ROBI POLIKAR

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CAREER GOALS

- Develop solutions with meaningful impact to real-world problems in areas of research interest listed below.
- Develop, foster and establish a successful model of research-based engineering education that incorporates all levels of scholars – from freshman undergraduate to post-doctoral – into integrated research and learning communities;
- Provide leadership and vision to implement such a model by integrating research, scholarly and creative activity with education, such that these activities synergistically complement each other; empower colleagues, faculty and students to help eliminate barriers that hinder such efforts;

CURRENT AREAS OF RESEARCH INTEREST

- Computational intelligence – machine learning, data fusion, bio-inspired learning systems
- Biomedical signal processing – early diagnosis of Alzheimer's disease, EEG analysis
- Biomedical systems & devices, bioinformatics, brain-computer interface systems, optical brain imaging

EDUCATION

- Ph.D. Electrical Eng. and Biomedical Eng., Iowa State University, (ISU)   2000
- M.Sc. Electrical Eng. and Biomedical Eng., ISU   1995
- B.Sc.   Electrical Engineering, Istanbul Technical University   1993

EMPLOYMENT

- Professor of Electrical and Computer Engineering, Rowan University   Sept 2011 - current
- Chair, Electrical and Computer Engineering, Rowan University   July 2011 - current
- Associate Professor of Electrical and Computer Engineering, Rowan University   2006 – 2011
- Visiting Associate Professor of Biomedical Engineering (inc. sabbatical leave in 2008)
   School of Biomedical Engineering, Drexel University   2008 – 2010
- Assistant Professor of Electrical and Computer Engineering   2001 – 2006
   Dept. of Electrical and Computer Engineering, Rowan University
- Postdoctoral associate, Electrical and Comp. Eng, ISU   2000

EXECUTIVE SUMMARY / HIGHLIGHTS

- Funded Research: Fundamental / theoretical research actively supported by Adaptive Intelligence Systems program within NSF, including a **CAREER award on "Ensemble Systems for Incremental Learning"**. Large scale applied research supported by government agencies as well as industrial partners.
- Publication Record: Total of **137 all-peer reviewed publications**: 30 in journals; 6 in book / encyclopedia chapters, 18 in edited volumes; 83 (also peer reviewed and published) conference proceedings.
- Citation Record: **Over 2100 total citations**, **H-index of 20**. The highest H-index and the highest number of citations among all faculty at Rowan's College of Engineering.
- Student Involvement: 43 students appearing 110+ times (60+ graduate, 50+ undergraduate) as authors or co-authors in 70+ papers since 2002, with five students receiving best paper awards.
- Professional Activities: **Associate editor of IEEE Transactions on Neural Networks**; chair/co-chair/program committee member in various conference organizations; chair and organizer for several special sessions and tutorials; regularly invited to join NSF review panels; reviewer for numerous journals.
- Teaching: Eight new courses developed and taught; consistently high student evaluations (over 4.5/5.0) despite (student perceived) difficulty, high expectations, workload and challenging nature of the courses.
- Service: Steering committee chair for **establishing a new Biomedical Sciences and Engineering program** at Rowan (including Rowan's first PhD program), ECE graduate coordinator, member of graduate executive council, member of senate and various senate committees. Chair of ECE department.

