*Curriculum Vitae*

# Gregory Ditzler

Department of Electrical & Computer Engineering
The University of Arizona
1230 E Speedway Blvd
Tucson, AZ 85721
ditzler@arizona.edu
http://gditzler.github.io

## Research Interests

Machine Learning, Adversarial Machine Learning, Learning in a Nonstationary Environment (Concept Drift), Feature Selection, Scalable Machine Learning, Applications: Cybersecurity and Human Health.

## 1 Education

- PhD, Electrical Engineering
  Drexel University 2011–2015
  Thesis: *Scalable Subset Selection with Filters and Its Applications*
  Advisor: Gail L. Rosen, Ph.D.

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

- BSc, Electronics Engineering Technology
  The Pennsylvania College of Technology 2004–2008

## 2 Professional Experience

- Assistant Professor 2015–Present
  Department of Electrical & Computer Engineering
  University of Arizona
  Tucson, AZ

- Research Assistant 2011–2015
  Department of Electrical & Computer Engineering
  Drexel University
  Philadelphia, PA

- Research Intern 2013
  AT&T Research Labs
  Florham Park, NJ

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

- Electronics Systems Engineer 2008/9
  QorTek, Inc.
  Williamsport, PA

## 3 Honors and Awards

2020 National Science Foundation's CAREER Award
2018 Air Force Research Labs Visiting Faculty Fellowship
2018 IEEE CIS Computational Intelligence Magazine Outstanding Paper Award (2015)
2017 IEEE International Conference on Cloud & Autonomic Computing Best Paper Award
2016 Air Force Research Labs Summer Faculty Fellowship
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 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 Award
2013 Koerner Family Engineering Award
2012 Defense Threat Reduction Agency & NSF Algorithms Workshop Travel Grant
2011 NSF Travel Award to the International Joint Conference on Neural Networks
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

## 4 Publications

My h-index as of 03/05/2021 is 14 with 1300+ citations. Citations are documented with publications from advised graduate and undergraduate students.

### Book Chapters

4. S. Woloszynek, Z. Zhao, G. Ditzler, J. R. Price, E. R. Reichenberger, Y. Lan, J. Chen, J. Earl, S. Keshani Langroodi, G. Ehrlich, and G. Rosen, "Analysis Methods for Shotgun Metagenomics," *Springer Theoretical and Applied Aspects of Systems Biology*, 2018, pp. 71–112.

3. 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, 2015.
2. G. Ditzler, Y. Lan, J.-L. Bouchot, and G. Rosen, "Feature selection for metagenomic data analysis," *Encyclopedia of Metagenomics*, 2014.
1. 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.

