Gregory Charles Ditzler

Contact Information

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Research Interests

pattern recognition algorithms, multiple classifier systems, incremental/online learning, concept drift, class imbalance, data mining, stream mining, machine learning, comparative metagenomics, bioinformatics

Education

PhD **Drexel University (2011 – Present)**
Electrical & Computer Engineering
Thesis advisor: Gail Rosen, Ph.D., and Robi Polikar, Ph.D.
Research areas: online learning, feature selection, and metagenomic data analysis

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

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

Appointments

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

- *As a teaching assistant*, I worked in several sections teaching linear algebra (ENGR231), introduction/advanced digital signal processing (ECES352 / 435), and signals, systems & transforms (ECES302).
- *As a research assistant*, I work with Dr. Gail Rosen in the Ecological & Evolutionary Signal Processing and Informatics Laboratory (EESI). I research machine learning approaches in the field of metagenomics. Some recent work focuses on deep learning methods for metagenomic samples, identifying variable importance using a Neyman-Pearson test, and online learning with multiple experts for large volume data streams.

Adjunct Professor **Sept. 2010 – Present**
Rowan University, Dept. of Electrical & Computer Engineering Glassboro, NJ

- *As an adjunct professor*, I taught a sophomore level AC circuit analysis course. Topics included: Laplace transforms, phasors, three-phase, transient response, forced response, and analog filter design. I have also run two junior/senior clinic research projects in the department of electrical & computer engineering. The projects included comparative analysis of the earth microbiome project, and fundamental work in feature selection.

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

- *As an intern*, I worked under the supervision of Dr. Diamantino Caseiro on the problem of generic language modeling. We researched the use of recurrent neural network language models to combine heterogeneous data sources to improve the quality of the generic model.

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

- *As a research assistant*, I worked with Dr. Robi Polikar in the Signal Processing & Pattern Recognition Laboratory (SPPRL) where I researched methods for learning class imbalance in the presence of concept drift. I have been involved with other projects on speaker identification and multi-objective optimization.

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

- *As an engineer*, I worked on SBIR contracts involving piezoelectric sensor design and signal acquisition. I designed class-*D* amplifiers for piezoelectric and magnetostrictive loads. Responsibilities included: writing SBIR proposals, writing project reports for PI(s), collaborating with contractors to meet deadlines.
- *As an intern*, I programmed various FPGAs using Verilog HDL and microcontollers in C. Worked with experienced engineers for designing circuit boards for amplifiers, signal conditioning circuits, and debug circuits/code.

Teaching Experience

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

Course ID	Course Title	Teaching Role	Date(s) Taught	University
ENGR01402	Jr./Sr. Clinic	Adjunct Professor	F–2013	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

Miscellaneous Experience

Programming Languages: Matlab, Java, Python, Bash, C, C#, LabVIEW, Lua, Verilog HDL, VHDL, and R.
Hardware Programming: Xilinx 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
Relevant Coursework: Digital Image/Signal Processing, Pattern Recognition & Machine Learning, Calculus (I, II, III), Ordinary & Partial Differential Equations, Optimization Theory, Speech Processing, Smart Sensors, Probability Theory, Detection & Estimation Theory, Stochastic Processes, and Bioinformatics
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.
Other: Linux/Mac/Windows operating systems, LaTeX, Weka, MOA, QIIME, Torch7, Theano

Publications

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, 2013, To appear.

Journals

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

13. **G. Ditzler**, G. Rosen, and R. Polikar, "Incremental learning of new classes with unbalanced data," *International Joint Conference on Neural Networks*, 2013, 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, 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, Posters, & Abstracts

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.

Activities

Journal Reviewer

BMC Bioinformatics	2012
IEEE Transactions on Knowledge and Data Engineering	2013
IEEE Transactions on Systems, Man, and Cybernetics: Part B	2013
IEEE Transactions on Neural Networks and Learning Systems	2012/3
Springer Neural Computing & Applications Journal	2012
Springer Neural Processing Letters Journal	2012/3
Springer Pattern Analysis & Applications Journal	2012/3

Conference Reviewer

Artificial Intelligence Applications and Innovations Conference	2013
IEEE International Joint Conference on Neural Networks	2011-13
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 Symposium on Computational Intelligence in Dynamic & Uncertain Environments	2013

Service

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

Awards/Honors

1. Nihat Bilgutay Award 2013
2. Koerner Family Award 2013
3. DTRA/NSF Algorithms Workshop Travel Grant 2012
4. Graduate Research and Teaching Fellowship, Drexel University 2011/12
5. Student Travel Award for the IJCNN, National Science Foundation 2011

6. Graduate Research Achievement Award[1], Rowan University 2011
7. Graduate Research Assistantship, Rowan University 2009
8. Award for Outstanding Leadership & Service to the Pennsylvania College of Technology IEEE Branch 2007/8
9. 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

References

Available upon request.

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