SELECTED ACTIVE & RECENT GRANTS

- Organizing the Curriculum - Enhancing Student Understanding of Core Engineering Concepts through Biomedical Activities, National Science Foundation *Transforming Undergraduate Education in Science, Technology, Engineering and Mathematics (TUES) – Type 1 Program*, 2012 – 2014, Total Award Amount: $200,000. Role: Co-PI.
- Vertical Integration of Concepts and Laboratory Experiences in Biometrics Across the Four Year Electrical and Computer Engineering Curriculum, *National Science Foundation, Transforming Undergraduate Education in Science, Technology, Engineering and Mathematics (TUES) – Type 2 Program*, 2011- 2015, Total Award Amount: $600,000 with subcontracts; $356,654 for Rowan (lead institution). Role: Co-PI.
- Incremental Learning from Unbalanced Data in Nonstationary Environments (Collaborative Research with Univ. of Notre Dame), *National Science Foundation*, 2009 – 2012. Total award amount: $330,000, Role: PI (two awards provided to two institutions independently, with both investigators serving as PI).
- Translational Research: Novel ERP Analysis for Early Diagnosis of Alzheimer's disease: Bringing Research to Patients–*Neuronetrix, Inc*. 2007 – on going. Total award amount: $130,673. Role: PI
- Brain Computer Interface Equipment Grant, Dean's Fund, Rowan University, 2008.Total award amount $27,000, Role : PI.
- Diagnostic Biomarkers for Neurodegenerative Diseases, University of Pennsylvania consortium – Center for Excellence Research in Neurodegenerative Diseases, *State of Pennsylvania*, 2005-2009. Collaborative Research with Univ. of Penn. Total award amount: $4,500,000. Role: Site-PI.
- Incremental learning and multiresolution wavelet analysis of ERPs for early diagnosis of Alzheimer's disease, *National Inst. on Aging / National Inst. of Health*, March 2003 – 2008. Collaborative Research with Univ. of Penn. and Drexel Univ. Total award amount: $1,108,000, Role: Site-PI / PI.
- An ensemble of classifiers approach for incremental learning, *CAREER Program, National Science Foundation*, 2003 – 2009. Total award amount: $400,000; Role : PI.
- Experiments for integrating biomedical engineering into electrical engineering curriculum, *Course, Curriculum and Laboratory Improvement Program, Division of Undergraduate Education, National Science Foundation*, June 2003 – May 2007. Total award amount: $75,000;Role: PI.
- Acquisition of a Desktop, High-Resolution, Three-Dimensional X-Ray Computed Tomography (CT) System, *NSF Major Research Instrumentation*, 2004 – 2006. Total award amount: $238,698, Role: Co-PI.
- Data fusion for nondestructive evaluation of non-piggable pipes, *U.S. Department of Energy*, 2002 – 2005. Total award amount: $215,866, Role: Co-PI.
- Acquisition of a portable large scale visualization system for nondestructive evaluation, *NSF Major Research Instrumentation*, 2002 – 2005. Total award amount: $171,292, Role: Co-PI.
- Automated Identification and Quantification of VOCs Using Electronic Nose Systems, *New Jersey Water Resources Research Institute,* Feb 2004-Feb 2005. Total award amount: $25,000, Role: PI.
- Automated Detection and Identification of Wastewater Odors Using Electronic Nose Systems, *US Filter*, September 2002 – August 2003. Total award amount: $25,000, Role: Co-PI.
- Digital Imaging Across Curriculum, *Course, Curriculum and Laboratory Improvement Program, Division of Undergraduate Education, National Science Foundation*, Jan. 2003–Dec. 2005. Total award amount: $75,000, Role: Senior Personnel.
- Research opportunities in pollution prevention, *NSF, Research Experiences for Undergraduates,* 2000-2003. Total award amount: $254,000, Role: Senior Personnel.
- A bridge to 21st century – *Delaware River Port Authority*, 2002. Total award amount: $999,331, Role: Senior Personnel.
- Signal Processing and Analysis for Optical Brain Imaging Sensors, *Drexel University*, 2002. Total award amount: $10,000, Role: PI.
- Optimum Sensor Selection for Automated Identification of Volatile Organic Compounds, *Rowan University, Separately Budgeted Research*, 2001. Total award amount: $3,500, Role: PI.

WORKS UNDER REVIEW / IN PREPARATION

- K. Dyer and R. Polikar, "COMPOSE: Compacted Polytope Sample Extraction, A semi supervised learning framework for initially labeled non-stationary streaming environments," *IEEE Transactions on Neural Networks and Learning Systems*, under review.
- R. Polikar, H. Gandhi, T. Patel, M.Ahiskali, B. Balut, D. Green, J. Kounios and C. M. Clark, "Stacked Generalization Based Decision Fusion of Multichannel ERPs for Early Diagnosis of Alzheimer's Disease," *Artificial Intelligence in Medicine*, in preparation.
- J. LaRocco, B. Angelone and R. Polikar, "Effects of mental training on brain computer interface performance with distractions," *Consciousness and Cognition*, in preparation.

PUBLISHED WORKS & RESEARCH IMPACT

TOTAL NUMBER OF REFEREED & PEER-REVIEWED PUBLICATIONS: 137

H-INDEX: 20 (Based on Google Scholar & Harzing's Publish or Perish)

Developed by H.E. Hirsch, the H-index is a standardized combined measure of quantity and quality of a scientist's research output that combines both the scientific productivity, measured by the number of publications, and the apparent scientific impact of these publications, measured by the citations they receive. An H-index of 20 means that Dr. Polikar has 20 publications, each has been cited 20 times or more. An H-index of 20 is the highest at Rowan's College of Engineering.

TOTAL NUMBER OF CITATIONS: 2,250 (August 2012), also highest at Rowan's College of Engineering.

JOURNAL PUBLICATIONS (TOTAL: 30)

- G. Ditzler and R. Polikar, "Incremental Learning of Concept Drift from Streaming Imbalanced Data," *IEEE Transactions on Knowledge and Data Engineering*, **accepted**.
- K. Pourrezaei, Z. Barati, P. A. Shewokis, M. Izzetoglu, R. Polikar, G. Mychaskiw, "Hemodynamic response to repeated noxious cold pressor tests measured by functional near infrared spectroscopy on forehead," *Annals of Biomedical Engineering*, **accepted.**
- T.R. Hoens, R. Polikar, N. Chawla, "Learning from streaming data with concept drift and imbalance: an overview," *Progress in Artificial Intelligence*, vol. 1, no. 1, pp. 89-101, 2012.
- Elwell R. and Polikar R., "Incremental Learning of Concept Drift in Nonstationary Environments" *IEEE Transactions on Neural Networks*, vol. 22, no. 10, pp. 1517-1531, 2011**.**
- Garbarine E., DePasquale J., Gadia V., Polikar R., and Rosen G., "Information-theoretic approaches to SVM feature selection for metagenome read classification," *Computational Biology and Chemistry*, vol. 35, no. 3, pp. 199-209, doi:10.1016/j.compbiolchem.2011.04.007, 2011.
- Rosen G., Caseiro D., Polikar R., Sokhansanj, and Essinger S., "Discovering the Unknown: Improving Detection of Novel Species and Genera from Short Reads," *Journal of Biomedicine and Biotechnology*, vol. 2011, Article ID: 495849, doi:10.1155/2011/495849, 2011.
- Polikar R., DePasquale J., Syed M. H., Brown G., Kuncheva L.I., " Learn++.MF: A random subspace approach for the missing feature problem," *Pattern Recognition*, vol. 43, no. 11, pp. 3817-3832, 2010.
- Rosen G., Sokhansanj B., Polikar R., Bruns, M.A., Russell J., Garbarine E., Essinger S., and Yok, N., "Signal processing for metagenomics: extracting information from the soup," *Current Genomics*, vol. 10, no. 7, pp. 493-510, 2009.
- Merzagora A.C., Butti M., Polikar R., Izzetoglu M., Bunce S., Cerutti S., Bianchi A.M., Onaral B., "Model comparison for automatic characterization and classification of average ERPs using visual oddball paradigm," *Clinical Neurophysiology*, vol.120, no. 2, pp. 264-274, 2009.
- Polikar, R., "Ensemble learning," *Scholarpedia*, vol. 4, no. 1, pp. 2776, 2009.
- Muhlbaier M., Topalis A., Polikar R., "Learn++.NC: Combining Ensemble of Classifiers Combined with Dynamically Weighted Consult-and-Vote for Efficient Incremental Learning of New Classes," *IEEE Transactions on Neural Networks*, vol. 20, no. 1, pp. 152 – 168, 2009.
- Rosen G., Garbarine E., Caseiro D., Polikar R. and Sokhansanj B., "Metagenome fragment classification using *N*-mer frequency profiles," *Advances in Bioinformatics*, vol. 2008, pp.1-12, 2008.

