

# Tom Hartvigsen

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[thartvigsen.github.io](https://github.com/thartvigsen)

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

## EDUCATION

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### **Worcester Polytechnic Institute**, Worcester, MA

Ph.D., Data Science

Expected Dec. 2021

Dissertation: *Observation and Prediction Timing in Time Series Classification*.

Committee: Elke Rundensteiner (Advisor), Xiangnan Kong (Advisor), Randy Paffenroth, Jenna Wiens

### **SUNY Geneseo**, Geneseo, NY

B.A., Applied Mathematics

May 2016

BioMathematics minor

Advisors: Prof. Chris Leary, Prof. Kirk Anne

## EXPERIENCE

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### **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**, UMass Medical School

2018 - 2019

Developed an automatic text summarization tool for clinical trial eligibility criteria to recommend inclusion and exclusion criteria for new clinical trials.

Supervisor: Dr. Jomol Matthew

### **Research Intern**, NSF REU, 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

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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

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### 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.*  
Dongyu Zhang, Cansu Sen, Jidapa Thadajarassiri, **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<sup>†</sup>, Liubou Klindziuk<sup>†</sup>, Lolita Nazarov<sup>†</sup>, **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<sup>†</sup>, Alec Hauck<sup>†</sup>, Sruthi Kurada<sup>†</sup>, 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<sup>†</sup>, Erin Teeple, Xiangnan Kong, Elke Rundensteiner.  
HEALTHINF 2018.
2. *MRSA Infection Prediction System*.  
Sarah Brownell<sup>†</sup>, **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.

<sup>†</sup>undergraduate advisee.

## SELECTED TALKS

<b>Computational Sustainability Doctoral Consortium</b> <i>Adaptive-Halting Policy Networks for Early Classification</i>	Virtual Event October 2020
<b>Harvard University, Data to Actionable Knowledge Group</b> <i>Adaptive-Halting Policy Networks for Early Classification</i>	Cambridge, MA September 2020
<b>Florida State University, Data Science Group</b> <i>Adaptive-Halting Policy Networks for Early Classification</i>	Panama, FL June 2020
<b>Worcester Polytechnic Institute, 3MT Competition</b> <i>Early Classification of Clinical Time Series</i>	Worcester, MA April 2020
<b>MITRE, Data Science Group</b> <i>Adaptive-Halting Policy Networks for Early Classification</i>	Bedford, MA March 2020
<b>Worcester Polytechnic Institute, Data Science Department Colloquium</b> <i>Selective Activation in Recurrent Neural Networks</i>	Worcester, MA November 2019

<b>University of Minnesota, Institute for Mathematics and its Applications</b> <i>Adaptive-Halting Policy Networks for Early Classification</i>	Minneapolis, MN September 2019
<b>Worcester Polytechnic Institute, NSF REU Tutorial</b> <i>Introduction to Deep Learning with PyTorch</i>	Worcester, MA July 2019
<b>Northeastern University, New England Machine Learning Day</b> <i>Adaptive-Halting Policy Networks for Early Classification</i>	Boston, MA May 2019
<b>Worcester Polytechnic Institute, Arts and Sciences Week</b> <i>Recurrent Models for Clinical Time Series</i>	Worcester, MA May 2019
<b>Worcester Polytechnic Institute, Graduate Research Innovation &amp; Exchange</b> <i>Partial Recurrent State Updates for Irregular Multivariate Time Series, First Place Poster</i>	Worcester, MA March 2019
<b>Worcester Polytechnic Institute, Graduate Research Innovation &amp; Exchange</b> <i>Adaptively-Halting RNN for Tunable Earliness in Multivariate Time Series Classification, Poster</i>	Worcester, MA March 2018
<b>Worcester Polytechnic Institute, Graduate Research Innovation &amp; Exchange</b> <i>CREST - Risk Prediction for Clostridium Difficile Infection Using Multimodal Data Mining, Poster</i>	Worcester, MA 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 – Thesis: <i>Learned Saliency Maps to Explain Deep Time Series Classifiers</i>	2019-Now
• Ramesh Doddaiiah (PhD student), Worcester Polytechnic Institute	2020-Now
• Aleksa Perucic (MS Thesis), Worcester Polytechnic Institute – Thesis: <i>SIFT - A Deep Network for Irregular Multivariate Time Series</i>	2019-2020
• 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
<b>Teaching Assistant</b> , SUNY Geneseo, Modeling Biological Systems (2x) and BioStats (1x).	2015-2016
<b>Guest Lecturer</b> , <i>Modeling Biological Systems</i> , SUNY Geneseo	2016

## SERVICE

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