Gregory Charles Ditzler

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Career Goals

- Develop solutions to real-world problems using machine learning and mathematical optimization methods.
- Engage engineering students, at both the graduate and undergraduate levels, in research-based education in both the classroom and laboratory setting. Provide undergraduate students the opportunity to be involved and contribute to open research problems.
- Perform collaborative research in the areas described below and in my publications.

Research Interests

concept drift, subset selection, incremental/online learning, multiple classifier systems, class imbalance, data mining, machine learning, comparative metagenomics, bioinformatics

Education

PhD **Drexel University (2011 – Present)**
Electrical & Computer Engineering
Thesis advisor: Gail Rosen, Ph.D.
Research areas: online learning, feature subset selection, and metagenomic data analysis
Committee: Dr. Andrew Cohen, Dr. Robi Polikar, Dr. Gail Rosen, Dr. John M. Walsh, and Dr. Steve Weber

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

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

Employment

Graduate Research Assistant **June 2011 – Present**
Teaching Assistant **Sept. 2011 – April 2013**
Drexel University, Dept. of Electrical & Computer Engineering Philadelphia, PA

Adjunct Professor **Sept. 2010 – Present**
Graduate Research Assistant **May 2009 – July 2011**
Rowan University, Dept. of Electrical & Computer Engineering Glassboro, NJ

Research Intern - Technical II **May 2013 – Aug. 2013**
AT&T Research Labs, Shannon Laboratory Florham Park, NJ

Electronics Systems Engineer **May 2008 – May 2009**
Electronics Systems Intern **March 2007 – May 2008**
QorTek Inc. Williamsport, PA

Teaching Experience

Summer (Su), Spring (Sp), Fall (F), Winter (W)

Course ID	Course Title	Teaching Role	Date(s) Taught	University
ENGR01402	Jr./Sr. Engineering Clinic	Adjunct Professor	F–2013, Sp–2014	Rowan University
ECES302	Signals, Systems & Transforms	Teaching Assistant	Sp–2012, F–2012	Drexel University
ECES352	Introduction to Digital Signal Processing	Teaching Assistant	Su–2012, W–2013	Drexel University
ECES435	Advanced Digital Signal Processing	Teaching Assistant	W–2012	Drexel University
ENGR231	Linear Engineering Systems	Teaching Assistant	F–2011	Drexel University
ECE09202	Networks II	Adjunct Professor	F–2010	Rowan University

Awards/Honors

1. IEEE Computational Intelligence Society Travel Award (Beijing, China) 2014
2. Nihat Bilgutay Research Excellence Award 2013
3. Koerner Family Engineering Research Award 2013
4. Defense Threat Reduction Agency & NSF Algorithms Workshop Travel Grant (San Diego, CA) 2012
5. Graduate Research and Teaching Fellowship, Drexel University 2011–14
6. Student Travel Award for the IJCNN, National Science Foundation (San Jose, CA) 2011
7. Graduate Research Achievement Award[1], Rowan University 2011
8. Graduate Research Assistantship, Rowan University 2009–11
9. Award for Outstanding Leadership & Service to the Pennsylvania College of Technology IEEE Branch 2007/8
10. Penn College Award for Leadership to the College and Community 2008

Professional Affiliations

IEEE Student Member 2004 – Present
IEEE Signal Processing Society 2008 – Present
IEEE Computational Intelligence Society 2009 – Present

Publications

Submitted / Under Revision

4. **G. Ditzler**, M. Austen*, R, Polikar, and G. Rosen, "Scalable Subset Selection and Variable Importance," 2014, In preparation. (* denotes an undergraduate author)
3. **G Ditzler**, J. Calvin Morrison, and G. Rosen, "FizzyQIIME: Feature Selection for Metagenomics," 2014, In preparation.
2. **G. Ditzler**, G. Rosen and R. Polikar, "Passive–aggressive online learning of multiple experts for large volume data streams," 2014, In preparation.
1. **G. Ditzler**, R. Polikar, and G. Rosen, "Learning features and environmental structure across metagenomic samples using deep learning," *IEEE/ACM Transactions on Computational Biology*, 2014, Submitted.

