, PI
- NURail – Tier I ($299,966), USDOT-RITA, 2013-2018, Co-PI (PI: Pasi Lautala)
- NURail Center – Phase II ($45,172/$788,295), USDOT-RITA, 2012-2016, Co-PI (PI: Pasi Lautala)
- CI Fellows Project: Clustering of Large Data Sets ($267,500), NSF / CRA, 2010-2012, PI
- Synthetic Aperture Radar Signal Processing ($438,193), Leonard Wood Institute, 2010-2011, Co-PI (PI: James Keller)
- Developing Interfaces to Provide Range of Motion Feedback to Elderly People Using Exercise Equipment ($40,000), RAND/Hartford Foundation, 2007-2008, Co-I (PI: Gregory Alexander)

JOURNAL ARTICLES

S.K. Kakula, A.J. Pinar, D.T. Anderson, and T.C. Havens. Online learning of classification and regression using the Choquet integral. In preparation, *IEEE Trans. Fuzzy Systems.*

D.T. Anderson, M. Deardorff, T.C. Havens, S.K. Kakula, T. Wilkin, M.A. Islam, A.J. Pinar, and A.R. Buck. Fuzzy integral = contextual linear order statistic.

I.T. Cummings, J.P. Doane, T.J. Schulz, and T.C. Havens. Adaptive beamforming and mutual coupling

estimation techniques for aperture-level simultaneous transmit and receive phased arrays. In review, *IEEE Trans. Wireless Communications*.

I.T. Cummings, T.J. Schulz, J.P. Doane, and T.C. Havens. Narrowband direction-of-arrival estimation with aperture-level simultaneous transmit and receive digital phased arrays. In review, *IEEE Trans. Signal Processing*.

1. S.K. Kakula, A.J. Pinar, M.A. Islam, D.T. Anderson, and T.C. Havens (Oct, 2021). Novel regularization for learning the fuzzy Choquet integral with limited training data. *IEEE Trans. Fuzzy Systems, 29*(1), 2890-2901.
2. M.A. Islam, D.T. Anderson, T.C. Havens, and J. Ball (Sept, 2021). A generalized fuzzy extension principle and its application to information fusion. *IEEE Trans. Fuzzy Systems, 25*(9), 2726-2738.
3. S. Yazdanparast, T.C. Havens, and M. Jamalabdollahi. Linear time community detection by a novel modularity gain acceleration in label propagation. Accepted, *IEEE Trans. Big Data*.
4. B. Murray, M.A. Islam, A. Pinar, D.T. Anderson, G. Scott, T.C. Havens, and J.M. Keller (Aug, 2021). Explainable AI for the Choquet integral. *IEEE Trans. Emerging Topics Comp. Intell, 5*(4), 520-529.
5. S.J. Whitaker, A. Barnard, G.D. Anderson, and T.C. Havens (July, 2021). Recurrent networks for DOA identification of anthropogenic acoustic sources in a shallow water channel using a vector sensor. *J. Acoustical Society of America, 150*(1), 111-119.
6. S. Yazdanparast, T.C. Havens, and M. Jamalabdollahi (June, 2021). Soft overlapping community detection in large-scale networks via fast fuzzy modularity maximization. *IEEE Trans. Fuzzy Systems, 29*(6), 1533-1543.
7. S. Kabir, C. Wagner, T.C. Havens, and D.T. Anderson (Nov, 2020). A similarity measure based on bidirectional subsethood for intervals. *IEEE Trans. Fuzzy Systems, 28*(11), 2890-2904.
8. M.A. Islam, D.T. Anderson, A. Pinar, T.C. Havens, G. Scott, and J.M. Keller (July, 2020). Enabling explainable fusion in deep learning with fuzzy integral neural networks. *IEEE Trans. Fuzzy Systems, 28*(7), 1291-1300.
9. I.T. Cummings, T.J. Schulz, J.P. Doane, and T.C. Havens (Dec, 2020). Aperture-level simultaneous transmit and receive with digital phased arrays. *IEEE Trans. Signal Processing, 68*(1), 1243-1258.
10. J. Bialas, T. Oommen, and T.C. Havens (Oct, 2019). Optimal segmentation for building class in high spatial resolution images using random forests. *Int. J. App. Earth Obs. Geoinf. 82*, 101895.
11. C.D. Demars, M.C. Roggemann, A.J. Webb, and T.C. Havens. (Oct, 2018) Target localization and tracking by fusing Doppler differentials from cellular emanations with a multi-spectral video tracker. *Sensors, 18*(11), 3687.
12. A.J. Webb, T.C. Havens, and T.J. Schulz (Sept, 2018). Fast image reconstruction in forward looking GPR using dual l1 regularization. *IEEE Trans. Computational Imaging, 4*(3), 470-478.
13. M.A. Islam, D.T. Anderson, A.J. Pinar, and T.C. Havens (Aug, 2018). Data-driven compression and efficient learning of the Choquet integral. *IEEE Trans. Fuzzy Systems, 26*(4), 1908-1922.
14. H. Deilamsalehy and T.C. Havens (Apr, 2018). Fuzzy adaptive extended Kalman filter for robust 3D pose estimation. *Int. J. Intelligent Unmanned Systems*, *6*(2), 50-68.
15. H.I. Sweidan and T.C. Havens (Apr, 2018). Sensor relocation for improved target tracking. *IET Wireless Sensor Systems, 8*(2), 76-86.
16. A.J. Pinar, J. Rice, L. Hu, D.T. Anderson, and T.C. Havens (Dec, 2017). Efficient multiple kernel classification using feature and decision level fusion. *IEEE Trans. Fuzzy Systems, 25*(6), 1403-1416. CIS Publication Spotlight
17. A.J. Pinar, D.T. Anderson, A. Zare, T.C. Havens, and T. Adeyeba (2017). Measures of the shapley index for learning lower complexity fuzzy integrals. *Granular Computing, 2*(4), 303-319.
18. J. Frank, U. Rebbapragada, J. Bialas, T. Oommen, and T.C. Havens (2017). Effect of label noise on the machine-learned classification of earthquake damage. *Remote Sensing, 9*(8), 803.
19. H. Deilamsalehy, T.C. Havens, P. Lautala, E. Medici, and J. Davis (2017). An automatic train car wheel flat spot detection method using thermal camera imagery. *J. Rail and Rapid Transit, 231*(6), 690-700. Editor's Choice Selection
20. H. Deilamsalehy, T.C. Havens, J. Manela (2017). Heterogeneous multi-sensor fusion for mobile platform 3D pose estimation. *J. Dynamic Systems, Measurement, and Control, 139*(7), 071002.