## Journals

14. J.-H. Jeong, H. Jo, and G. Ditzler, "Convolutional neural networks for pavement roughness assessment using calibration-free vehicle dynamics," *Computer-Aided Civil and Infrastructure Engineering*, 2020.
13. G. Ditzler, S. Miller, and J. Rozenblit, "Learning What We Don't Care About: Regularization with Sacrificial Functions," *Information Sciences*, 2019, vol. 496, pp 198–211.
12. H. Liu and G. Ditzler, "A Semi-parallel Framework for Greedy Information Theoretic Feature Selection," *Information Science*, 2019, vol. 492, pp 13–28.
11. G. Ditzler, R. Shterenberg, N. Bouaynaya, and H. M. Fathallah Shaykh, "Sparse Kalman Filtering for Time-Varying Networks," *BMC BioData Mining*, 2019, vol. 12, no. 9.
10. Z. Liang, D. Schwartz, G. Ditzler, and O. Ozan Koyluoglu, "Weight normalization with spiking neural networks," *Neural Networks*, 2019, vol. 108, pp. 365-378.
9. R. Razavi-Far, E. Hallaji, M. Saif and G. Ditzler, "A Novelty Detector and Extreme Verification Latency Model for Nonstationary Environments," *IEEE Transactions on Industrial Electronics*, 2018, vol. 66, no. 1, pp. 561-570.
8. G. Ditzler, N. Bouaynaya, and R. Shterenberg, "AKRON: An Algorithm for Approximating Sparse Kernel Reconstruction," *Signal Processing*, 2018, vol. 144, pp. 265–270.
7. G. Ditzler, J. LaBarck, J. Ritchie, G. Rosen, and R. Polikar, "Improvements to Scalable Online Feature Selection Using Bagging and Boosting," *IEEE Transactions on Neural Networks and Learning Systems*, 2018. vol. 29, no. 9, pp. 4504-4509.
6. G. Ditzler, R. Polikar, and G. Rosen, "A Sequential Learning Approach for Scaling up Filter-Based Feature Subset Selection," *IEEE Transactions on Neural Networks and Learning Systems*, 2018, vol. 29, no. 6, pp. 2530–2544.
5. G. Ditzler, J. Calvin Morrison, Y. Lan, and G. Rosen, "Fizzy: Feature selection for metagenomics," *BMC Bioinformatics*, 2015, vol 16, no. 358.
4. G. Ditzler, R. Polikar, and G. Rosen, "Multi-Layer and Recursive Neural Networks for Metagenomic Classification," *IEEE Transactions on Nanobioscience*, 2015, vol. 14, no. 6, pp. 608–616.
3. G. Ditzler, M. Roveri, C. Alippi, and R. Polikar, "Adaptive strategies for learning in nonstationary environments: a survey," *IEEE Computational Intelligence Magazine*, 2015, vol. 10, no. 4, pp. 12–25. (**2018 Outstanding Paper Award**)
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*, 2015, vol. 26, no. 4, pp. 880–886.
1. G. Ditzler and R. Polikar, "Incremental learning of concept drift from streaming imbalanced data,"

*IEEE Transactions on Knowledge & Data Engineering*, 2013, vol. 25, no. 10, pp. 2283–2301.

## Conferences

34. H. Liu and G. Ditzler, "Bypassing Temporal Dependency in Adversarial Audio Examples," *IEEE Symposium Series on Computational Intelligence*, 2020.
33. K.-S. Peng, G. Ditzler, and J. Rozenblit, "A Light-Weight Monocular Depth Estimation With Edge-Guided Occlusion Fading Reduction," *International Symposium on Visual Computing*, 2020.
32. H. Liu and G. Ditzler, "Detecting Adversarial Audio via Activation Quantization Error," *IEEE/INNS International Joint Conference on Neural Networks*, 2020.
31. K.-S. Peng, G. Ditzler, and J. Rozenblit, "Self-Supervised Correlational Monocular Depth Estimation using ResVGG Network," *International Conference on Intelligent Systems and Image Processing*, 2019.
30. H. Liu and G. Ditzler, "Poisoning mRMR with Adversarial Data," *IEEE International Conference on Acoustics, Speech and Signal Processing*, 2019.
29. T. Zhao, M. Li and G. Ditzler, "Optimal Online Reconfigurable Antenna State Selection Based on Thompson Sampling," *International Conference on Computing, Networking and Communications*, 2019.
28. Z. Liang and G. Ditzler, "The Impact of an Adversary in a Language Model," *IEEE Symposium on Computational Intelligence and Data Mining*, 2018.
27. S. Hess, P. Satam[#], S. Hariri, and G. Ditzler, "A Framework for Static Malicious HTML File Identification," *ACS/IEEE International Conference on Computer Systems and Applications*, 2018.
26. J. Guo, Z. Liang, E. Scribner, G. Ditzler, N. Bouaynaya and H. Fathallah-Shaykh, "Nonlinear Brain Tumor Model Estimation with Long Short-Term Memory Neural Networks," *IEEE/INNS International Joint Conference on Neural Networks*, 2018.
25. H. Liu and G. Ditzler, "Speeding Up Joint Mutual Information Feature Selection with a Heuristic," *IEEE Symposium on Computational Intelligence in Big Data*, 2017.
24. G. Ditzler and A. Prater, "Learning Variable Selection Models from Adversarial Environments," *IEEE Symposium on Computational Intelligence in Data Mining*, 2017.
23. G. Ditzler, A. Akoglu, and S. Hariri, "High Performance Machine Learning (HPML) Framework to Support DDDAS Decision Support Systems: Design Overview," *Workshop on InfoSymbiotics: DDDAS Dynamic Data Driven Applications Systems*, 2017.
22. S. Makki, R. Haque, Y. Taher, Z. Assaghir, M.-S. Hacid, G. Ditzler, and H. Zeineddine, "Fraud Analysis Approaches in the Age of Big Data – A Review of State of the Art," *International Workshop on Autonomic Systems for Big Data Analytics*, 2017.
21. F. de la Peña Montero, S. Hariri, and G. Ditzler, "A Self-Protection Agent using Error Correcting Output Codes to Secure Computers and Applications," *IEEE International Conference on Cloud and Autonomic Computing*, 2017.
20. E. Esmaili, A. Akoglu, G. Ditzler, S. Hariri, J. Szep and T. Moukabary, "Autonomic Management of 3D Cardiac Simulations," *IEEE International Conference on Cloud and Autonomic Computing*, 2017. (**Best Paper Award**)
19. H. Liu and G. Ditzler, "A Fast Information-theoretic Approximation of Joint Mutual Information Feature Selection," *IEEE/INNS International Joint Conference on Neural Networks*, 2017.
18. V. Carluccio, N. Bouaynaya, G. Ditzler, and H. M. Fathallah Shaykh, "The AKRON-Kalman

