Tom Hartvigsen

twhartvigsen@wpi.edu thartvigsen.github.io

INTERESTS: Data Mining, Recurrent Neural Networks, Time Series, Reinforcement Learning, Interpretability.

EDUCATION

Worcester Polytechnic Institute, *Worcester, MA*

Ph.D., Data Science — Expected Dec. 2021
Advisors: Prof. Elke Rundensteiner, Prof. Xiangnan Kong
Dissertation Title: *Observation and Prediction Timing in Time Series Classification*.
Committee Members: Prof. Randy Paffenroth (WPI), Prof. Jenna Wiens (U. Mich.)

M.S., Data Science — 2018
Advisors: Prof. Elke Rundensteiner, Prof. Xiangnan Kong
Thesis: *Adaptive-Halting Policy Network for Early Classification*.

SUNY Geneseo, *Geneseo, NY*

B.A., Applied Mathematics — May 2016
BioMathematics minor
Advisors: Prof. Chris Leary, Prof. Kirk Anne

EXPERIENCE

PhD Research Fellow, *Worcester Polytechnic Institute* — Aug 2016 - present
Solving time series classification problems for time-sensitive domains. I supervised two masters theses, led three summers of NSF-funded undergrad research, and wrote one NSF grant based on my research..
Advisors: Prof. Elke Rundensteiner, Prof. Xiangnan Kong

Research Intern (Machine Learning - NLP), *UMass Medical School* — 2018 - 2019
Developed an automatic text summarization tool for clinical trial eligibility criteria to be used in recommendation for new clinical trials.
Supervisor: Dr. Jomol Matthew

NSF REU Intern, *University of Arizona, Department of Environmental Science* — Summer 2015
Built an instance-segmentation model for remotely-captured images of creosote bushes to model the effects of drought over time in the sonoran desert.
Supervisor: Prof. Shirley Papuga

Research Assistant, *SUNY Geneseo* — 2013 - 2016
Modeled infection spread on graphs, built a graph dataset from IMDB, and mined song lyrics for text features useful for discriminating genres and artists.
Supervisors: Prof. Chris Leary, Dr. Kirk Anne

HONORS & AWARDS

CIKM Student Travel Award, ACM — 2020
KDD Student Travel Award, NSF and ACM — 2020
Best Poster, HEALTHINF — 2020
Graduate Student Travel Award ($1000), WPI — 2020
IMA Travel Award ($500), University of Minnesota — 2019
KDD Student Travel Award ($500), NSF and ACM — 2019
Graduate Student Travel Award ($1000), WPI — 2019
Outstanding Graduate Research Award, WPI Data Science — 2019
Best Poster ($500), Graduate Research Innovation and Exchange, WPI — 2019

Graduate Student Travel Award ($1000), WPI 2018
Graduate Student Travel Award ($1000), WPI 2017
GAANN Fellowship (Tuition Award + Annual Stipend), U.S. Department of Education 2016

PUBLICATIONS

FULL PAPERS UNDER REVIEW

25. *Continuous-Time Attention Networks for Irregularly-Sampled Time Series Classification.*
Thomas Hartvigsen, Jidapa Thadajarassiri, Xiangnan Kong, Elke Rundensteiner.

24. *Learning Saliency Maps to Explain Deep Time Series Classifiers.*
Prathyush Parvatharaju, Ramesh Doddiah, **Thomas Hartvigsen**, Elke Rundensteiner.

23. *Recurrent Bayesian Classifier Chains for Exact Multi-label Classification.*
Walter Gerych, **Thomas Hartvigsen**, Luke Buquicchio, Elke Rundensteiner.

22. *Explainable Text Classification with Partially-Labeled Human Attention.*
Jidapa Thadajarassiri, Dongyu Zhang, **Thomas Hartvigsen**, Cansu Sen, Xiangnan Kong, Elke Rundensteiner.

21. *Positive Unlabeled Learning with a Sequential Selection Bias.*
Walter Gerych, **Thomas Hartvigsen**, Luke Buquicchio, Kavin Chandrasekaran, Abdulaziz Alajaji, Hamid Mansoor, Elke Rundensteiner, Emmanuel Agu.