21. S. Yazdanparast and T.C. Havens (2017). Modularity maximization using completely positive programming. *Physica A: Statistical Mechanics and its Applications, 471*(1), 20-32.
22. D.T. Anderson, P. Elmore, F. Petry, and T.C. Havens (2016). Fuzzy Choquet integration of homogeneous possibility and probability distributions. *Information Sciences, 363*, 24-39.
23. S. Nuchitprasitchai, M. Roggemann, and T.C. Havens (2016). An algorithm for reconstructing three dimensional images from overlapping two dimensional intensity measurements with relaxed camera positioning requirements. *Int. J. Modern Engineering Research, 6*(9), 69-81.
24. C. Demars, M. Roggemann, and T.C. Havens (2015), Multi-spectral detection and tracking of multiple moving targets in cluttered urban environments. *Optical Engineering, 54*(12), 123106.
25. D. Kumar, J.C. Bezdek, M. Palaniswami, S. Rajasegarar, C. Leckie, and T.C. Havens (2016). A hybrid approach to clustering in big data. *IEEE Trans. Systems, Man, and Cybernetics, 46*(10), 2372-2385.
26. T.C. Havens, D.T. Anderson, and C. Wagner (2015). Data-informed fuzzy measures for fuzzy integration of intervals and fuzzy numbers. *IEEE Trans. Fuzzy Systems*, *23*(5), 1861-1875.
27. J. Su and T.C. Havens (2015). Quadratic program-based modularity maximization for fuzzy community detection in social networks. *IEEE Trans. Fuzzy Systems*, *23*(5), 1356-1371.
28. A.J. Pinar, B. Wijnen, G.C. Anzalone, T.C. Havens, P.G. Sanders, and J.M. Pearce (2015). Low-cost open-source voltage and current monitor for gas metal arc weld 3-D printing. *J. Sensors 2015*, paper ID 876714, 8 pages.
29. C. Wagner, S. Miller, J.M. Garibaldi, D.T. Anderson, and T.C. Havens (2015). From interval-valued data to general type-2 fuzzy sets. *IEEE Trans. Fuzzy Systems 23*(2), 248-269.
30. M. Moshtaghi, J.C. Bezdek, T.C. Havens, C. Leckie, S. Karunasekera, S. Rajasegarar, and M. Palaniswami (2014). Streaming analysis in wireless sensor networks. *Wireless Communications and Mobile Computing, 14*(9), 905-921.
31. D.T. Anderson, T.C. Havens, C. Wagner, J.M. Keller, M.F. Anderson, and D.J. Wescott. Extension of the fuzzy integral for general fuzzy set-valued information (2014). *IEEE Trans. Fuzzy Systems, 22*(6), 1625-1639.
32. S. Rajasegarar, T.C. Havens, S. Karunasekera, C. Leckie, J.C. Bezdek, M. Jamriska, A. Gunatilaka, A. Skvortsov, and M. Palaniswami (2014). High resolution monitoring of atmospheric pollutants using a system of low-cost sensors. *IEEE Trans. Geoscience and Remote Sensing 52*(7), 3823-3832.
33. T.C. Havens, J.C. Bezdek, C. Leckie, K. Ramamohanarao, and M. Palaniswami (2013). A soft modularity function for detecting fuzzy communities in social networks. *IEEE Trans. Fuzzy Systems 21*(6), 1170-1175.
34. M. Popescu, J.C. Bezdek, T.C. Havens, and J.M. Keller (2012). A cluster validity framework based on induced partition dissimilarity. *IEEE Trans. Cybernetics, 43*(1), 308-320.
35. T.C. Havens, J.C. Bezdek, C. Leckie, L.O. Hall, and M. Palaniswami (2012). Fuzzy c-means algorithms for very large data. *IEEE Trans. Fuzzy Systems, 20*(6), 1130-1146. CIS Publication Spotlight
36. T.C. Havens and J.C. Bezdek (2012). A new formulation of the coVAT algorithm for visual assessment of clustering tendency in rectangular data. *Int. J. Intelligent Systems, 27*(6), 590-212.
37. T.C. Havens and J.C. Bezdek (2012). An efficient formulation of the improved visual assessment of tendency (iVAT) algorithm. *IEEE Trans. Knowledge and Data Engineering, 24*(5), 813-822.
38. J.C. Bezdek, S. Rajasegarar, M. Moshtaghi, C. Leckie, M. Palaniswami, and T.C. Havens (2011). Anomaly detection in environmental monitoring networks. *Computational Intelligence Magazine, 6*(2), 52-58.
39. M. Moshtaghi, T.C. Havens, J.C. Bezdek, L. Park, C. Leckie, S. Rajasegarar, J.M. Keller, and M. Palaniswami (2011). Clustering ellipses for anomaly detection. *Pattern Recognition*, *44*(1), 55-69.
40. I.J. Sledge, T.C. Havens, J.C. Bezdek, and J.M. Keller (2010). Relational duals of cluster validity functions for the c-means family. *IEEE Trans. Fuzzy Systems*, *18*(6), 1160-1170. CIS Publication Spotlight
41. I.J. Sledge, J.C. Bezdek, T.C. Havens, and J.M. Keller (2010). Relational generalizations of validity indexes. *IEEE Trans. Fuzzy Systems, 18*(4), 771-786.
42. T.C. Havens, J.M. Keller, and M. Popescu (2010). Computing with words with the ontological self organizing map. *IEEE Trans. Fuzzy Systems, 18*(3), 473-485.
43. T.C. Havens, G.L. Alexander, C. Abbott, J.M. Keller, M. Skubic, and M. Rantz (2010). Tracking exercise motions of older adults using contours. *J. Applied Computer Science Methods, 1*(2), 21-42.
44. G.L. Alexander, T.C. Havens, M. Rantz, J.M. Keller, and C.C. Abbott (2010). An analysis of human

