Walter Gerych
Framingham, MA wgerych@wpi.edu

RESEARCH INTERESTS

Machine Learning, Deep Learning, Semi-Supervised Learning, Generative Modeling, Human Activity Recognition, Machine Learning for Healthcare

EDUCATION

Worcester Polytechnic Institute, *Worcester, MA* 12/2017 - Current
PhD, Data Science Expected 05/2023
MS, Data Science; GPA: 4.0/4.0 12/2019

SUNY Geneseo, *Geneseo, NY* 08/2013 - 04/2017
BS, Mathematics
Edgar Fellows Honors Program

RESEARCH EXPERIENCE

Worcester Polytechnic Institute, Research Assistant 06/2018 –Current
Advisors: Elke Rundensteiner, Emmanuel Agu

- Working on DARPA WASH project
  - Team of five students, two professors, and four medical collaborators
  - Developed methods to detect physical activity using mobile sensors
  - Created deep-learning classifiers to detect symptoms of influenza from sensor data
  - Proposed generative model to synthesize user-specific activity data
  - Developed generative methods for activity data augmentation
  - Developed method for detecting depression from changes in activity data

- Developing methods for stabilizing GAN training
- Proposed first study of and algorithms for identifiable biased positive-unlabeled learning
- Created Bayesian Network-based recurrent approach for multi-label learning
- Developed first deep-learning formulation of Maximum Variance Unfolding
- Proposed method to perform classification from biased sequential partially labeled data
- Developed deep anomaly detection technique based on Wasserstein autoencoders

- Collaborated on the following research projects:
  - Knowledge amalgamation for multi-label and multi-task learning
  - Mathematically rigorous theoretical comparison of fair-ranking metrics
  - Conditional generative models for text
  - Early classification of irregularly sampled time series
  - Few-shot learning for human activity data
  - Open-set classification using likelihood-based generative models
  - Visualization tools for human activity data and health

MIT Lincoln Lab, Intern 05/2022 –08/2022
Advisor: John Moores

- Developed deep models to forecast optical turbulence timeseries
- Created novel multi-stream Seq2Seq network to incorporate asynchronous exogenous variable streams for optical turbulence prediction
- Designed next-frame prediction network for optical turbulence phase screen prediction
- Performed robust analysis on scintillation for multiple wavelengths of real-world optical link

Kansas State University, Research Intern 05/2015 - 08/2015
PI: Jeremy LeCrone

- Developed cellular automata method for modeling mean curvature flow

SELECTED HONORS & AWARDS

DARPA Riser, *DARPA* 2022
DARPA award for early-career scientists identified as up-and-coming in their field
Data Science Leadership Award, *WPI,* 2021, 2020
Best Poster, *Graduate Research Innovation and Exchange, WPI* 2022, 2021
Best Poster Finalist, *Graduate Research Innovation and Exchange, WPI* 2020
V. Ambujamma Memorial Scholarship, *SUNY Geneseo* 2016
For outstanding achievement as a student of mathematics

PUBLICATIONS

I have first-author publications in NeurIPS, AAAI, SDM, CIKM, AIES, Big Data, ICMLA, and ICSC.

1. Knowledge Amalgamation for Multi-Label Classification via Label Dependency Transfer.
   Jidapa Thadajarassiri, Thomas Hartvigsen, **Walter Gerych**, Xiangnan Kong, Elke Rundensteiner. To appear in **AAAI**, 2023.

2. ***Positive Unlabeled Learning with a Sequential Selection Bias.***
   Walter Gerych, Thomas Hartvigsen, Luke Buquicchio, Emmanuel Agu, Elke Rundensteiner. **SDM**, 2022.

3. ***Robust Recurrent Classifier Chains for Multi-Label Learning with Missing Labels.***
   Walter Gerych, Thomas Hartvigsen, Luke Buquicchio, Emmanuel Agu, Elke Rundensteiner. **CIKM,** 2022.

4. ***Stop&Hop: Early Classification of Irregular Time Series***
   Thomas Hartvigsen, **Walter Gerych**, Jidapa Thadajarassiri, Xiangnan Kong, Elke Rundensteiner. **CIKM,** 2022.

5. ***Recovering The Propensity Score From Biased Positive Unlabeled Data.***
   Walter Gerych, Thomas Hartvigsen, Luke Buquicchio, Emmanuel Agu, Elke Rundensteiner. **AAAI**, 2022.
   Oral spotlight.

6. *On Detecting COVID-Risky Behavior from Smartphones.*
   Thomas Hartvigsen*, **Walter Gerych* (Joint First Author)**, Marzyeh Ghassemi. **Workshop on Epidemiology meets Data Mining and Knowledge Discovery, KDD**, 2022.