20. *Exact Multi-Label Classification with Incompletely Labeled Data.*
Walter Gerych, **Thomas Hartvigsen**, Luke Buquicchio, Elke Rundensteiner, Emmanuel Agu.

19. *Multi-State Brain Network Discovery.*
Hang Yin, Xinyue Liu, Xiangnan Kong, **Thomas Hartvigsen**, Yanhua Li.

18. *Energy-Efficient Models for High-Dimensional Spike Train Classification using Sparse Spiking Neural Networks.*
Hang Yin, John Boaz Lee, Xiangnan Kong, **Thomas Hartvigsen**, Sihong Xie.

17. *Variational Open-Set Recognition.*
Luke Buquicchio, Walter Gerych, Kavin Chandrasekaran, Abdulaziz Alajaji, Hamid Mansoor, **Thomas Hartvigsen**, Elke Rundensteiner.

PEER-REVIEWED

16. *Semi-Supervised Knowledge Amalgamation for Sequence Classification.*
Jidapa Thadajarassiri, **Thomas Hartvigsen**, Xiangnan Kong, Elke Rundensteiner.
AAAI 2021.

15. *Recurrent Halting Chain for Early Multi-label Classification.*
Thomas Hartvigsen, Cansu Sen, Xiangnan Kong, Elke Rundensteiner.
ACM SIGKDD 2020, research track.

14. *Human Attention Maps for Text Classification: Do Humans and Neural Networks Focus on the Same Words?*
Cansu Sen, **Thomas Hartvigsen**, Biao Yin, Xiangnan Kong, Elke Rundensteiner.
ACL 2020, long paper.

13. *Learning to Selectively Update State Neurons in Recurrent Networks.*
Thomas Hartvigsen, Cansu Sen, Xiangnan Kong, Elke Rundensteiner.
CIKM 2020, long paper.

12. *Learning Similarity-Preserving Word Meta-Embedding.*
Jidapa Thadajarassiri, Cansu Sen, **Thomas Hartvigsen**, Xiangnan Kong, Elke Rundensteiner.
IEEE BigData 2020, long paper.

11. *Clinical Performance Evaluation of a Machine Learning System for Predicting Hospital-Acquired Clostridium Difficile Infection.*

Erin Teeple, **Thomas Hartvigsen**, Cansu Sen, Kajal Claypool, Elke Rundensteiner.
HEALTHINF 2020, long paper, best poster award.

10. *Adaptive-Halting Policy Network for Early Classification.*
Thomas Hartvigsen, Cansu Sen, Xiangnan Kong, Elke Rundensteiner.
ACM SIGKDD 2019, research track.

9. *Patient-Level Classification of Clinical Note Sequences Guided by Attributed Hierarchical Attention.*
Cansu Sen, **Thomas Hartvigsen**, Xiangnan Kong, Elke Rundensteiner.
IEEE BigData 2019.

8. *Learning Temporal Relevance in Longitudinal Medical Notes.*
Cansu Sen, **Thomas Hartvigsen**, Xiangnan Kong, Elke Rundensteiner.
IEEE BigData 2019.

7. *Comparing General and Locally-Learned Word Embeddings for Clinical Text Mining.*
Jidapa Thadajarassiri, Cansu Sen, **Thomas Hartvigsen**, Xiangnan Kong, Elke Rundensteiner.
IEEE BHI 2019.

6. *Early Diagnosis Prediction with Recurrent Neural Networks.*
Daniel Johnston†, Liubou Klindziuk†, Lolita Nazarov†, **Thomas Hartvigsen**, Elke Rundensteiner.
IEEE URTC 2019. Best paper runner up.

5. *Detecting MRSA Infections by Fusing Structured and Unstructured Electronic Health Record Data.*
Thomas Hartvigsen, Cansu Sen, Elke Rundensteiner.
BIOSTEC 2018.

4. *Handling Missing Values in Multivariate Time Series Classification.*
Julia Friend†, Alec Hauck†, Sruthi Kurada†, Cansu Sen, **Thomas Hartvigsen**, Elke Rundensteiner.
IEEE URTC 2018.

3. *Early Prediction of MRSA Infections using Electronic Health Records.*
Thomas Hartvigsen, Cansu Sen, Sarah Brownell†, Erin Teeple, Xiangnan Kong, Elke Rundensteiner.
HEALTHINF 2018.