Filter for Tracking Time-Varying Networks," *IEEE International Conference on Biomedical and Health Informatics*, 2017.

17. G. Ditzler, "A Study of Incremental Spectral Meta-Learning for Nonstationary Environments," *IEEE/INNS International Joint Conference on Neural Networks*, 2016.
16. G. Ditzler, M. Austen, R, Polikar, and G. Rosen, "Scaling a Neyman-Pearson subset selection approach via heuristics for mining massive data," *IEEE Symposium on Computational Intelligence in Data Mining*, 2014.
15. G. Ditzler and G. Rosen, "Feature Subset Selection for Inferring Relative Importance of Taxonomy," *ACM International Workshop on Big Data in Life Sciences*, 2014. (invited)
14. G. Ditzler, G. Rosen and R. Polikar, "Domain Adaptation Bounds for Multiple Expert Systems Under Concept Drift," *IEEE/INNS International Joint Conference on Neural Networks*, 2014. (**Best Student Paper Award**)
13. G. Ditzler, G. Rosen and R. Polikar, "Incremental learning of new classes with unbalanced data," *IEEE/INNS International Joint Conference on Neural Networks*, 2013.
12. G. Ditzler, G. Rosen and R. Polikar, "Discounted expert weighting for concept drift," *IEEE International Symposium on Computational Intelligence in Dynamic and Uncertain Environments*, 2013.
11. G. Ditzler, R. Polikar, and G. Rosen, "Information theoretic feature selection for high dimensional metagenomic data," *IEEE International Workshop on Genomic Signal Processing and Statistics*, 2012.
10. G. Ditzler, G. Rosen and R. Polikar, "A transductive learning algorithm for concept drift," *IEEE/INNS International Joint Conference on Neural Networks*, 2012.
9. G. Ditzler, R. Polikar and G. Rosen, "Determining significance in metagenomics," *North Eastern Biomedical Engineering Conference*, 2012.
8. G. Ditzler, R. Polikar, and G. Rosen, "Forensic identification with environmental samples," *IEEE International Conference on Acoustic, Speech and Signal Processing*, 2012.
7. G. Ditzler and R. Polikar, "Semi-supervised learning in nonstationary environments," *IEEE/INNS International Joint Conference on Neural Networks*, 2011.
6. G. Ditzler and R. Polikar "Hellinger distance based drift detection algorithm," *IEEE Symposium on Computational Intelligence in Dynamic and Uncertain Environments*, 2011.
5. G. Ditzler, J. Ethridge, R. Polikar, and R. Ramachandran, "Fusion methods for boosting performance of speaker identification systems," *Asia Pacific Conference of Circuits and Systems*, 2010.
4. G. Ditzler, R. Polikar, and N. V. Chawla, "An incremental learning algorithm for nonstationary environments and imbalanced data," *International Conference on Pattern Recognition*, 2010.
3. J. Ethridge, G. Ditzler, and R. Polikar, "Optimal $\nu$-SVM parameter estimation using multi-objective evolutionary algorithms," *IEEE Congress on Evolutionary Computing*, 2010.
2. G. Ditzler and R. Polikar, "An ensemble-based incremental learning framework for concept drift and class imbalance," *IEEE/INNS International Joint Conference on Neural Networks*, 2010.
1. G. Ditzler, M. Muhlbaier, and R. Polikar, "Incremental learning of new classes in unbalanced data: Learn++.UDNC," *International Workshop on Multiple Classifier Systems*, 2010.