motion detection systems use during elder exercise routines. *Western J. of Nursing Research, 32*(2), 233-249. MNRS Best Paper Award

45. T.C. Havens, J.C. Bezdek, J.M. Keller, M. Popescu, and J.M. Huband (2009). Is VAT really single linkage in disguise? *Ann. Mathematics and Artificial Intelligence, 55*(3), 237-251.
46. I.J. Sledge, T.C. Havens, J.M. Huband, J.C. Bezdek, and J.M. Keller (2009). Finding the number of clusters in ordered dissimilarities. *Soft Computing, 13*(12), 1125-1142.
47. T.C. Havens, J.C. Bezdek, J.M. Keller, and M. Popescu (2009). Clustering in ordered dissimilarity data. *Int. J. Intelligent Systems*, *24*(5), 504-528.
48. J.T. Beyer, M.C. Roggemann, L.J. Otten, T.J. Schulz, T.C. Havens, and W.W. Brown (2003). Experimental estimation of the spatial statistics of turbulence-induced index of refraction fluctuations in the upper atmosphere. *Applied Optics*, *42*, 908-921.
49. T.C. Havens, M.C. Roggemann, T.J. Schulz, W.W. Brown, J.T. Beyer, and L.J. Otten (2002). Measurement and data-processing approach for detecting anisotropic spatial statistics of turbulence-induced index of refraction fluctuations in the upper atmosphere. *Applied Optics 41*, 2800-2808.
50. W.W. Brown, M.C. Roggemann, T.J. Schulz, T.C. Havens, J.T. Beyer, and L.J. Otten (2001). Measurement and data-processing approach for estimating the spatial statistics of turbulence-induced index of refraction fluctuations in the upper atmosphere. *Applied Optics*, *40*, 1863-1871.

CONFERENCE PAPERS

51. Y. Wang, T.C. Havens, and A. Barnard (Dec, 2021). Environment sound classification (ESC) with Choquet integral fusion. *Symp. Ser. Comp. Intell.*
52. E. Hedayati, T.C. Havens, and J.P Bos (July, 2021). Light field compression by residual CNN-assisted JPEG. *Int J. Conf. Neural Networks.*
53. S.J. Whitaker, Z. Dekraker, A. Barnard, T.C. Havens, G.D. Anderson II (July, 2021). Uncertain inference using ordinal classification in deep networks for acoustic localization. *Int. J. Conf. Neural Networks.*
54. B. Murray, D.T. Anderson, T.C. Havens (July, 2021). Actionable XAI for the fuzzy integral. *IEEE Int. Conf. Fuzzy Systems.*
55. M. Deardorff, D.T. Anderson, T.C. Havens, B. Murray, S.K. Kakula, and T. Wilkin (July, 2021). Earth mover's distance as a similarity measure for linear order statistics and fuzzy integrals. *IEEE Int. Conf. Fuzzy Systems.*
56. S.K. Kakula, A.J. Pinar, T.C. Havens, and D.T. Anderson (July, 2021). Online sequential learning of fuzzy measures for Choquet integral fusion. *IEEE Int. Conf. Fuzzy Systems.*
57. N. Hamilton, A. Webb, Z. Dekraker, B. Hendrickson, M. Blanck, E. Nelson, W. Roemer, and T.C. Havens (Apr, 2021). Augmentation methods for object detection in overhead imagery. *SPIE DSS, 11729,* 1172901.
58. A.J Pinar, A.J. Webb, J.L. Brown, T.C. Havens, B. Alvey, G.N. DeSouza, D.T. Anderson, and S.R. Price (Apr, 2021). Effects of perturbed depth sensors in autonomous ground vehicles. *SPIE DSS, 11746,* 117461F.
59. S.K. Kakula, A.J. Pinar, T.C. Havens, and D.T. Anderson (Dec, 2020). Visualization and analysis tools for explainable Choquet integral regression. *IEEE Symp. Ser. Comp. Intell.*
60. S.K. Kakula, A.J. Pinar, D.T. Anderson, and T.C. Havens (Oct., 2020). Online learning of the fuzzy Choquet integral. *IEEE Int. Conf. Systems, Man, and Cybernetics.*
61. S.K. Kakula, A.J. Pinar, T.C. Havens, and D.T. Anderson (July, 2020). Extended linear order statistic (ELOS) aggregation and regression. *IEEE Int. Conf. Fuzzy Systems.*
62. A. Wilbik, T.C. Havens, and T. Wilkin (July, 2020). On a paradox of extended linguistic summaries. *IEEE Int. Conf. Fuzzy Systems.*
63. S.K. Kakula, A.J. Pinar, T.C. Havens, and D.T. Anderson (July, 2020). Choquet integral ridge regression. *IEEE Int. Conf. Fuzzy Systems.*
64. B.J. Murray, D.T. Anderson, T.C. Havens, T. Wilkin, and A. Wilbik (June, 2020). Information fusion-2-text: explainable aggregation via linguistic protoforms. *Int. Conf. Info. Process. and Management of Uncertainty, 1239, 114-127.*
65. T.C. Havens and D.T. Anderson (June, 2019). Machine learning of Choquet integral regression with respect to a bounded capacity (or non-monotonic fuzzy measure). *IEEE Int. Conf. Fuzzy Systems.*