Book Chapters

3. 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*, Springer, 2014, To appear.
2. **G. Ditzler**, Y. Lan, J.-L. Bouchot, and G. Rosen, "Feature selection for metagenomic data analysis," *Encyclopedia of Metagenomics*, 2014, To appear.
1. 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, 2014, In press.

Journals

2. **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*, 2014, Accepted.
1. **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.

Peer Reviewed Conference/Workshop Publications

14. **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, Accepted.

[1] Only one research achievement award is issued to the entire graduate school each year.

13. **G. Ditzler**, G. Rosen, and R. Polikar, "Incremental learning of new classes with unbalanced data," *International Joint Conference on Neural Networks*, 2013, Dallas, TX, In press.
12. **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.
11. **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.
10. **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.
9. **G. Ditzler**, R. Polikar and G. Rosen, "Determining significance in metagenomics," in *North Eastern Biomedical Engineering Conference*, 2012, Philadelphia, PA, pp. 385–386.
8. **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.
7. **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.
6. **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.
5. **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.
4. **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.
3. 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.
2. **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.
1. **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.

Other Publications, Workshops & Abstracts

6. **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*, 2014.
5. **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*, 2014.
4. J.-L. Bouchot, **G. Ditzler**, and G. Rosen, "The Earth Microbiome Project from a Data Science Perspective", *DTRA/NSF/NGA Algorithms Workshop*, 2014.
3. **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*, 2013.
2. **G. Ditzler** and G. Rosen, "Deep Learning of Features and Structure of Soil Samples," *DTRA/NSF/NGA Algorithms Workshop*, 2012.
1. **G. Ditzler**, "Incremental Learning of Concept Drift from Imbalanced Data," *Master's Thesis*, Rowan University, 2011.

Presentations

2. **G. Ditzler**, "Generic language modeling using deep neural networks," *AT&T Shannon Research Labs, Florham Park*, NJ, August 2013.
1. **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*, November 2013 (Invited).

Activities

Journal Reviewer

BMC Bioinformatics	2012
BMC Genomics	2014
Elsevier Neurocomputing	2014
IEEE Transactions on Knowledge and Data Engineering	2013/14
IEEE Transactions on Systems, Man, and Cybernetics: Part B	2013

IEEE Transactions on Neural Networks and Learning Systems 2012–14
Springer Neural Computing & Applications Journal 2012
Springer Neural Processing Letters Journal 2012–14
Springer Pattern Analysis & Applications Journal 2012–14

Conference Reviewer

Artificial Intelligence Applications and Innovations Conference 2013
IEEE International Joint Conference on Neural Networks 2011-14
IEEE International Symposium of Circuits & Systems 2011
IEEE Symposium on Computational Intelligence in Dynamic & Uncertain Environments 2013
International Workshop on Learning Strategies and Data Processing in Nonstationary Environments 2013

Technical Program Committee

IEEE/INNS WCCI Session: Concept Drift, Domain Adaptation & Learning in Dynamic Environments 2014
IEEE Symposium on Computational Intelligence in Dynamic & Uncertain Environments 2013

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

Miscellaneous Skills

Programming Languages: Matlab, Python, Bash, Java, C, C#, LabVIEW, Lua, Verilog HDL, VHDL, and R.
Hardware Programming: Xilinx Spartan/Virtex FPGAs, TI DSPs, microcontrollers (HC12, Silicon Labs, Microchip), Microchip DSPics, Actel FPGAs
General Software: Matlab, Eclipse IDE, Xilinx Platform Studio, LabVIEW, Cadsoft EAGLE, Visual Studio, Actel Libero IDE
Projects: concept drift & class imbalance in incremental learning scenarios, classifier fusion methods for robust speaker identification systems, classifier parameter optimization using genetic algorithms, automated trabecular bone segmentation in CT images, forensic identification using metagenomic samples, integration of feature selection methods into KBase services, deep learning methods for recovering structure in microbial communities, and developing language models using recurrent neural networks.
Other: Linux/Mac/Windows operating systems, LaTeX, Weka, MOA, QIIME, Torch7, Theano

References

Gail Rosen, PhD (Associate Professor): Drexel University
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Robi Polikar, PhD (ECE Chair & Professor): Rowan University
e: polikar@rowan.edu
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Shreekanth Mandayam, PhD (Vice President for Research): Rowan University
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Diamantino Caseiro, PhD (Senior Researcher): Google
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More references are available upon request.