## Work in Progress / Submitted / Under Revision

### *Journals*

2. H. Liu and G. Ditzler, "Data Poisoning Against Filter Feature Selection," under revision *Information Sciences*, 2021.
1. G. Ditzler, S. Gupta, P. Satam, and S. Hariri, "Online Ensemble Learning for Robust Intrusion Detection with Large Volume Data Streams," submitted to the *IEEE Transactions on Network and Systems Management*, 2021.

### *Conference*

4. A. Berian, K. Staab, N. Teku, G. Ditzler, T. Bose, and R. Tandon, "Adversarial Filters for Secure Modulation Classification," submitted to the *IEEE International Workshop on Data Driven Intelligence for Networks and Systems*, 2021.
3. S. Gupta, R. Golata, E. Zambrana and G. Ditzler, "Transferability of Adversarial Attacks Against Feature Selection," submitted to the *IEEE/INNS International Joint Conference on Neural Networks*, 2021.
2. S. Hess and G. Ditzler, "OrderNet: Sorting High-Dimensional Low-Sample Data with Few-Shot Learning," submitted to the *IEEE/INNS International Joint Conference on Neural Networks*, 2021.
1. D. Schwartz and G. Ditzler, "An Algorithm for Adversarial Training to Improve Neural Network Robustness," submitted to the *IEEE/INNS International Joint Conference on Neural Networks*, 2021.

### *In Progress*

3. K.-S. Peng, G. Ditzler, and J. Rozenblit, "Self-Supervised Correlational Monocular Depth Estimation using a Hybrid Network," in preparation, 2021.
2. K.-S. Peng, G. Ditzler, and J. Rozenblit, "Weakly Semi-Supervised Joint Semantic Understanding for Segmentation and Depth Estimation," in preparation, 2021.
1. D. Schwartz, N. Thurston, T. Sawyer, J. Barton, and G. Ditzler, "Early Ovarian Cancer Detection in Mice," in preparation, 2021.

## 5 Invited Talks

22. "Soft Weight Networks for Few-Shot Learning," *University of Arizona*, Department of Mathematics, Modeling Seminar Tucson, AZ, 2019.
21. "Soft Weight Networks for Few-Shot Learning," *Rowan University*, Department of Electrical and Computer Engineering, Glassboro, NJ, 2019.
20. "Soft Weight Networks for Few-Shot Learning," *Drexel University*, Department of Electrical and Computer Engineering, Philadelphia, PA, 2019.
19. "Soft Weight Networks for Few-Shot Learning," *University of Arizona*, Department of Aerospace and Mechanical Engineering, Tucson, AZ, 2019.
18. "Lifelong Learning in Large Volume Data Streams, Multilayer Mapping of Cyberspace, and Malicious HTML File Prediction," *Franco-American Workshop on Cybersecurity*, Lyon, France, 2018.
17. "Large Scale Feature Selection and Its Applications," *Keynote Speaker at the International Conference on Control Engineering & Information Technology*, Sousse, Tunisa, 2017.
16. "Large Scale Feature Selection and Its Applications," *Plenary Speaker at the IEEE Symposium on Computational Intelligence in Data Mining*, Honolulu, HI, 2017.