66. C. Veal, A. Yang, A. Hurt, M. Islam, D.T. Anderson, G. Scott, T.C. Havens, J.M. Keller and B. Tang (June, 2019). Linear order statistic neuron. *IEEE Int. Conf. Fuzzy Systems*.
67. B. Murray, M. Islam, A.J. Pinar, D.T. Anderson, G. Scott, T.C. Havens, F. Petry and P. Elmore (June, 2019). Transfer learning for the Choquet integral. *IEEE Int. Conf. Fuzzy Systems*.
68. S. Kabir, C. Wagner, T.C. Havens and D.T. Anderson (June, 2019). Measuring similarity between discontinuous intervals – challenges and solutions. *IEEE Int. Conf. Fuzzy Systems*.
69. I.T. Cummings, T.J. Schulz, J.P. Doane, S.A. Zekavat, and T.C. Havens (Oct, 2018). Information-theoretic optimization of full-duplex communication between digital phased arrays. *Allerton Conf. Comm., Control, and Comp.,* 373-377.
70. T.C. Havens, A.J. Pinar, D.T. Anderson, and C. Wagner (July, 2018). SPFI: shape-preserving Choquet fuzzy integral for non-normal fuzzy set-valued evidence. *IEEE Int. Conf. Fuzzy Systems*.
71. B. Murray, M. Aminul Islam, A.J. Pinar, T.C. Havens, D.T. Anderson, and G. Scott (July, 2018). Explainable AI for understanding decision and data-driven optimization of the Choquet integral. *IEEE Int. Conf. Fuzzy Systems*. Best Student Paper Award Finalist
72. S. Kabir, C. Wagner, T.C. Havens, and D.T. Anderson (July, 2018). A bi-directional subsethood based similarity measure for fuzzy sets. *IEEE Int. Conf. Fuzzy Systems*.
73. I.T. Cummings, T.J. Schulz, J.P. Doane, and T.C. Havens (July, 2018). Optimizing the information-theoretic partitioning of simultaneous transmit and receive phased arrays. *IEEE Int. Symp. Antennas and Propagation*.
74. U. Ahrawal, A.J. Pinar, C. Wagner, T.C. Havens, D. Soria, and J. Garibaldi (June, 2018). Comparison of fuzzy integral-fuzzy measure based ensemble algorithms with state-of-the-art ensemble algorithms. *Int. Conf. Info. Process. and Management of Uncertainty*, 329-341.
75. M.A. Islam, D.T. Anderson, X. Du, T.C. Havens, and C. Wagner (June, 2018). Efficient binary fuzzy measure representation and Choquet integral learning. *Int. Conf. Info. Process. and Management of Uncertainty*, 115-126.
76. I.T. Cummings, T.J. Schulz, J.P. Doane, and T.C. Havens (April, 2018). An information-theoretic approach to partitioning simultaneous transmit and receive digital phased arrays. *IEEE Radar Conf.*
77. T.C. Havens and A.J. Pinar (2017). Generating random fuzzy (capacity) measures for data fusion simulations. *IEEE Symp. Series Comp. Intell.*
78. A.J. Pinar, T.C. Havens, D.T. Anderson, and M.A. Islam (2017). Visualization and learning of the Choquet integral with limited training data. *IEEE Int. Conf. Fuzzy Systems*.
79. C. Wagner, T.C. Havens, and D.T. Anderson (2017). The arithmetic recursive average as an instance of the recursive weighted power mean. *IEEE Int. Conf. Fuzzy Systems*.
80. S. Kabir, C. Wagner, U. Aickelin, D.T. Anderson, and T.C. Havens (2017). Novel similarity measure for interval-valued data based on their overlapping ratio. *IEEE Int. Conf. Fuzzy Systems*.
81. T.C. Havens, C. Wagner, and D.T. Anderson (2017). Efficient modeling and representation of agreement in interval-valued data. *IEEE Int. Conf. Fuzzy Systems*.
82. A.J. Pinar, T.C. Havens, and A. Webb (2017). Multisensor fusion of FLGPR and thermal and visible-spectrum cameras for standoff detection of buried objects. *Proc. SPIE DSS, 10182,* 101821A.
83. A. Webb, T.C. Havens, and T.J. Schulz (2017). GPR imaging with mutual intensity. *Proc. SPIE DSS, 10182,* 101821B.
84. H. Deilamsalehy, T.C. Havens, and P. Lautala (2017). Sensor fusion of wayside visible and thermal imagery for rail car wheel and bearing damage detection. *Proc. Joint Rail Conference,* no. JRC2017-2284.
85. A.J. Pinar, J. Rice, T.C. Havens, M. Masarik, J. Burns, and D.T. Anderson (2016). Explosive hazard detection with feature and decision level fusion, multiple kernel learning, and fuzzy integrals. *IEEE CISDA*. doi:10.1109/SSCI.2016.7850069
86. H. Deilamsalehy and T.C. Havens (2016). Sensor-fused three-dimensional localization using IMU, camera and lidar. *IEEE SENSORS,* 1-3.
87. A. Webb, T.C. Havens, and T.J. Schulz (2016). Iterative image formation for forward looking GPR. *MSS Battlefield, Survivability, and Discrimination*.
88. H. Sweidan and T.C. Havens (2016). Coverage optimization in a terrain-aware wireless sensor network. *IEEE Cong. Evolutionary Computation,* 3687-3694.