Journal Publications (Cont.)

- Cevikalp H. and Polikar R., "Local classifier weighting by quadratic programming," *IEEE Transactions on Neural Networks*, vol. 19, no. 10, pp. 1832 – 1838, 2008.
- Polikar R., Topalis A., Green D., Kounios J., Clark C.M., Ensemble based data fusion for early diagnosis of Alzheimer's disease, *Information Fusion*, vol. 9, no. 1, pp. 83-95, 2008.
- Polikar R., "Bootstrap inspired techniques in computational intelligence: ensemble of classifiers, incremental learning, data fusion and missing features, *IEEE Signal Processing Magazine*, v. 24, no. 4, pp. 59-72, 2007.
- Parikh D. and Polikar R., "An Ensemble based incremental learning approach to data fusion, *IEEE Transactions on Systems, Man and Cybernetics*, vol. 37, no. 2, pp. 437-450, 2007**.**
- Polikar R., Topalis A., Green D., Kounios J., Clark C.M., Comparative multiresolution analysis and ensemble of classifiers approach for early diagnosis of Alzheimer's disease, *Computers in Biology and Medicine* vol. 37, no. 4, pp. 542-558, 2007.
- Polikar R., "Ensemble based systems in decision making," *IEEE Circuits and Systems Magazine*, vol. 6, no.3, pp. 21-45, 2006.
- Polikar R., Jahan K. and Healy B., "A combined pattern separability and two-tiered classification approach for identification of binary mixtures of VOCs," *Sensors & Actuators (B)*, vol. 116, no:1-2, pp. 174-182, 2006.
- Schmalzel J., Figueroa F., Morris J., Mandayam S., and Polikar R., "An architecture for intelligent systems based on smart sensors," *IEEE Tran. Instrumentation & Measurement*, vol. 54, no. 4, pp:1612-1616, 2005.
- Polikar R., Udpa L., Udpa, S., Honavar, V., "An incremental learning algorithm with confidence estimation for automated identification of NDE signals," *IEEE Transactions on Ultrasonics, Ferroelectrics, and Frequency Control*, vol. 51, no. 8, pp. 990-1001, 2004.
- Jahan K., Chen J., Mandayam S., Krchnavek R., Sukumaran B., Mehta Y., Kadlowec J., Von Lockette P., Polikar R., "Digital imaging experiences for undergraduate engineering students," *World Transactions on Engineering and Technology Education,* vol. 3, no.2, pp. 227-230, 2004.
- Das M., Shekhar H., Liu X., Polikar R., Ramuhalli P., Udpa L., Udpa S., "A generalized likelihood ratio technique for automated analysis of bobbin coil eddy current data," *NDT&E International*, vol. 35, no. 5, pp. 329-336, 2002.
- Polikar R., Udpa L., Udpa, S., Honavar, V., "Learn++: An incremental learning algorithm for supervised neural networks," *IEEE Transactions on System, Man and Cybernetics (C), Special Issue on Knowledge Management*, vol. 31, no. 4, pp. 497-508, 2001.
- Polikar R., Shinar R., Udpa L., Porter M.D., "Artificial intelligence methods for selection of an optimized sensor array for identification of volatile organic compounds," *Sensors and Actuators (B)*, vol. 80, no. 3, pp. 243-254, 2001.
- Shekhar, H.; Polikar, R.; Ramuhalli, P.; Liu, X.; Das, M.; Udpa, L.; Udpa, S.S., "Dynamic thresholding for automated analysis of bobbin probe eddy current data," *International Journal of Applied Electromagnetics and Mechanics*, vol. 15, no. 1-4, pp. 39-46, SPEC, 2001-2002.
- Simone, G., Morabito, F.C.; Polikar, R.; Ramuhalli, P.; Udpa, L.; Udpa, S., "Feature extraction techniques for ultrasonic signal classification," *International Journal of Applied Electromagnetics and Mechanics*, vol. 15, no. 1-4, pp. 291-294, SPEC 2001-2002.
- Xiang P., Ramakrishnan S., Cai X., Ramuhalli P., Polikar R., Udpa S.S., Udpa L., "Automated analysis of rotating probe multi-frequency eddy current data from steam generator tubes," *International Journal of Applied Electromagnetics and Mechanics*, vol. 12, no. 3-4, pp. 151-164, 2000.
- Spanner J., Udpa L., Polikar R., Ramuhalli P., "Neural networks for ultrasonic detection of inter-granular stress corrosion cracking," *The e-Jour. of Nondes. Testing & Ultrasonics*, vol. 5, no. 7, 2000.
- Polikar R., Udpa L., Udpa S.S., Taylor T., "Frequency invariant classification of ultrasonic weld inspection signals," *IEEE Trans. on UFFC,* vol. 45, no. 3, pp. 614-625, 1998.

