Gregory Ditzler

Applied Machine Learning, Data Mining, Feature Subset Selection, Multiple Classifier Systems, & Data Science

Education

2011–2015 **PhD**, *Drexel University*, Electrical & Computer Engineering.
Advisor: Gail Rosen, Ph.D.
Research areas: online learning, feature subset selection, and study of the microbiome
Committee: Steve Weber, Andrew Cohen, John M. Walsh, Robi Polikar and Gavin Brown

2009–2011 **MSc**, *Rowan University*, Electrical & Computer Engineering.
Advisor: Robi Polikar, Ph.D.
Thesis title: Incremental learning of concept drift from imbalanced data
Committee: Shreekanth Mandayam and Nancy Tinkum

2004–2008 **BSc**, *Pennsylvania College of Technology*, Electronics Engineering Technology.
Project: PowerPC and MicroBlaze applications on the Xilinx Virtex-II Pro
Minor: Mathematics

Employment

Current **The University of Arizona**, *Department of Electrical & Computer Engineering*, Tucson, AZ.
Assistant Professor 2015–Present

2011–2015 **Drexel University**, *Department of Electrical & Computer Engineering*, Philadelphia, PA.
Research Fellow 2011–2015
Teaching Assistant 2011–2013

2009–2015 **Rowan University**, *Department of Electrical & Computer Engineering*, Glassboro, NJ.
Adjunct Professor 2010–2015
Research Assistant 2009–2011

2013 **AT&T Research Labs**, *Shannon Laboratory*, Florham Park, NJ.
Research Intern (Technical II)

2007–2009 **QorTek, Inc.**, *Systems Engineering*, Williamsport, PA.
Electronic Systems Engineer 2008/09
Electronic Systems Intern 2007/08

Awards & Honors

2015 Joseph and Shirley Carleone Endowed Fellowship
2015 Drexel University's Office of Graduate Studies Research Excellence Award
2015 Best Poster at the Drexel IEEE Research Day Poster Competition
2014 IEEE SSCI 2014 Doctoral Consortium Travel Award
2014 NSF Travel Award to the ACM International Workshop on Big Data in Life Sciences

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2014 Best Student Paper at the International Joint Conference on Neural Networks
2014 IEEE Computational Intelligence Society Travel Award
2013 Nihat Bilgutay Research Award
2013 Koerner Family Engineering Research Award
2012 Defense Threat Reduction Agency & NSF Algorithms Workshop Travel Grant
2011 Student Travel Award for the IJCNN, National Science Foundation
2011 Graduate Research Achievement Award, Rowan University
2008 Award for Outstanding Leadership & Service to the Pennsylvania College of Technology IEEE Branch
2008 Penn College Award for Leadership to the College and Community

Professional Affiliations

2014–Present Association for Computing Machinery
2004–Present IEEE Member (Signal Processing Society, Computational Intelligence Society)
2014–Present Society for Industrial and Applied Mathematics

Publications

In Preparation / Submitted / Under Revision

- **G. Ditzler**, J. Calvin Morrison, Y. Lan, and G. Rosen, "Fizzy: Feature selection for metagenomics," Submitted, 2015.
- **G. Ditzler**, R. Polikar, and G. Rosen, "A Sequential Learning Approach for Scaling up Filter-Based Feature Subset Selection," In Preparation, 2015.
- **G. Ditzler**, J. LaBarck, J. Ritchie, G. Rosen, and R. Polikar, "Online Feature Selection Using Bagging and Boosting," In Preparation, 2015.
- N. Bouaynaya, **G. Ditzler**, and R. Shterenberg, "AKRON: An Algorithm for Approximating Sparse Kernel Reconstruction using Convex Optimization," In Preparation, 2015.

Book Chapters

- C. Alippi, G. Boracchi, **G. Ditzler**, R. Polikar, and M. Roveri, "Adaptive Classifiers for Nonstationary Environments," *Contemporary Issues in Systems Science and Engineering*, IEEE/Wiley Press Book Series, M.-C. Zhou, H.-X. Li, and M. Weijnen (Eds), 2015.
- J.-L. Bouchot, W. Trimble, **G. Ditzler**, Y. Lan, S. Essinger, and G. Rosen, "Advances in machine learning for processing and comparison of metagenomic data," *Computational Systems Biology*, In A. Kriete and R. Eils (Eds), Springer, 2014.
- **G. Ditzler**, Y. Lan, J.-L. Bouchot, and G. Rosen, "Feature selection for metagenomic data analysis," *Encyclopedia of Metagenomics*, K. E. Nelson (Eds), 2014.

Journals

- **G. Ditzler**, R. Polikar, and G. Rosen, "Multi-Layer and Recursive Neural Networks for Metagenomic Classification," *IEEE Transactions on Nanobioscience*, 2015, accepted.
- **G. Ditzler**, M. Roveri, C. Alippi, and R. Polikar, "Adaptive strategies for learning in nonstationary environments: a survey," *IEEE Computational Intelligence Magazine*, 2015, accepted.
- **G. Ditzler**, R. Polikar, and G. Rosen, "A bootstrap based Neyman-Pearson test for identifying variable importance," *IEEE Transactions on Neural Networks and Learning Systems*, vol. 26, no. 4, 2015, pp. 880-886.
- **G. Ditzler** and R. Polikar, "Incremental learning of concept drift from streaming imbalanced data," in *IEEE Transactions on Knowledge and Data Engineering*, vol. 25, no. 10, 2013, pp. 2283–2301.