89. J. Manela and T.C. Havens (2016). Histogram particle swarm optimization (HistPSO): evolving non-parametric acceleration distributions. *IEEE Cong. Evolutionary Computation,* 2071-2076.
90. L. Tomlin, D.T. Anderson, C. Wagner, T.C. Havens, and J.M. Keller (2016). Fuzzy integral for rule aggregation in fuzzy inference systems. *Int. Conf. Info. Proc. and Management of Uncertainty*, 78-90.
91. H. Deilamsalehy, T.C. Havens, and P. Lautala (2016). Detection of sliding wheels and hot bearings using wayside thermal cameras. *Proc. Joint Rail Conference,* no. JRC2016-5711.
92. A. Pinar, T.C. Havens, J. Rice, M. Masarik, J. Burns, and B. Thelen (2016). A comparison of robust principal component analysis techniques for buried object detection in downward looking GPR and EMI sensor data. *Proc. SPIE DSS, 9823,* 98230T.
93. J. Rice, A. Pinar, T.C. Havens, and T.J. Schulz (2016). Spatiotemporal features for buried hazard detection. *Proc. SPIE DSS, 9823,* 98231N.
94. A. Webb, T.C. Havens, and T.J. Schulz (2016). Spectral diversity for ground clutter mitigation in forward-looking GPR. *Proc. SPIE DSS, 9823,* 98231M.
95. M.P. Masarik, J. Burns, B.T. Thelen, J. Kelly, and T.C. Havens (2016). Enhanced buried UXO detection via GPR/EMI data fusion. *Proc. SPIE DSS, 9823,* 98230R.
96. S.R. Price, B. Murray, L. Hu, D.T. Anderson, T.C. Havens, R.H. Luke, and J.M. Keller (2016). Multiple kernel based feature and decision level fusion of iECO individuals for explosive hazard detection in FLIR imagery. *Proc. SPIE DSS, 9823,* 98231G.
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98. M.A. Islam, D.T. Anderson, and T.C. Havens (2015). Multi-criteria based learning of the Choquet integral using goal programming. *Proc. NAFIPS*, 1-6.
99. T. Adeyeba, D.T. Anderson, and T.C. Havens (2015). Insights and characterizations of l1-norm based sparsity learning of a lexicographically encoded capacity vector for the Choquet integral. *Proc. IEEE Int. Conf. Fuzzy Systems,* 1-7.
100. A. Pinar, T.C. Havens, D.T. Anderson, and L. Hu (2015). Feature and decision level fusion using multiple kernel learning and fuzzy integrals. *Proc. IEEE Int. Conf. Fuzzy Systems*, 1-7.
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102. S.R. Price, D.T. Anderson, and T.C. Havens (2015). Fusion of iECO image descriptors for buried explosive hazard detection in forward-looking infrared imagery. *Proc. SPIE, 9454*, 945405.
103. J. Becker, T.C. Havens, A. Pinar, and T.J. Schulz (2015). Deep belief networks for false alarm rejection in forward-looking ground-penetrating radar. *Proc. SPIE, 9454*, 94540W.
104. M.P. Masarik, J. Burns, B.T. Thelen, and T.C. Havens (2015). GPR anomaly detection with robust principal component analysis. *Proc. SPIE, 9454*, 945414.
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108. C.N. Brooks, R.J. Dobson, D.B. Dean, T. Oommen, T.C. Havens, T.M. Ahlborn, S.J. Cook, and A. Clover (2014). Evaluating the use of unmanned aerial vehicles for transportation purposes: a Michigan demonstration. *21st World Congress: Intelligent Transportation Systems.*
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112. V. Navale and T.C. Havens (2014). Fuzzy logic controller for energy management of power split hybrid electric vehicle transmission. *IEEE Int. Conf. Fuzzy Systems*, 940-947.
113. J. Su and T.C. Havens (2014). Fuzzy community detection in social networks using a genetic algorithm. *IEEE Int. Conf. Fuzzy Systems,* 2039-2046.
114. T.C. Havens, J. Becker, A. Pinar, and T.J. Schulz (2014). Multi-band sensor-fused explosive hazard detection in forward-looking ground-penetrating radar. *Proc. SPIE, 9072,* 90720T.
115. S. Price, D.T. Anderson, C. Wagner, T.C. Havens, and J.M. Keller (2014). Indices for introspection of the Choquet integral. *Studies in Fuzziness and Soft Computing, vol. 312: Proc. World Conf. Soft Computing,* 261-271.
116. J. Su and T.C. Havens (2014). A generalized fuzzy t-norm formulation of fuzzy modularity for community detection in social networks. *Studies in Fuzziness and Soft Computing, vol. 312: Proc. World Conf. Soft Computing,* 65-76.
117. Z. Zhang and T.C. Havens (2013). Scalable approximation of kernel fuzzy c-means. *Proc. IEEE Int. Conf. Big Data,* 161-168.
118. D. Kumar, M. Palaniswami, S. Rajasegarar, C. Leckie, J.C. Bezdek, and T.C. Havens (2013). clusiVAT: a mixed visual/numerical clustering algorithm for big data. *Proc. IEEE Int. Conf. Big Data,* 112-117.
119. C. Wagner, D.T. Anderson, and T.C. Havens. Generalization of the fuzzy integral for discontinuous interval- and non-convex interval fuzzy set-valued inputs (2013). *Proc. IEEE Int. Conf. Fuzzy Systems,* 1-8.
120. L. Hu, D.T. Anderson, and T.C. Havens (2013). Multiple kernel aggregation using fuzzy integrals. *Proc. IEEE Int. Conf. Fuzzy Systems*, 1-7.
121. T.C. Havens, D.T. Anderson, C. Wagner, H. Deilamsalehy, and D. Wonnacott (2013). Fuzzy integrals of intervals using a measure of generalized accord. *Proc. IEEE Int. Conf. Fuzzy Systems*, 1-8.
122. T.C. Havens, J.C. Bezdek, C. Leckie, and M. Palaniswami (2013). Extension of iVAT to asymmetric matrices. *Proc. IEEE Int. Conf. Fuzzy Systems*, 1-6.
123. T.C. Havens, J.C. Bezdek, C. Leckie, J. Chan, W. Liu, J. Bailey, K. Romamohanarao, and M. Palaniswami (2013). Clustering and visualization of fuzzy communities in social networks. *Proc. IEEE Int. Conf. Fuzzy Systems,* 1-7.
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125. T.C. Havens (2012). Approximation of kernel k-means for streaming data. *Proc. Int. Conf. Pattern Recognition,* 509-512.
126. T.C. Havens, J.C. Bezdek, and M. Palaniswami (2012). Cluster validity for kernel fuzzy clustering. *Proc. IEEE Int. Conf. Fuzzy Systems*, 1-8. Best Paper Award Finalist
127. D.T. Anderson, T.C. Havens, C. Wagner, J.M. Keller, M. Anderson, and D. Wescott (2012). Sugeno fuzzy integral generalizations for sub-normal fuzzy set-valued inputs. *Proc. IEEE Int. Conf. Fuzzy Systems*, 1-8. Best Paper Award
128. S. Rajasegarar, J.C. Bezdek, M. Moshtaghi, C. Leckie, T.C. Havens, and M. Palaniswami (2012). Measures for clustering and anomaly detection in sets of higher dimensional ellipsoids. *IEEE Int. Joint Conf. Neural Networks*, 1-8.
129. T.C. Havens, J.M. Keller, K. Stone, K.C. Ho, T.T. Ton, D.C. Wong, and M. Soumekh (2012). Multiple kernel learning for explosive hazards detection in forward-looking ground-penetrating radar. *Proc. SPIE, 8357*, 83571D.
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131. M. Popescu, J.M. Keller, J.C. Bezdek, and T.C. Havens (2011). Correlation cluster validity. *IEEE Int. Conf. Systems, Man, Cybernetics*, 2531-2536. IEEE Franklin V. Taylor Memorial Best Paper Award
132. R. Chitta, R. Jin, T.C. Havens, and A.K. Jain (2011). Approximate kernel k-means: solution to large scale kernel clustering. *Proc. ACM SIGKDD Conf. Knowledge Discovery and Data Mining*, 895-903.
133. T.C. Havens, R. Chitta, A.K. Jain, and R. Jin (2011). Speedup of fuzzy and possibilistic c-means for