EDITED VOLUMES & BOOK / ENCYCLOPEDIA CHAPTERS (6)

- Alippi C, Boracchi G., Ditzler G., Polikar R., Roveri M., Adaptive Classifiers for Nonstationary Environments, Contemporary Issues in Systems Science and Engineering, IEEE/Wiley Press Book Series, 2012
- Polikar R., "Ensemble Learning," in *Ensemble Machine Learning: Methods and Applications*, Cha Zhang and Yunqian Ma, editors, Springer, 2012.
- Polikar R., "Pattern recognition in bioengineering," *Wiley Encyclopedia of Biomedical Engineering*, M. Akay, editor, vol. 4, pp. 2695 – 2716, New York, NY: Wiley Interscience, 2006.
- Oza N., Polikar R., Kittler J. and Roli F. (Editors), *Multiple Classifier Systems, Proceedings of the 6th Int. Workshop on MCS 2005*, Lecture Notes in Computer Science, vol. 3541, 2005.
- Polikar R., Keinert F., Greer M.H., "Wavelet analysis of event related potentials for early diagnosis of Alzheimer's disease," in *Wavelets in Signal and Image Analysis, From Theory to Practice* (ed. A. Petrosian and F.G. Meyer), pp. 453-478, Boston, MA: Kluwer Academic Publishers, 2001.
- Polikar R., The story of wavelets, in *Physics and Modern Topics in Mechanical and Electrical Engineering*, (ed. Mastorakis, N), pp. 192-197, World Scientific and Eng. Society Press, 1999.

PROCEEDINGS APPEARING AS FULL PAPERS IN EDITED VOLUMES (TOTAL : 18)

- Ditzler G., and Polikar R., "Incremental learning of new classes in unbalanced datasets: Learn++.UDNC," *Multiple Classifier Systems (MCS 2010)*, Lecture Notes in Computer Science, N. El Gayar et al., eds., vol. 5997, pp. 33-42, Cairo, Egypt, April 2010.
- Elwell R. and Polikar R., "Incremental learning of variable rate concept drift," *Multiple Classifier Systems (MCS 2009)*, Lecture Notes in Computer Science, J.A. Benediktsson et al, eds., vol. 5519, pp. 142-151, Reykjavik, Iceland, June 2009.
- A.C. Merzagora, M. Izzetoglu, R. Polikar, V. Weisser, B. Onaral and M.T. Schulteis, "Functional near-infrared spectroscopy and electroencephalography: A multimodal imaging approach," *Foun. of Augmented Cognition. Neuroergonomics and Operational Neuroscience,* vol. 5638, pp. 417-426, Springer, 2009.
- DePasquale, J. and Polikar R., "Random feature subset selection for ensemble based classification of data with missing features," 7th Int. Workshop on Multiple Classifier Systems, May 23-25, Prague, Czech Republic, in *Lecture Notes in Computer Science*, vol. 4472, pp. 251-260, Berlin: Springer, 2007.
- Muhlbaier, M.D., and Polikar, R., "An ensemble approach for incremental learning in nonstationary environments," 7th Int. Workshop on Multiple Classifier Systems, May 23-25, Prague, Czech Republic, in *Lecture Notes in Computer Science*, vol. 4472, pp. 490-500, Berlin: Springer, 2007.
- Syed-Mohammed H., Leander J., Marbach M., and Polikar R., "Can AdaBoost.M1 learn incrementally? A comparison to Learn++ under different combination rules," Int. Conf. on Artificial Neural Networks (ICANN2006), *Lecture Notes in Computer Science (LNCS)* , vol. 4131, pp. 254-263, Athens, Greece. Berlin: Springer, 2006.
- Erdem Z., Polikar R., Gurgen F., Yumusak N., "Classification of volatile organic compounds with incremental SVM and RBF networks," *20th Int. Symposium on Computer and Information Sciences (ISCIS 2005) Lecture Notes in Computer Science (LNCS)*, vol. 3733, pp. 322-331, Istanbul, Turkey. Berlin: Springer, 2005.
- Erdem Z., Polikar R., Gurgen F. , Yumusak N., "Reducing the effect of out-voting problem in ensemble based incremental support vector machines" *15th Int. Conf. on Artificial Neural Networks (ICANN 2005): Lecture Notes in Computer Science (LNCS)*, vol. 3697, pp. 607-612, Warsaw, Poland. Springer, 2005.
- Muhlbaier M., Topalis A., Polikar R., "Ensemble confidence estimates posterior probability," *6th Int. Workshop on Multiple Classifier Systems (MCS 2005)*, Springer Lecture Notes in Computer Science (LNCS), vol. 3541, pp. 326-335, Seaside. Monterey, CA, June 2005.
- Z. Erdem, R. Polikar, N. Yumuşak, F. Gürgen, "Ensemble of Support Vector Machines Classifiers with Learn++ Algorithm (in Turkish)" *Proc. of IEEE 13th Signal Processing and Applications Conference (IEEE SIU'05)*, IEEE Catalogue Number: 05EX1102C, 16-18 May 2005, Kayseri, Turkey.
- Erdem Z., Polikar R., Gurgen F., Yumusak N., "Ensemble of SVM classifiers for incremental learning," *6th Int. Workshop on Multiple Classifier Systems (MCS 2005)*, Springer Lecture Notes in Computer Science (LNCS), vol. 3541, pp. 246-256, Seaside. Monterey, CA, June 2005.