15. "Learning What We Don't Care About: Regularization with Sacrificial Functions," *University of Arizona*, Dept. of AME, 2017.
14. "Introduction to Machine Learning," Fifth Franco-American Workshop on Cybersecurity, Lyon, France, 2017.
13. "Model Optimization with Sacrificial Functions," *Fifth Franco-American Workshop on Cybersecurity*, Lyon, France, 2017.
12. "A Tactical Cyber-Immune System," *Fifth Franco-American Workshop on Cybersecurity*, Lyon, France, 2017. (with S. Hariri)
11. "Big Data Panel," *Annual Conference of the Prognostics and Health Management Society*, Denver, CO, 2016.
10. "Feature Selection: With and Without an Adversary," *Air Force Research Laboratory*, Rome, NY, 2016.
9. "Feature selection and learning in nonstationary environments," *Rincon Research Corporation*, Tucson, AZ, 2016.
8. "Scaling up feature subset selection," *Raytheon Information Systems and Computing Symposium*, Desert Diamond Casino Conference Center, Tucson, AZ, 2016.
7. "Scalable machine learning and its applications to life science," *University of Arizona*, Dept. of SIE, Tucson, AZ, 2015.
6. "Scalable machine learning and its applications to life science," *University of Arizona*, Dept. of ECE, Tucson, AZ, 2015.
5. "An introduction to learning in nonstationary environments," *IEEE Symposium Series on Computational Intelligence*, South Africa, 2015. (with G. Boracchi)
4. "An introduction to MapReduce," *Drexel University's Center Biological Discovery from Big Data*, Philadelphia, PA, 2015.
3. "Feature Subset Selection for Inferring Relative Importance of Taxonomy," *ACM International Workshop on Big Data in Life Sciences*, Newport Beach, CA, 2014. (with G. Rosen)
2. "Generic language modeling using deep neural networks," *AT&T Shannon Research Labs*, Florham Park, NJ, August 2013. (with D. Caserio)
1. "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*, Washington, DC, November 2013. (with G. Rosen and Y. Lan)

## 6 Funding

### Current

- "Hormonal Response to Infant Caregiving: A Novel Strategy to Break the Opioid Relapse Cycle during the Postpartum Period," *National Institutes of Health*, Senior Personnel, $2,295,326, 2020–Present.
- "Tactical Cyber Immune System," *Army Research Office STTR Phase II*, PI, $200,000, 2020–Present.
- "REU Site: CAT Vehicle: The Cognitive and Autonomous Test Vehicle," *National Science Foundation*, Co-PI, $415,000, 2020–Present.
- "CAREER: Learning in Adversarial and Nonstationary Environments," *National Science Foun-*

*dation*, PI, $500,000, 2020–Present.
- "AMAP-based Autonomic Security Operations Center," *Air Force Research Lab SBIR Phase II*, Co-PI, $200,000. 2019–Present.
- "PACT: Partnership for Proactive Cybersecurity Training," *Department of Energy*, Co-PI, $3,000,000. 2019–Present.