large-scale clustering. *Proc. IEEE Int. Conf. Fuzzy Systems*, 463-470.

134. T.C. Havens, J.M. Keller, K.C. Ho, T.T. Ton, D.C. Wong, and M. Soumekh (2011). Narrow band processing and fusion approach for explosive hazard detection in FLGPR. *Proc. SPIE, 8017*(1), 80171F.
135. J. Farrell, T.C. Havens, K.C. Ho, J.M. Keller, T.T. Ton, D.C. Wong, and M. Soumekh (2011). Detection of explosive hazards using spectrum features from forward-looking ground penetrating radar imagery. *Proc. SPIE, 8017*(1), 80171E.
136. T.C. Havens, D.T. Anderson, and J.M. Keller (2010). A fuzzy Choquet integral with an interval type-2 fuzzy number-valued integrand. *Proc. IEEE Int. Conf. Fuzzy Systems*, 1-8.
137. J.C. Bezdek, T.C. Havens, J.M. Keller, C.A. Leckie, L. Park, and M. Palaniswami (2010). Clustering elliptical anomalies in sensor networks. *Proc. IEEE Int. Conf. Fuzzy Systems*, 1-8.
138. I.J. Sledge, T.C. Havens, J.C. Bezdek, and J.M. Keller (2010). Relational cluster validity. *Proc. IEEE Int. Conf. Fuzzy Systems*, 1-9.
139. I.J. Sledge, J.C. Bezdek, T.C. Havens, and J.M. Keller (2010). A relational dual of the fuzzy possibilistic c-means algorithm. *Proc. IEEE Int. Conf. Fuzzy Systems*, 1-9.
140. D.T. Anderson, J.M. Keller, and T.C. Havens (2010). Learning fuzzy-valued fuzzy measures for the fuzzy-valued Sugeno fuzzy integral. *Proc. Int. Conf. Information Processing and Management of Uncertainty in Knowledge-Based Systems, 6178*, 502-511.
141. T.C. Havens, J.C. Bezdek, and J.M. Keller (2010). A new implementation of the co-VAT algorithm for visual assessment of clusters in rectangular relational data. *Artificial Intelligence and Soft Computing*, Part I, 363-371.
142. T.C. Havens, C.J. Spain, K.C. Ho, J.M. Keller, T.T. Ton, D.C. Wong, and M. Soumekh (2010). Improved detection and false alarm rejection using ground-penetrating radar and color imagery in a forward-looking system. *Proc. SPIE, 7664*(1), 76641U.
143. T.C. Havens, K.C. Ho, J. Farrell, J.M. Keller, M. Popescu, T.T. Ton, D.C. Wong, and M. Soumekh (2010). Locally adaptive detection algorithm for forward-looking ground-penetrating radar. *Proc. SPIE, 7664*(1), 76642E.
144. M. Popescu, K. Stone, T.C. Havens, K.C. Ho, and J.M. Keller (2010). Anomaly detection in forward-looking infrared imaging using one class classifiers. *Proc. SPIE, 7664*(1), 76642B.
145. K. Stone, J.M. Keller, M. Popescu, T.C. Havens, and K.C. Ho (2010). Forward-looking anomaly detection via fusion of infrared and color imagery. *Proc. SPIE, 7664*(1), 766425.
146. T.C. Havens, J.M. Keller, G.L. Alexander, M. Skubic, and M. Rantz (2009). Fuzzy contour tracking of human silhouettes. *Proc. IEEE Int. Conf. Fuzzy Systems*, 951-956.
147. T.C. Havens, K. Stone, J.M. Keller, and K.C. Ho (2009). Sensor-fused detection of explosive hazards. *Proc. SPIE*, *7303*(1), 73032A.
148. T.C. Havens, G.L. Alexander, C. Abbott, J.M. Keller, M. Skubic, and M. Rantz (2009). Contour tracking of human exercises. *Proc. IEEE Workshop on Computational Intelligence and Computer Vision*, 22-28.
149. T.C. Havens, J.C. Bezdek, J.M. Keller, and M. Popescu (2008). Dunn's cluster validity index as a contrast measure of VAT images. *Proc. Int. Conf. Pattern Recognition*, 1-4.
150. I.J. Sledge, J.M. Keller, T.C. Havens, G.L. Alexander, and M. Skubic (2008). Temporal activity analysis. *Proc. AAAI Symposium on AI in Eldercare,* 101-108.
151. T.C. Havens, C.J. Spain, N.G. Salmon, and J.M. Keller (2008). Roach infestation optimization. *Proc. IEEE Swarm Intelligence Symposium*, 1-7.
152. T.C. Havens, J.M. Keller, M. Popescu, and J.C. Bezdek (2008). Ontological self-organizing maps for cluster visualization and functional summarization of gene products using Gene Ontology similarity measures. *Proc. IEEE Int. Conf. Fuzzy Systems*, 104-109.
153. M. Popescu, J.C. Bezdek, J.M. Keller, T.C. Havens, and J.M. Huband (2008). A new cluster validity measure for bioinformatics relational datasets. *Proc. IEEE Int. Conf. Fuzzy Systems*, 726-731.
154. T.C. Havens, J.M. Keller, E. MacNeal Rehrig, H.M. Appel, M. Popescu, J.C. Schultz, and J.C. Bezdek (2008). Fuzzy cluster analysis of bioinformatics data composed of microarray expression data and Gene Ontology annotations. *Proc. North American Fuzzy Information Processing Society*, 1-6.