Conferences

- **G. Ditzler**, M. Austen, R, Polikar, and G. Rosen, "Scaling a Neyman-Pearson Subset Selection Approach Via Heuristics for Mining Massive Data," 2014, *IEEE Symposium on Computational Intelligence and Data Mining*, 2014, Orlando, FL. (**travel award**)

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- **G. Ditzler**, G. Rosen, and R. Polikar, "Domain Adaptation Bounds for Multiple Expert Systems Under Concept Drift," *International Joint Conference on Neural Networks*, 2014, Beijing, China. (**travel award & best paper**)
- *G. Ditzler* and G. Rosen, "Feature Subset Selection for Inferring Relative Importance of Taxonomy," *ACM International Workshop on Big Data in Life Sciences*, 2014, Newport Beach, CA. (**invited & travel award**)
- **G. Ditzler**, G. Rosen, and R. Polikar, "Incremental learning of new classes with unbalanced data," *International Joint Conference on Neural Networks*, 2013, Dallas, TX.
- **G. Ditzler**, G. Rosen and R. Polikar, "Discounted expert weighting for concept drift," *International Symposium on Computational Intelligence in Dynamic and Uncertain Environments*, 2013, Singapore, pp. 61–67.
- **G. Ditzler**, R. Polikar, and G. Rosen, "Information theoretic feature selection for high dimensional metagenomic data," in *IEEE International Workshop on Genomic Signal Processing and Statistics*, 2012, Washington, D.C., pp. 143–146.
- **G. Ditzler**, G. Rosen and R. Polikar, "A transductive learning algorithm for concept drift," in *International Joint Conference on Neural Networks*, 2012, Brisbane, Australia, pp. 945–952.
- **G. Ditzler**, R. Polikar and G. Rosen, "Determining significance in metagenomics," in *North Eastern Biomedical Engineering Conference*, 2012, Philadelphia, PA, pp. 385–386.
- **G. Ditzler**, R. Polikar, and G. Rosen, "Forensic identification with environmental samples," in *International Conference on Acoustic, Speech and Signal Processing*, 2012, Kyoto, Japan, pp. 1861–1864.
- **G. Ditzler** and R. Polikar, "Semi-supervised learning in nonstationary environments," in *International Joint Conference on Neural Networks*, 2011, San Jose, CA, pp. 2471–2478. *(student travel award)*
- **G. Ditzler** and R. Polikar, "Hellinger distance based drift detection algorithm," in *IEEE Symposium on Computational Intelligence in Dynamic and Uncertain Environments*, 2011, Paris, France, pp. 41–48.
- **G. Ditzler**, J. Ethridge, R. Polikar, and R. Ramachandran, "Fusion methods for boosting performance of speaker identification systems," in *Asia Pacific Conference of Circuits and Systems*, 2010, Kuala Lampur, Malaysia, pp. 116–119.
- **G. Ditzler**, R. Polikar, and N. V. Chawla, "An incremental learning algorithm for nonstationary environments and imbalanced data," in *International Conference on Pattern Recognition*, 2010, Istanbul, Turkey, pp. 2997–3000.
- J. Ethridge, **G. Ditzler**, and R. Polikar, "Optimal ν-SVM parameter estimation using multi-objective evolutionary algorithms," in *IEEE Congress on Evolutionary Computing*, 2010, Barcelona, Spain, pp. 3570–3577.
- **G. Ditzler** and R. Polikar, "An incremental learning framework for concept drift and class imbalance." in *International Joint Conference on Neural Networks*, 2010, Barcelona, Spain, pp. 736-743.
- **G. Ditzler**, M. Muhlbaier, and R. Polikar, "Incremental learning of new classes in unbalanced data: Learn^{++}.UDNC," in *International Workshop on Multiple Classifier Systems*, 2010, Lecture Notes in Computer Science, N. El. Gayer *et al*, vol. 5997, Cairo, Egypt, pp. 33–42.

Invited Talks

- **G. Ditzler**, "An introduction to MapReduce," *Drexel University's Center Biological Discovery from Big Data*, 2015.
- **G. Ditzler**, "Scalable machine learning for knowledge discovery and prediction," *University of Arizona*, 2014.
- **G. Ditzler**, "Scalable machine learning for knowledge discovery and prediction," *Rowan University*, 2014.
- **G. Ditzler**, "Feature Subset Selection for Inferring Relative Importance of Taxonomy," *ACM International Workshop on Big Data in Life Sciences*, 2014.
- **G. Ditzler**, "Generic language modeling using deep neural networks," *AT&T Shannon Research Labs, Florham Park*, NJ, August 2013.