Proceedings Appearing as Full Papers in Edited Volumes (Cont.)

- Muhlbaier M., Topalis A., Polikar R., "Learn++.MT: A new approach to incremental learning," *5th Int. Workshop on Multiple Classifier Systems (MCS 2004)*, Springer Lecture Notes in Computer Science (LNCS), vol. 3077 , pp. 52-61, Cagliari, Italy, June 2004.
- Lewitt M. and Polikar R., "An ensemble approach for data fusion with Learn++," *4th Int. Workshop on Multiple Classifier Systems (MCS 2003)*, LNCS vol. 2709, pp. 176-185Surrey, England, June 2003.
- Byorick J. and Polikar R., "Confidence estimation using incremental learning algorithm, Learn++," *Int. Conf. on Artificial Neural Networks*, Springer LNCS vol. 2714, pp. 181 – 188, Istanbul, Turkey, 2003.
- Eckerd R., Neyhart J., Polikar R., Mandayam S., Tseng M., "Neural and decision theoretic approaches for the automated segmentation of radiodense tissue in digitized mammograms," *Review of Progress in Quantitative Nondestructive Evaluation (QNDE 2002),* vol. 22B, pp. 1735-1742, Bellingham, WA, July 2002, published by American Institute of Physics, 2003.
- Polikar R., "Incremental learning of NDE signals with confidence estimation," *Review of Progress in Quantitative Nondestructive Evaluation (QNDE 2001),* vol. 21A, pp. 744-751, Brunswick, ME, 29 July – 3 August 2001, published by American Institute of Physics, 2002.
- Neyhart J.T, Kirlakovsky M., Coleman K.L., Polikar R. , Tseng M., Mandayam S.A., "Automated segmentation and quantitative characterization of radiodense tissue in digitized mammograms," *Review of Progress in Quantitative Nondestructive Evaluation (QNDE 2001),* vol. 21B, pp. 1866-1879, Brunswick, ME, July 2001, published by American Institute of Physics, 2002.
- Polikar R., Udpa L., Udpa, S.S., Time scaling and frequency invariant classification of ultrasonic NDE signals, *Proc. of 24th Review of Progress in Quantitative Nondestructive Evaluation,* Vol. 17A, pp. 743-749, San Diego CA, 1998.

Peer-reviewed Conference Proceedings (Total:83)

- Dyer K., Polikar R., "Semi-Supervised Learning in Initially Labeled Non-Stationary Environments with Gradual Drift," *World Congress in Computational Intelligence - Int. Joint Conf. on Neural Networks (IJCNN 2012)*, Brisbane, Australia, June 2012.
- Ditzler G., Rosen G., Polikar R., "Transductive Learning Algorithms for Nonstationary Environments," *Int. Joint Conf. on Neural Networks (IJCNN 2012)*, Brisbane, Australia, June 2012.
- Ditzler G., Polikar R., Rosen G., "Determining significance in metagenomic samples," *38th Northeast Bioengineering Conference (NEBEB 2012)*, pp. 143-144, Philadelphia, PA, March 2012.
- Ditzler G., Rosen G., Polikar R., "Forensic identification with environmental samples," *IEEE International Conference on Acoustic Speech and Signal Processing (ICASSP 2012)*, Kyoto, Japan, March 2012 **- accepted.**
- Ramachandran R., Shetty S., Dahm K., Polikar R., "Open-Ended Design and Performance Evaluation of a Biometric Speaker Identification System," *IEEE International Symposium on Circuits & Systems (ISCAS 2012)*, Seoul, Korea, May 2012.
- Hoens T., Polikar R., Chawla N. "Heuristic Updatable Weighted Random Subspaces for Nonstationary Environments" *IEEE Int. Conference on Data Mining (ICDM 2011)*, pp.241-250, Vancouver, BC, 2011.
- Staudinger T. and Polikar R., "Analysis of Complexity Based EEG Features for the Diagnosis of Alzheimer's Disease" *IEEE Eng. In Medicine & Biology (EMBC 2011)* pp. 2033 – 2036, Boston, MA, September 2011.
- Essinger S., Polikar R., Rosen G., "Ordering Samples along Environmental Gradients using Particle Swarm Optimization" *IEEE Eng. In Medicine & Biology (EMBC 2011)* pp. 4382 – 4385, Boston, MA, September 2011.
- Ditzler G., Polikar R., "Semi-supervised Learning in Nonstationary Environments," *Int. Joint Conf. on Neural Networks (IJCNN 2011)*, pp. 2741-2748, San Jose, CA, August 2011.
- Ditzler G., Polikar R., "Hellinger Distance Based Drift Detection for Nonstationary Environments," *IEEE Symposium Series on Computational Intelligence (SSCI 2011)*, pp. 41-48, Paris, France, 2011.