### Previous

- "Doctoral Symposium at the IEEE International Conference on Autonomic Computing," *National Science Foundation*, PI, $15,000, 2018.
- "Multi-Layer Anomaly Behavior Analysis (MLABA) Methodology," *Office of Naval Research STTR Phase I*, PI, $15,000, 2018/19.
- "Adversarial Threats to Feature Selection," *Air Force Office of Scientific Research VFRP*, PI, $15k, 2018.
- "Techniques to Adjust Computational Trends Involving Changing Data," *Office of Naval Research STTR Phase I*, PI, $54,000, 2018.
- "Support of the Doctoral Symposium at the IEEE International Conference on Cloud and Autonomic Computing," *National Science Foundation*, PI, $15,000, 2018.
- "Autonomic Monitoring, Analysis, and Protection," *Air Force Office of Scientific Research STTR Phase II*, PI, $30,000, 2016/17.
- "Tactical Cyber Immune System," *Army Research Office STTR Phase I*, PI, $30,000, 2016/17.
- "Analysis of Large Data Sets," *Air Force Office of Scientific Research SFFP*, PI, $15,000, 2016.

## 7 University of Arizona Service

- CoE Software Engineering Degree Planning Committee — 2020–Present
- ECE Executive Committee — 2016/17; 2020–Present
- ECE Faculty Search Committee — 2019
- ECE Graduate Recruitment Committee — 2019/20
- ECE Graduate Studies Committee — 2017/18
- ECE Instructional Equipment and Software Planning Committee — 2015/16
- ECE Undergraduate Studies Committee — 2018/19

## 8 Extramural

### 8.1 Societies

- IEEE (S'04; M'14; SM'18)
  - IEEE Computational Intelligence Society
  - IEEE Signal Processing Society
  - IEEE Young Professionals

### 8.2 Associate Editor

- Cluster Computing — 2018–Present

- IEEE Transactions on Neural Networks and Learning Systems 2018–Present

### 8.3 IEEE Service

- Computational Intelligence Society Committee on Big Data Outreach 2017–Present
- Computational Intelligence Society Graduate Research Fellowships Committee 2016
- Computational Intelligence Society Mentoring Program 2020
- Computational Intelligence Society Neural Networks Technical Committee 2019–Present
- Computational Intelligence Society Social Media Outreach Committee 2017–Present
- Computational Intelligence Society Summer School Subcommittee 2017–Present
- Computational Intelligence Society Webinars Subcommittee 2016/20

### 8.4 Journal Review

- ACM Computing Surveys
- BMC Bioinformatics
- BMC Genomics
- Elsevier Neurocomputing
- EURASIP Journal on Bioinformatics and Systems Biology
- Evolving Systems
- IEEE Computational Intelligence Magazine
- IEEE Transactions on Industrial Informatics
- IEEE Transactions on Knowledge and Data Engineering
- IEEE Transactions on Signal Processing
- IEEE Transactions on Cybernetics
- IEEE Transactions on Systems, Man, and Cybernetics: Part B
- IEEE Transactions on Neural Networks and Learning Systems
- IET Generation, Transmission & Distribution
- Springer Machine Learning
- Springer Neural Computing & Applications Journal
- Springer Neural Processing Letters Journal
- Springer Pattern Analysis & Applications Journal

## 9 Teaching

- Automatic Control: ECE441a/541a
  Offered: Fa2015, Fa2017, Fa2019
- Computer Programming for Engineering Applications: ECE175
  Offered: Sp2016, Fa2016
- Digital Signal Processing: ECE429/529
  Offered: Fa2018, Fa2020
- Engineering Applications of Machine Learning and Data Analytics: ECE523
  Offered: Sp2017, Sp2018, Sp2019, Sp2020, Sp2021
  *I developed this course at the University of Arizona.*

## 10 Graduate Student Advising

### Current

- Jonathan Gill, PhD — 2020–Present
- Srishti Gupta, MSc — 2020–Present
- Jason Ligon, PhD — 2018–Present
- Sam Hess, PhD — 2017–Present
- David Schwartz, PhD — 2021–Present
- Kory Staab, PhD — 2021–Present

### Alumni (2 PhD; 2 MSc)

- Jiashu Guo, MSc — 2018
- Zhengzhong Liang, MSc — 2018
- Heng Liu, PhD — 2021
- Kuo Peng, PhD — 2019

## Citations by Year (per Google Scholar)

H-index=14; I10=18; Citations=1332.