BOOK CHAPTERS

155. T.C. Havens, D.T. Anderson, K. Stone, J. Becker, and A.J. Pinar (2016). Computational Intelligence in

Forward Looking Explosive Hazard Detection. In R. Abielmona et al. (Eds.), *Recent Advances in Computational Intelligence in Defense and Security* (pp. 13-44). Berlin: Springer.

156. T.C. Havens, J.C. Bezdek, and M. Palaniswami (2012). Incremental Kernel Fuzzy c-Means. In V. Pedrosa (Ed.), *Computational Intelligence: Revised and Selected Papers from IJCCI 2010* (pp. 3-18). Berlin: Springer.
157. M. Popescu, T.C. Havens, J.M. Keller, and J.C. Bezdek (2009). Clustering with Ontologies. In M. Popescu and D. Xu (Eds.), *Data Mining in Biomedicine Using Ontologies* (pp. 45-62). Boston, MA: Artech House.

INVITED TALKS

Explainable deep fusion, *ISR-2 Seminar Series: Advancing Toward Modern Detection and Estimation Theory*, Los Alamos National Laboratory	(July, 2020)
Introduction to Deep Learning, *GSG Programming Seminar Series*, Michigan Tech Graduate Student Government	(July, 2020)
Introduction to Machine Learning with Python, *GSG Programming Seminar Series*, Michigan Tech Graduate Student Government	(July, 2020)
Explainable deep fusion, Technological University of Eindhoven	(May, 2019)
Interpretable deep fusion using non-linear deep learning architectures, Ford M.C.	(March, 2019)
Making sense of deep fusion using explainable AI, NGA	(January, 2019)
Agile simultaneous transmit and receive phased arrays, AFRL	(November, 2018)
How to win on trivia night: sensor fusion beyond the weighted average, AFIT	(November, 2018)
How to win on trivia night: sensor fusion beyond the weighted average, MIT LL	(July, 2018)
How to win on trivia night: sensor fusion beyond the weighted average, CCC	(May, 2018)
How to win on trivia night: sensor fusion beyond the weighted average, U. Mich.	(March, 2018)
Sensor fusion and radar signal processing, Argo AI	(February, 2018)
Agile simultaneous transmit and receive phased arrays, Mississippi State University	(May, 2017)
Regularized learning of linear order statistics, University of Nottingham, UK	(June, 2016)
Kernel clustering of big data, University of Missouri	(March, 2015)
Kernel clustering of big data, University of Nottingham, UK	(February, 2013)
Aggregating crowd-sourced data using fuzzy integrals and fuzzy measure of generalized accord, University of Missouri	(March, 2013)
Ontological self-organizing map, University of Missouri	(March, 2012)
Fuzzy kernel clustering of large scale biomedical and bioinformatics data, Wayne State University	(October, 2011)
Incremental fuzzy c-means for large-scale data	
• Saginaw Valley State University	(February, 2012)
• Oakland University	(September, 2011)
Fuzzy kernel clustering of large-scale data	
• Wayne State University	(November, 2011)
• Western Michigan University	(October, 2011)
• University of Michigan-Flint	(October, 2011)
• University of Michigan-Dearborn	(September, 2011)
• University of Melbourne, Australia	(May, 2011)
Advances in clustering for next-generation data sets. Old Dominion University	(April, 2011)
Approximation of c-means clustering for large scale data. University of Missouri.	(March, 2011)
Computing with words using self-organizing maps. Michigan State University.	(September, 2010)
Fuzzy cluster analysis of genes using Gene Ontology similarity measures. University of Kansas	(April, 2008)
Exercise feedback system to improve efficacy and safety of elder's exercise routines.	(March, 2008)

RAND / Hartford Foundation Career Development Institute, RAND Corporation
Recognition technology for the functional assessment of older adults. University of Illinois-Urbana Champaign (November, 2007)