Peer-Reviewed Conference Proceedings (Cont.)

- Ditzler G., Ethridge J., Ramachandran R., Polikar, R., "'Fusion methods for boosting performance of speaker identification systems," *IEEE Asia Pacific Conference on Circuits and Systems (APCCAS 2010)*, pp. 116-199, Kuala Lumpur, Malaysia, December 2010.
- Polikar R., Tilley C., Hillis B., Clark C.M., "Multimodal EEG, MRI and PET data fusion for Alzheimer's disease diagnosis," *IEEE Engineering in Medicine and Biology Conference (EMBC 2010)* , pp. 6058 – 6061, Buenos Aires, Argentina, September 2010.
- Ditzler G., Chawla N., Polikar R. "An incremental learning algorithm for nonstationary environments and class imbalance," *Int. Conf. on Pattern Recognition (ICPR 2010)*, pp. 2997-3000, Istanbul, Turkey, August 2010.
- Ditzler G. and Polikar R., "An incremental learning framework for concept drift and class imbalance," *Int. Joint Conf. on Neural Networks (IJCNN 2010)*, pp. 736-743 , Barcelona, Spain, July 2010.
- Essinger S., Polikar R., Rosen G., "Neural network-based taxonomic classification for metagenomics," *Int. Joint Conf. on Neural Networks (IJCNN 2010)*, pp. 2962 - 2968, Barcelona, Spain, July 2010.
- Ethridge J., Ditzler G., Polikar R., " Optimal nu-SVM parameter estimation using multi objective evolutionary algorithms," *Int. Joint Conf. on Neural Networks (IJCNN 2010)*, pp. 3570-3577 , Barcelona, Spain, July 2010.
- Ahiskali M, Green D., Kounios J., Clark C.M., Polikar R., "ERP based decision fusion for AD diagnosis across cohorts," *IEEE Engineering in Medicine and Biology Conference (EMBC 2009)* , pp. 2494 - 2497 Minneapolis, MN, September 2009.
- Elwell R. and Polikar R., "Incremental learning in nonstationary environments with controlled forgetting," *Int. Joint Conf. on Neural Networks (IJCNN 2009)*, pp. 771-778, Atlanta, GA June 2009.
- Ahiskali M., Polikar R., Kounios J., Green D., Clark C.M., "Combining multichannel ERP data for early diagnosis of Alzheimer's disease," *IEEE Neuroengineering Conference 2009*, pp. 522-525, Antalya, Turkey, May 2009.
- Karnick M., Muhlbaier M., Polikar R., "Incremental learning in non-stationary environments with concept drift using a multiple classifier based approach," *International Conference on Pattern Recognition (ICPR2008)*, pp. 1-4, Tampa, FL, December 2008**.**
- Patel T., Polikar R., Davatzidos C. and Clark C., "EEG and MRI data fusion for early diagnosis of Alzheimer's disease," *IEEE Engineering in Medicine and Biology Conference (EMBC 2008)* , pp. 1757-1760, Vancouver, BC, Canada, August 2008.
- Cevikalp H., Triggs B., and Polikar R., " Nearest hyperdisk methods for high dimensional classification," *International Conference on Machine Learning (ICML 2008)*, Helsinki, Finland, July 2008.
- Cevikalp H., Triggs B., Frederic J. and Polikar R., "Margin-based discriminant dimensionality reduction for visual recognition," *Computer Vision and Pattern Recognition (CVPR 2008)*, pp. 1-8, Anchorage, AK, 23-28 June 2008.
- Karnick M., Ahiskali M., Muhlbaier M., Polikar R., "Learning concept drift in nonstationary environments using an ensemble of classifiers based approach," *IEEE World Congress on Computational Intelligence*, pp. 3455-3462, Hong Kong, June 2008.
- Merzagora A., Shewokis P., Bunce S., Shultheis M., Izzetoglu K., Izzetoglu M., Polikar R., Onaral B., "Combined fNIRs and EEG for the assessment of cognitive impairments following traumatic brain injury," (abstract only) *Society of Applied Neuroscience Meeting (SAN 2008)*, Seville, Spain 2008.
- Muhlbaier M. and Polikar R., Multiple classifiers based incremental learning algorithm for learning in nonstationary environments," *IEEE International Conf. on Machine Learning and Cybernetics*, pp. 3618-3623, Hong Kong, China, August 2007.
- Balut B., Karnick M., Green D., Kounios J., Clark C., and Polikar R., "Ensemble based data fusion from parietal region of event related potentials for early diagnosis of Alzheimer's disease," *Int. Joint Conf. on Neural Networks* (IJCNN 2007) , pp. 2409-2414, Orlando, Fl, July 2007.

Peer-Reviewed Conference Proceedings (Cont.)