2. *MRSA Infection Prediction System.*
Sarah Brownell†, **Thomas Hartvigsen**, Xiangnan Kong, Elke Rundensteiner.
IEEE URTC 2017.

1. *CREST - Risk Prediction for Clostridium Difficile Infection Using Multimodal Data Mining.*
Cansu Sen, **Thomas Hartvigsen**, Kajal Claypool, Elke Rundensteiner.
ECML 2017.

†undergraduate advisee.

Selected Talks

Computational Sustainability Doctoral Consortium — Virtual Event
Adaptive-Halting Policy Networks for Early Classification — October 2020

Harvard University, Data to Actionable Knowledge Group — Cambridge, MA
Adaptive-Halting Policy Networks for Early Classification — September 2020

Florida State University, Data Science Group — Panama, FL
Adaptive-Halting Policy Networks for Early Classification — June 2020

MITRE, Data Science Group — Bedford, MA
Adaptive-Halting Policy Networks for Early Classification — March 2020

Worcester Polytechnic Institute, Data Science Department Colloquium — Worcester, MA
Selective Activation in Recurrent Neural Networks — November 2019

University of Minnesota, Institute for Mathematics and its Applications Minneapolis, MN
Adaptive-Halting Policy Networks for Early Classification September 2019

Worcester Polytechnic Institute, NSF REU Tutorial Worcester, MA
Introduction to Deep Learning with PyTorch July 2019

Northeastern University, New England Machine Learning Day Boston, MA
Adaptive-Halting Policy Networks for Early Classification May 2019

Worcester Polytechnic Institute, Arts and Sciences Week Worcester, MA
Recurrent Models for Clinical Time Series May 2019

Worcester Polytechnic Institute, Graduate Research Innovation & Exchange Worcester, MA
Partial Recurrent State Updates for Irregular Multivariate Time Series March 2019

Worcester Polytechnic Institute, Graduate Research Innovation & Exchange Worcester, MA
Adaptively-Halting RNN for Tunable Earliness in Multivariate Time Series Classification March 2018

Worcester Polytechnic Institute, Graduate Research Innovation & Exchange Worcester, MA
CREST - Risk Prediction for Clostridium Difficile Infection Using Multimodal Data Mining March 2017

MENTORING/TEACHING

I have had the pleasure of leading five projects. Three were summer groups of undergraduate REU students, and two were Masters Theses. All projects resulted a paper and most students presented their work at a conference.

Students Advised

- Prathyush Parvatharaju (MS Thesis), Worcester Polytechnic Institute 2019-Now
  - Thesis: *Learned Saliency Maps to Explain Deep Time Series Classifiers*
- Ramesh Doddaiah (PhD student), Worcester Polytechnic Institute 2020-Now
- Aleksa Perucic (MS Thesis), Worcester Polytechnic Institute 2019-2020
  - Thesis: *SIFT - A Deep Network for Irregular Multivariate Time Series*
- Liubuo Klindziuk (Undergraduate), Amherst College, NSF REU 2019
- Daniel Johnston (Undergraduate), Columbia University, NSF REU 2019
- Lolita Nazarov (Undergraduate), StonyBrook University, NSF REU 2019
- Julia Friend (Undergraduate), Oberlin College, NSF REU 2018
- Alex Hauck (Undergraduate), Valporaiso University, NSF REU 2018
- Sruthi Kurada, Advanced Math & Science Academy Charter School, NSF REU 2018
- Sarah Brownell (Undergraduate), Simmons University, NSF REU 2017
- Sean Tocci (Undergraduate), UMass Dartmouth, NSF REU 2017

Teaching Assistant, SUNY Geneseo, Modeling Biological Systems (2x) and BioStats (1x). 2015-2016
Guest Lecturer, *Modeling Biological Systems*, SUNY Geneseo 2016

SERVICE

Program Committee: AAAI ('21), CVPR ('21), ICCV ('21), ACL ('21)
External Reviewer: KDD ('19, '20)
Organized/led the Deep Learning Reading Group at WPI 2019-2020
Graduate Student Council of Arts & Sciences, WPI 2018-2020
Graduate Student Government Senate, WPI 2018
Data Science Graduate Student Council, WPI 2016-2019