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- **G. Ditzler**, "Functional feature selection over varying sample phenotypes: Integration of feature selection methods into KBase," *Genomic Science Annual Contractor-Grantee Meeting/USDA-DOE Plant Feedstock Genomics for Bioenergy*, November 2013 (**invited**).

Other: Workshops, Theses, and Non-Peer Reviewed Abstracts

- **G. Ditzler** and G. Rosen, "Scalable Subset Selection Using Filters and its Applications," *DTRA/NSF Algorithms Workshop*, Arlington, VA, 2015.
- **G. Ditzler**, "Scalable Subset Selection Using Filters and its Applications," *PhD Thesis*, Drexel University, 2015.
- **G. Ditzler**, "Scaling Up Subset Selection and the Microbiome," *IEEE SSCI Doctoral Consortium*, Orlando, FL, 2014.
- **G. Ditzler**, J. Calvin Morrison, and G. Rosen, "FizzyQIIME: Feature Selection for Metagenomics," *Genomic Science Annual Contractor-Grantee Meeting/USDA-DOE Plant Feedstock Genomics for Bioenergy*, Bethesda, MD, 2014.
- **G. Ditzler**, R. Polikar, and G. Rosen, "Application of a post-hoc Neyman-Pearson hypothesis test for identifying variable importance in comparative metagenomics," *DTRA/NSF/NGA Algorithms Workshop*, Boulder, CO, 2014.
- J.-L. Bouchot, **G. Ditzler**, and G. Rosen, "The Earth Microbiome Project from a Data Science Perspective", *DTRA / NSF / NGA Algorithms Workshop*, Boulder, CO, 2014.
- **G. Ditzler**, Y. Lan, and G. Rosen, "Functional feature selection over varying sample phenotypes: Integration of feature selection methods into KBase," *Genomic Science Annual Contractor-Grantee Meeting/USDA-DOE Plant Feedstock Genomics for Bioenergy*, Bethesda, MD, 2013.
- **G. Ditzler** and G. Rosen, "Deep Learning of Features and Structure of Soil Samples," *DTRA/NSF/NGA Algorithms Workshop*, San Diego, CA, 2012. (**travel award**)
- **G. Ditzler**, "Incremental Learning of Concept Drift from Imbalanced Data," *Master's Thesis*, Rowan University, 2011.

Teaching Experience

- ECE-441A/541: Automatic Control — The University of Arizona
  F2015
- ENGR-01401: Jr./Sr. Engineering Clinic — Rowan University
  F2013, Sp2014, F2014, Sp2015
- ECE-09202: Networks II — Rowan University
  F2010

Activities

Journal Reviewer

- BMC Bioinformatics
- BMC Genomics
- Elsevier Neurocomputing
- IEEE Computational Intelligence Magazine
- IEEE Transactions on Industrial Informatics
- IEEE Transactions on Knowledge and Data Engineering
- IEEE Transactions on Systems, Man, and Cybernetics: Part B
- IEEE Transactions on Neural Networks and Learning Systems
- Springer Neural Computing & Applications Journal
- Springer Neural Processing Letters Journal
- Springer Pattern Analysis & Applications Journal

Conference Reviewer

- Artificial Intelligence Applications and Innovations Conference — 2013

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- IEEE International Joint Conference on Neural Networks 2011-15
- IEEE International Symposium of Circuits & Systems 2011
- IEEE Symposium on Computational Intelligence in Dynamic & Uncertain Environments 2013-15
- International Workshop on Learning Strategies and Data Processing in Nonstationary Environments 2013

Technical Program Committee Member

- ACM International Workshop on Big Data in Life Sciences 2015
- IEEE/INNS International Joint Conference on Neural Networks 2014/15
- IEEE Symposium Series on Computational Intelligence 2013–15
- International Conference on Contemporary Computing (IC3) 2015

University of Arizona Service

- UA Instructional Equipment and Software Planning Committee 2015/16

Other Service

- Drexel IEEE Graduate Forum Board Member (Vice President) 2013/14
- IEEE Region 2 Student Activities Conference Planning Committee 2008
- Penn College IEEE Branch Vice Chair 2007/8

Advising (University of Arizona)

PhD

- Someone (2015–Present)

MSc

- Someone (2015–Present)

Graduate Committees Served

PhD

- Joshua Haas Rowan University, 2015–Present

Software & Technology

Programming Languages

- Experienced (30k+ lines): Python, Matlab, Bash
- Knowledgeable (1k-30k lines): R, Java, C#, C, Verilog HDL, VHDL, LabView
- Dabble (<1k lines): Julia, Lua, Perl

Distributed Computing

- Spark, HTCondor, Univa GridEngine, GPU (Python)
- Applications: DataBricks

Toolkits

- Python: IPython, Jupyter, Matplotlib, Numpy, Pandas, Scikit-Learn, Scipy, Statsmodels, Theano
- Other: CVX (Matlab), Massive Online Analysis (Java), Weka (Java)
- Software: Atom, Eclipse, Emacs, Git, RStudio, Sublime Text 2, Vim

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