- Depasquale J., and Polikar R., "Random feature subset selection for analysis of data with missing features," Proc. Int. Joint Conf. on Neural Networks, pp. 2379-2384, Orlando, Fl, July 2007.
- Polikar R., Ramachandran R., Head L. and Tahamont M., Introducing Multidisciplinary Novel Content Through Laboratory Exercises On Real-World Applications, *Annual ASEE Conference and Exposition,* Session 1526, Honolulu, HI, June 2007.
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STUDENT RESEARCH FOSTERING / STUDENT INVOLVEMENT IN PAPERS

- 42 students appearing 110+ times (60+ graduate, 50+ undergraduate) as first authors or co-authors in 68 papers since 2002. Five students receiving best paper awards in IEEE events.

INVITED TALKS & TUTORIALS

- Ensemble Based Systems for Incremental Learning of Nonstationary Environments, Iowa State University, Ames, IA, Invited talk for Progress in Engineering Award, April 2012.
- Ensemble Based Systems for Incremental Learning of Nonstationary Environments, University of Delaware, Newark, April 2012.
- Biomedical Signal Processing and Brain Computer Interface Research at Rowan, ***Cooper University Hospital***, Camden, NJ. Research Seminar Series, December 2010.
- Multimodal Data Fusion, ***The Rutgers Center for Computational & Integrative Biology***, Camden, NJ. Invited talk, December 2010.
- Learning in Nonstationary Environments, ***Drexel University, School of Health Sciences, Systems and Biomedical Engineering***, Philadelphia, PA. Invited talk, January 2010.
- Ensemble Based Systems for Learning in Nonstationary Environments, ***Temple University, Electrical and Computer Eng. Department***, Philadelphia, PA. Invited talk, November 2008.
- Learning in Nonstationary Environments– ***Drexel University, Computer Science & Electrical and Computer Eng. Department***, Philadelphia, PA. Invited talk, February 11 & 25, 2008.
- Ensemble Systems and Applications for Early Diagnosis of Alzheimer's Disease, ***Stevens Institute of Technology***, Hoboken, NJ. Invited talk, November 2007.
- Ensemble Based Systems in Computational Intelligence: Incremental & Nonstationary Learning, Data Fusion, and Missing Data Analysis, ***Int. Joint Conf. Neural Networks***, Tutorial, Orlando, August 2007.
- Ensemble Based Systems in Decision Making, ***Int. Conf. on Artificial Neural Networks***, Tutorial, Athens, Greece – September 2006.
- Ensemble Classifiers and Applications to Biomedical Engineering, ***Drexel University, School of Biomedical Engineering***, Philadelphia, PA, invited talk on – November 2005
- Wavelet Analysis for Early Diagnosis of Alzheimer's Disease, ***University of Sciences in Philadelphia***, invited talk – October 2005

Invited Talks & Tutorials (cont.)

- Ensemble based systems for data fusion, Tutorial *IEEE Information Fusion Conf*, Phila., PA, 2005.
- Neural networks and ensemble of classifiers for water quality monitoring, *Invited Talk*, ***New Jersey Department of Environmental Protection***, Trenton, NJ, May 2004.
- Ensemble of classifiers, *Invited Talk**, Lockheed Martin Co***. Moorestown, NJ, March 2004.
- Pattern recognition and neural networks for water quality assessment, *Invited Talk**, Passaic Valley Water Commission***, Totowa, NJ, May 2003
- Odor identification using an electronic nose, *Invited Talk**, The South Jersey Water Environment Association**, Contemporary Topics in Wastewater Treatment*, Glassboro, NJ, October 2002.
- Short Course: Theory and Applications of Wavelets, taught for ***IEEE Philadelphia Section***, 2002.
- The story of wavelets, *Invited Lecture**, Dept. of Industrial Engineering, Rutgers University***, New Brunswick, NJ, April 2002.

Web Publications

- Polikar R., The Engineer's Ultimate Guide to Wavelet Analysis: The Wavelet Tutorial, 1995.
  http://engineering.rowan.edu/~polikar/WAVELETS/WTtutorial.html
  A popular tutorial on wavelet analysis, accessed by over 1 million people over the last ten years, has been used as lecture notes at various universities, and referenced by most major wavelet related web servers. It is the source of the invited plenary talk referenced above. The tutorial is also featured in 9 May 2003 issue of **Science** magazine (vol. 300, no. 5621, pp. 873, 2003).

- Polikar R., Ensemble learning, **www.scholarpedia.org** (refereed version of Wikipedia) *invited article*. See Journal list for full citation (this peer-reviewed article appears in archived journal ISSN 1941-6016).

Involvement in University Committees / Services to University

Steering Committee for establishing a new degree program in Biomedical Sciences and Engineering (including the first PhD program at Rowan University)	2010
Committee for Integrating Research at the new Cooper Medical School at Rowan	2010
Graduate Executive Committee	2007 – present
Graduate Coordinator – Electrical and Computer Engineering	2006 – present
College Graduate Committee	2008 – present
University Senate	2002 – present
Founding Chair – Senate Research Committee (Chair for 3 years)	2004 – 2007, 2010
Academic Policies & Procedures Committee	2003 – 2004
University Curriculum Committee	2002 – 2003
College & Departmental Curriculum Committee	2001 – 2003
Institutional Review Board	2001 – 2002
Advisor / mentor for international students	continuous

Course Development (Courses developed and subsequently taught)