7. *Triplet-based Domain Adaptation (Triple-DARE) for Lab-to-field Human Context Recognition.*
   Abdulaziz Alajaji, **Walter Gerych**, Luke Buquicchio, Kavin Chandrasekaran, Hamid Mansoor, Emmanuel Agu, Elke Rundensteiner. **IEEE PerCom Industry Track**, 2022.

8. *Recurrent Bayesian Classifier Chains for Exact Multi-Label Classification.*
   Walter Gerych, Tom Hartvigsen, Luke Buquicchio, Emmanuel Agu, Elke Rundensteiner. **NeurIPS**, 2021.

9. *GAN For Generating User-Specific Human Activity Data From An Incomplete Training Corpus.*
   Walter Gerych, Harrison Kim, Joshua DeOliveira, MaryClare Martin, Luke Buquicchio, Kavin Chandrasekaran, Abdulaziz Alajaji, Hamid Mansoor, Emmanuel Agu, Elke Rundensteiner. **IEEE Big Data** 4th Special Session on HealthCare Data, 2021.

10. *Variational Open Set Recognition.*
    Luke Buquicchio, **Walter Gerych**, Kavin Chandrasekaran, Abdulaziz Alajaji, Hamid Mansoor, Thomas Hartvigsen, Elke Rundensteiner, Emmanuel Agu. **IEEE Big Data**, 2021.

11. *Local Geometry Preserving Deep Networks For Featurizing High-Dimensional Datasets.*
    Walter Gerych, Jessica Bader, Declan Nelson, Thalia Chai-Zhang, Luke Buquicchio, Abdulaziz Alajaji, Kevin Chandrasekaran, Emmanuel Agu, Elke Rundensteiner. **IEEE ICMLA**, 2021.

12. *Few-Shot Classification for Human Context Recognition Using Smartphone Data Traces.*
    Luke Buquicchio, **Walter Gerych**, Abdulaziz Alajaji, Kavin Chandrasekaran, Hamid Mansoor, Emmanuel Agu, and Elke Rundensteiner. **IEEE ICMLA**, 2021.

13. *Visual Analytics of SmartphoneSensed Human Behavior and Health.*
    Hamid Mansoor, **Walter Gerych**, Abdulaziz Alajaji, Luke Buquicchio, Kavin Chandrasekaran, Emmanuel Agu, Elke Rundensteiner. **IEEE Computer Graphics and Applications**, 2021.

14. *Smartphone Health Biomarkers: Positive Unlabeled Learning of In-the-Wild Contexts.*
    Abdulaziz Alajaji, **Walter Gerych**, Luke Buquicchio, Kavin Chandrasekaran, Emmanuel Agu, Elke Rundensteiner. **Pervasive Computing**, 2021.

15. *Measuring Group Advantage: A Comparative Study of Fair Ranking Metrics.*
    Caitlin Kuhlman*, **Walter Gerych* (Joint First Author)**, Elke A. Rundensteiner. **AIES**, 2021.

16. *PLEADES: Population Level Observation of Smartphone Sensed Symptoms for In-the-wild Data*
    Hamid Mansoor, **Walter Gerych**, Abdulaziz Alajaji, Luke Buquicchio, Kavin Chandrasekaran, Emmanuel Agu, Elke Rundensteiner. **VISIGRAPP**, 2021.

17. ***Complex Activity Recognition Using Topic Models for Feature Generation from Wearable Sensor Data.***
Kavin Chandrasekaran, **Walter Gerych**, Luke Buquicchio, Abdulaziz Alajaji, Emmanuel Agu, Elke Rundensteiner. **SMARTCOMP**, 2021.

18. ***BurstPU: Classification of Weakly Labeled Datasets with Sequential Bias.***
Walter Gerych, Luke Buquicchio, Kavin Chandrasekaran, Abdulaziz Alajaji, Hamid Mansoor, Aidan Murphy, Emmanuel Agu, Elke Rundensteiner. **IEEE Big Data**, 2020.

19. ***INTOSIS: Interactive Observation of Smartphone Inferred Symptoms for In-The-Wild Data.***
Hamid Mansoor, **Walter Gerych**, Luke Buquicchio, Abdulaziz Alajaji, Kavin Chandrasekaran, Emmanuel Agu, Elke Rundensteiner. **IEEE Big Data**, 2020.

20. ***DeepContext: Parameterized Compatibility-Based Attention CNN for Human Context Recognition.***
Abdulaziz Alajaji, **Walter Gerych**, Kavin Chandrasekaran, Luke Buquicchio, Emmanuel Agu, Elke Rundensteiner. **ICSC**, 2020.