ADVISING

PhD Students

- Current: James Bialas (anticipated, 2021), Stephen Whitaker (anticipated, 2024), Yilin Wang (anticipated, 2024), Nicholas Hamilton (anticipated, 2024), Evan Lucas (anticipated, 2024)
- Graduated: Adam Webb (2021, MTRI), Siva Krishna Kakula (2021, startup), Ian Cummings (2020, LANL), Sakineh Yazdanparast (2019, Cisco), Husam Sweidan (2018, CCC), Hanieh Deilamsalehy (2017, Adobe), Anthony Pinar (2017, Michigan Tech)

MS Students: 12 graduated thesis students

Undergraduate Research

- Advisor, Summer Undergraduate Research Fellows: Aaron Dean (2018), Joshua Manela (2014)
- Advisor, Pavlis Honors College Academic Year Research Interns (2015-16, 2016-17, 2018-19, 2019-20)
- Co-advisor, ITOxygen Enterprise (2015-16)
- Advisor, Blue Marble Security: Security Team (2014-15)
- Advisor, College of Engineering Honors Program (2008), Advisees, Christopher Spain and Nathan Salmon, were two of ten undergraduates featured in, "The Challenges and Rewards of Undergraduate Research," the Summer 2008 cover story of *Mizzou Engineer Magazine*. Published results of research in the *Proc. IEEE Swarm Intelligence Symposium 2008*.

PROFESSIONAL SERVICE

- Senior member, IEEE (Computational Intelligence Society)
- Conference Publication Editor, IEEE Computational Intelligence Society (2021 – present)
- Member, IEEE Computational Intelligence Society Fuzzy Systems Technical Committee (2018 – present)
- Member, IEEE Computational Intelligence Society Social Media Committee (2015 – present)
- Member, *IEEE Trans. Fuzzy Systems* Best Paper Panel (2018 - present)
- Associate Editor, *IEEE Trans. Fuzzy Systems* (2012 – 2021)
- Co-Chair, IEEE CIS Task Force on Cybersecurity for Smart World (2017 – 2021)
- Panel Sessions Co-Chair, *IEEE Int. Conf. Fuzzy Systems 2021*
- General Co-Chair, *IEEE Int. Conf. Fuzzy Systems 2019*
- Member, IEEE Trans. Fuzzy Systems Outstanding Paper Committee (2018)
- Area Chair: *IEEE Int. Conf. Fuzzy Systems 2015*
- Technical Program Committee: *IPMU 2020; CISDA-SSCI 2016; FUZZ-IEEE 2017, 2021; IEEE ISSNIP 2015; IAPR CIBB & PRIB 2013; IEEE WCCI 2012; IEEE CEC 2009*
- Session Chair: *SPIE DSS 2016, FUZZ-IEEE 2015, IPMU 2014, IEEE WCCI 2014*
- Special Session Co-Chair: Special Session on CI for Security, Surveillance, and Defense, *IEEE WCCI 2016,* Special Session on Emerging Applications and Extensions of Fuzzy Measures and Integrals, *FUZZ-IEEE 2013*
- Special Session Chair: Special Session on Fuzzy Logic and Fuzzy Systems for Very Large Data, *FUZZ-IEEE 2012,* Special Session on Large-Scale Clustering, *FUZZ-IEEE 2011*
- NSF reviewer (2021)
- External reviewer: Maryland Industrial Partnerships Program, National Institute of Justice, US Army ERDC, Research Grants Council—Hong Kong
- Journal reviewer, *Entropy, Fuzzy Sets and Systems, The Imaging Science Journal, Soft Computing, J. Intelligent and Fuzzy Systems, Neural Networks, J. Theoretical Biology, Digital Signal Processing, IEEE Trans. Pattern Analysis and Machine Intelligence, Int. J. Computers and Applications, Int. J. Uncertainty, Fuzziness, and Knowledge-Based Systems, IEEE Trans. Fuzzy Systems, IEEE Trans. Geoscience and Remote Sensing, IEEE Trans. Image Processing, IEEE Trans. Evolutionary Computation, Computational Intelligence Magazine, Pattern Recognition Letters, Information*

Sciences, J. Engineering and Computer Innovations, J. Computer Engineering Research, J. Computer Science and Technology

HONORS AND AWARDS

IEEE Eta Kappa Nu, Beta Gamma Chapter, Professor of the Year	(2015)
Jackson Creative Canvas Course Contest Award	(2014)
Best Paper – *FUZZ-IEEE*	(2012)
IEEE Franklin V. Taylor Memorial Award (best paper at *IEEE SMC*)	(2011)
NSF / CRA Computing Innovation Fellowship	(2010-2012)
NSF CI TraCS Postdoctoral Fellowship (declined)	(2010)
Best Paper – Midwest Nursing Research Society	(2009)
Preparing Future Faculty Fellowship	(2008-2009)
IEEE Computational Intelligence Society Student Travel Award	(2008, 2010)
MU Graduate Professional Council Student Travel Award	(2008)
Top-20 Amazing Graduate Student, University of Missouri	(2008)
Featured in IEEE *CI Magazine*'s "Focus On Students"	(2008)
2nd Place – Mizzou GPC Research and Creative Arts Forum	(2007)
NSF GK-12 Fellowship	(2006-2007)
2nd Place – IEEE Computational Intelligence Society-Mizzou Chapter Poster Competition	(2006)
Best Exhibit Award – University of Missouri Engineering Open House	(2006)

CONSULTING ACTIVITY

Signature Research, Inc., Chief Scientist and subject matter expert in AI and machine learning	(2018 –)
Thermoanalytics, Inc., subject matter expert in AI and machine learning	(2017-2020)
ARiA LLC, subject matter expert in AI and machine learning	(2015-2016)

VISITING APPOINTMENT

Visiting Scholar, **University of Melbourne**, Australia	(2011, 2012)