Systems, Devices and Algorithms in Bioinformatics	2011
Theory and Applications of Pattern Recognition (Undergraduate & Graduate)	2001, 03, 07, 09
Biomedical Signal Processing & Modeling (Undergraduate & Graduate)	2006, 2010
Advanced Topics in Pattern Recognition – Ensemble Systems (Graduate only)	2005
Advanced Topics in Wavelets (Graduate only)	2006
Junior / Senior Clinic (Undergraduate – Junior / Senior)	2001-2008
Theory and Applications of Wavelets (Undergraduate & Graduate)	2001, 2002
Principles of Biomedical Systems and Devices (Undergraduate - Senior)	2003, 2004
Engineering Frontiers (Undergraduate – Senior)	2007-2010
Digital Signal Processing (Undergraduate – Junior)	2004-2010
Probability and Statistics in Engineering (Undergraduate – Junior)	2003-2006, 2010
Freshman Engineering Clinic II (Undergraduate – Freshman)	2002-2004

COURSE DEVELOPMENT (CONT.)

- Digital II – Microprocessors (Junior)   2002
- Electromagnetics (Sophomore / Junior) - Iowa State University   2000
- Engineering Problem Solving with C++ Programming (Freshman) – Iowa State University   1999
- Communications & Digital Signal Processing (Junior) - Iowa State University (televised)   1998, 1999

HONORS / AWARDS

- Professional Progress in Engineering (Midcareer Alumni) Award, Iowa State Univ., Ames, IA   2012
- Rowan University Research and Scholarly Activity Achievement Award   2008
- IEEE Senior Member Elevation   2008
- New Century Scholars Fellowship, *Stanford University*, Palo Alto, CA.   2002
- Biomedical Engineering Society Young Investor Travel Award   2002
- National Effective Teaching Institute, *American Society of Engineering Education*,   2001
  Albuquerque, NM.
- Excellence in Teaching Award, Iowa State University   2000

PROFESSIONAL ACTIVITIES & SERVICE – JOURNAL EDITING

- Associate Editor, IEEE Transactions on Neural Networks and Learning Systems   2011-present
- Guest Editor, IEEE Transactions on Neural Networks and Learning Systems   2012
  Special Issue on Learning in Nonstationary and Evolving Environments

PROFESSIONAL ACTIVITIES & SERVICE – CONFERENCE ORGANIZATION

- Technical Co-chair, IEEE World Congress on Computational Intelligence (WCCI 2014),   2014
  Beijing, China
- Co-chair, IEEE Symposium on Computational Intelligence in Dynamic   2013
  and Uncertain Environments *(CIDUE 2013)*, Singapore
- Co-chair, IEEE Symposium on Computational Intelligence in Dynamic   2011
  and Uncertain Environments *(CIDUE 2011)*, Paris, France
- Workshops Chair, 24th IEEE Int. Joint Conf. on Neural Networks *(IJCNN 2011)*   2011
- Organizing / Program Committee, 22nd IEEE Int. Joint Conf. on Neural Networks   2009
- Organizing / Program Committee, 20th IEEE Int. Joint Conf. on Neural Networks   2007
- Organizer and General Co-Chair, 6th International Workshop on Multiple   2005
  Classifier Systems, MCS2005, Monterey, CA.
- Organizing Committee, IEEE / ISIF Information Fusion Conference, Philadelphia, PA   2005
- Organizer and Chair, Special session on Incremental Learning   2003
  IEEE Int. Joint Conf. On Neural Networks (IJCNN 2003), Portland, OR.
- Organizer and Chair, Special Session on Signal Proc. for Nondestructive Testing   2001
  IEEE Int. Conf. On Acous., Speech and Signal Proc. (ICASSP 2001), Salt Lake City, UT.

PROFESSIONAL ACTIVITIES & SERVICE – PEER REVIEWING

- Proposal Review   2001 – present
  - NSF Electrical and Communications Systems (ECS) Division
  - NSF Career Program
  - NSF SBIR / STTR Programs
  - NSF Division of Undergraduate Education

- Manuscript Review
  - MIT Press – Journal of Machine Learning Research
  - MIT Press – Neural Computation
  - IEEE Transactions on Pattern Analysis and Machine Intelligence
  - IEEE Transactions on Neural Networks
  - IEEE Transactions on Systems, Man and Cybernetics
  - IEEE Transactions on Neural Systems and Rehabilitation Engineering
  - IEEE Transactions on Ultrasonics, Ferroelectrics and Frequency Control,
  - IEEE Sensors Journal
  - IEEE Signal Processing Magazine
  - Springer – Machine Learning
  - Elsevier – Information Fusion
  - Elsevier – Pattern Recognition / Elsevier – Pattern Recognition Letters
  - Elsevier – Neurocomputing
  - Elsevier – Computational Statistics and Data Analysis
  - Materials Evaluation , IEE Electronics Letters, and numerous conferences

PROFESSIONAL AND HONORARY AFFILIATIONS

- Member, IEEE   1994 – present
  - Senior Member   2008 – present
  - Society Memberships: Computational Intelligence Society , Signal Processing Society, Engineering in Medicine and Biology Society
- Electrical and Comp. Eng. Faculty advisor for Tau Beta Pi , NJ-Epsilon   2002 – present
- Member, Tau Beta Pi   1994 – present
- Member, Eta Kappa Nu   1994 – present

REFERENCES

Available upon request.