



# Gregory Ditzler

*Assistant Professor*

*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
- 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**)
- **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 Lumpur, 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  $\nu$ -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<sup>++</sup>.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.

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- **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.
- **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

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

## 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

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- Springer Pattern Analysis & Applications Journal

#### Conference Reviewer

- Artificial Intelligence Applications and Innovations Conference 2013
- 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

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