Walter Gerych
Framingham, MA   wgerych@mit.edu

RESEARCH INTERESTS

My research is on **Trustworthy Machine Learning**, with a focus on debiasing large pretrained models using efficient and minimally invasive approaches that maintain downstream performance.

EDUCATION

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

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

RESEARCH EXPERIENCE

MIT CSAIL, Postdoctoral Associate   10/2023 – Current
- Working under Prof. Ghassemi in CSAIL's HealthyML group.
- Researching methods to debias pretrained models, metric learning for diabetes subtyping, modeling uncertainty in survivorship analysis, and on verifying generative models

Worcester Polytechnic Institute, Research Assistant   06/2018 – 10/2023
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

- o Open-set classification using likelihood-based generative models
- o Visualization tools for human activity data and health

IBM Research, Research Scientist Intern   05/2023 –08/2023
Mentor: Yara Rizk, Manager: Vatche Isahagian
- Conducted research into measuring confidence of large language models (LLMs)
- Developed unsupervised system to select the optimal LLM and prompt template for each user query
- Submitted paper at AAAI 2024 on research carried out during internship *(accepted for publication)*
- Submitted patent disclosure on system developed during internship
  - o *Title: "A Method For Selecting Foundation Model-Prompt Pairs Using Estimated Confidences"*
  - o *Inventors: Yara Rizk, Walter Gerych, Vinod Muthusamy, Vatche Isahagian, Praveen Venkateswaran, Evelyn Duesterwald*

MIT Lincoln Lab, Intern   05/2022 –10/2023
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

PUBLICATIONS

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

1. *BendVLM: Test-Time Debiasing of Vision-Language Embeddings.*
   Walter Gerych Haoran Zhang, Kimia Hamidieh, Eileen Pan, Maanas Sharma, Thomas Hartvigsen, Marzyeh Ghassemi. **NeurIPS,** 2024.

2. *Identifying implicit social biases in vision-language models*
   Kimia Hamidieh, Haoran Zhang, Walter Gerych, Thomas Hartvigsen, Marzyeh Ghassemi. **AIES,** 2024.

3. *TAXI: Evaluating Categorical Knowledge Editing for Language Models.*
   Derek Powell, **Walter Gerych**, Thomas Hartvigsen. **ACL,** 2024.

4. *Who Knows the Answer? Finding the Best Model & Prompt Using Confidence-Based Search.*
   Walter Gerych, Yara Rizk, Vatche Isahagian, Vinod Muthusamy, Evelyn Duesterwald, Praveen Venkateswaran. **AAAI,** 2024.

5. *Amalgamating Multi-Task Models with Heteogeneous Architectures.*
   Jidapa Thadajarassiri, **Walter Gerych**, Xiangnan Kong, Elke Rundensteiner. **AAAI,** 2024.

6. *Debiasing Pretrained Generative Models By Uniformly Sampling Semantic Attributes.*
   Walter Gerych, Kevin Hickey, Luke Buquicchio, Kavin Chandrasekaran, Abdulaziz Alajaji, Emmanuel Agu, Elke Rundensteiner. **NeurIPS**, 2023

7. *Stabilizing Adversarial Training for Generative Networks.*
   Walter Gerych*, Kevin Hickey* (Joint First Author), Thomas Hartvigsen, Luke Buquicchio, Abdulaziz Alajaji, Kavin Chandrasekaran, Hamid Mansoor, Emmanuel Agu, Elke Rundensteiner. **IEEE Big Data MLDB**, 2023.

8. *Population-Level Visual Analytics of Smartphone Sensed Health Using Community Phenotypes.*
   Hamid Mansoor, **Walter Gerych**, Abdulaziz Alajaji, Luke Buquicchio, Kavin Chandrasekaran, Emmanuel Agu, Elke Rundensteiner. **IEEE ICHI,** 2023.

9. *Adversarial Human Context Recognition: Evasion Attacks and Defenses.*
   Abdulaziz Alajaji, **Walter Gerych**, Kavin Chandrasekaran, Luke Buquicchio, Emmanuel Agu, Elke Rundensteiner. **IEEE COMPSAC**, 2023.

10. *Knowledge Amalgamation for Multi-Label Classification via Label Dependency Transfer.*
    Jidapa Thadajarassiri, Thomas Hartvigsen, **Walter Gerych**, Xiangnan Kong, Elke Rundensteiner. **AAAI**, 2023. **Oral spotlight.**

11. *Domain Adaptation Methods for Lab-to-Field Human Context Recognition.*
    Abdulaziz Alajaji, **Walter Gerych**, Luke Buquicchio, Kavin Chandrasekaran, Hamid Mansoor, Emmanuel Agu, Elke Rundensteiner. **Sensors 23(6)**, 2023.

12. *INPHOVIS: Interactive Visual Analytics For Smartphone-Based Digital Phenotyping.*
    Hamid Mansoor, **Walter Gerych**, Abdulaziz Alajaji, Luke Buquicchio, Kavin Chandrasekaran, Emmanuel Agu, Elke Rundensteiner, Angela Incollingo Rodriguez. **Visual Informatics**, 2023.

13. *HAR-CTGAN: A Mobile Sensor Data Generation Tool for Human Activity Recognition.*
    Joshua DeOliveira, **Walter Gerych**, Aruzhan Koshkarova, Elke Rundensteiner, Emmanuel Agu. **IEEE Big Data 4th Special Session on HealthCare Data**, 2022.

14. *Text Generation to Aid Depression Detection: A Comparative Study of Conditional Sequence GANs*
    ML Tlachac, **Walter Gerych**, Kratika Agrawal, Benjamin Litterer, Nicholas Jurovich, Saitheeraj Thatigotla, Jidapa Thadajarassiri, Elke Rundensteiner. **IEEE Big Data 4th Special Session on HealthCare Data**, 2022.

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

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

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

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

19. *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.

20. *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.

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

22. *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.

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

24. *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.

25. *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.

26. *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.

27. *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.

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

29. *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.

30. *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.

31. *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.

32. *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.

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

34. *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.

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

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

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

SELECTED HONORS & AWARDS
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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	

TEACHING/MENTORING

I have mentored teams of REU students every summer since 2019. I have also mentored 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:

• Anastasia Dunca, BS, MIT	08/2024–Current
• Maanas Sharma, BS, MIT	02/2024–Current
• Nathan Zekarias, BS, UMD	05/2024–11/2024
• Joshua DeOliveira, MS, WPI	05/2021–05/2023
• Cindy Trac, BS, WPI	08/2022–05/2023
• Sirut Buasai, BS, WPI	08/2022–05/2023
• Jason Dykstra, BS, WPI	08/2022–05/2023
• Dillon McCarthy, BS, WPI	08/2022–05/2023
• 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 – Conferences and Workshops

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Senior Area Chair for CHIL	2024
Organization Committee for TS4H@ICLR	2021
Reviewer for NeurIPS, AAAI, ICLR, KDD, ML4H, CHIL	

SERVICE - Departmental

Data Science Student Council, WPI	2019-2023
President of Council	2021-2023
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