21. ***ARGUS: Interactive Visual Analytics Framework for the Discovery of Disruptions in Bio-Behavioral Rhythms.***
Hamid Mansoor, **Walter Gerych**, Luke Buquicchio, Kavin Chandrasekaran, Emmanuel Agu, Elke Rundensteiner. **EuroVis** (Short Papers), 2020.

22. ***COMEX: Identifying Mislabeled Human Behavioral Context Data Using Visual Analytics.***
Hamid Mansoor, **Walter Gerych**, Luke Buquicchio, Kavin Chandrasekaran, Emmanuel Agu, Elke Rundensteiner. **COMPSAC**, 2019.

23. ***Classifying Depression in Imbalanced Datasets Using an Autoencoder- Based Anomaly Detection Approach.***
Walter Gerych, Emmanuel Agu, Elke Rundensteiner. **ICSC**, 2019.

IN SUBMISSION:

Conditional Sequence Generative Adversarial Networks for Text Generation.
ML Tlachac, **Walter Gerych**, Kratika Agrawal, Nicholas Jurovich, Benjamin Litterer, Saitheeraj Thatigotla, Jidapa Thadajarassiri, Elke Rundensteiner.

Support Aligment to Improve Stability of GAN Convergence
Walter Gerych, Kevin Hickey, Thomas Hartvigsen, Luke Buquicchio, Emmanuel Agu, Elke Rundensteiner.

SUPERVISED UNDERGRADUATE PAPERS:

Human Context Recognition: A Controllable GAN Approach
Joshua DeOliveira, Harrison Kim, MaryClare Martin**, Walter Gerych**, Elke Rundensteiner. **IEEE URTC**, 2021

Positive Unlabeled Gradient Boosting

Caitlin Timmons, Andrea Boskovic, Sreeharsha Lakamsani, **Walter Gerych**, Luke Buquicchio, Elke Rundensteiner. **IEEE URTC**, 2020

Neural Network for Nonlinear Dimension Reduction Through Manifold Recovery

Jessica Bader, Declan Nelson, Thalia Chai-Zhang, **Walter Gerych**, Elke Rundensteiner. **IEEE URTC**, 2019

TEACHING/MENTORING

I have mentored teams of REU students every summer since 2019. I have also mentored three teams of students on their "Major Qualifying Projects" (year-long capstone projects). I typically give the students a research topic and direction, and then meet with them at least twice a week to resolve any issues and provide next steps.

Students Advised:

- Joshua DeOliveira, MS, WPI 05/2021–Current
- Cindy Trac, BS, WPI 08/2022–Current
- Sirut Buasai, BS, WPI 08/2022–Current
- Jason Dykstra, BS, WPI 08/2022–Current
- Dillon McCarthy, BS, WPI 08/2022–Current
- Aruzhan Koshkarova, BS, WPI 05/2022–08/2022
- Alek Lewis, BS, WPI 08/2021–05/2022
- Ryan Astor, BS, WPI 08/2021–05/2022
- Kyle Costello, BS, WPI 08/2021–05/2022
- Harrison Kim, BS, Northeastern University 05/2021–08/2021
- MaryClare Martin, BS, Holy Cross 05/2021–08/2021
- Jesse Abeyta, BS, WPI 08/2020–05/2021
- Vinay Nair, BS, WPI 08/2020–05/2021
- Nicholas Cheng, BS, WPI 08/2020–05/2021
- Bryan Gass, BS, WPI 08/2020–05/2021
- Caitlin Timmons, BS, Smith College 05/2020–08/2020
- Andrea Boskovic, BS, Amherst College 05/2020–08/2020
- Sreeharsha Lakamsani, BS, Arizona State University 05/2020–08/2020
- Jessica Bader, BS, Iowa State University 05/2019–08/2019
- Declan Nelson, BS, Georgia Institute of Technology 05/2019–08/2019
- Thalia Chao-Zhang, BS, Bard College 05/2019–08/2019

Developed workshop on Engaging Research Presentations for Graduate Students, WPI 01/2022
Lead workshop on Creating Engaging Presentations for Undergrads, WPI 06/2021
Developed workshop on Deep Learning with PyTorch for Undergrads, WPI 05/2019

Teaching assistant for Introduction to Data Science graduate class, WPI 01/2018-05/2018

SERVICE

Data Science Student Council, WPI	2019-Current
President of Council	2021-Current
Vice President	2020-2021
Judge for Graduate Qualifying Project Research Exchange, WPI	2021
Volunteer at Women in Data Science Conference @ WPI, WPI	2020, 2021
Organized Deep Learning Reading Group, WPI	2019-2020
Founder and President of Data Science Club, SUNY Geneseo	2016-2017