

Michael Hauser

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INTERESTS

Machine learning

- Neural networks: residual, convolution, LSTM, language models
- Manifold learning: t-SNE, Locally Linear Embedding, autoencoders, GAN
- Digital signal processing: computer vision, Fourier analysis, vector quantization

Mathematical physics

- Geometry: Riemannian and Algebraic Geometry, Information Geometry
- Physics: General Relativity, Quantum Mechanics, electromagnetics, fluid mechanics, information theory, dynamical systems theory

EDUCATION

Pennsylvania State University, State College, Pennsylvania, USA

- PhD in Mechanical Engineering Aug 2012 – Mar 2018
 - Thesis: Principles of Riemannian Geometry in Neural Networks
 - Focus: neural networks, Riemannian geometry, manifold learning
- MSc in Mechanical Engineering Aug 2012 – Jan 2016
 - Thesis: Probabilistic Forecasting of Symbol Sequences with Neural Networks
 - Focus: neural networks, digital signal processing, non-parametric density estimation
- MSc in Electrical Engineering Aug 2012 – Jan 2016
 - Thesis: D-Markov machine for modeling high-speed video
 - Focus: computer vision, digital signal processing, markov modeling

University of California, Riverside, Riverside, California, USA

- MSc in Mechanical Engineering Aug 2010 – May 2012
 - Thesis: Analysis of the multidimensional effects in biofilm
 - Focus: mass transfer, fluid mechanics, computational fluid dynamics

University of Toronto, Toronto, Ontario, Canada

- BSc (honours) in Physics Sep 2006 – May 2010
 - Thesis: Inducing orbital angular momentum on light
 - Focus: Quantum optics, electromagnetics
- BSc (honours) in Mathematics Sep 2006 – May 2010
 - Thesis: Cosmological models of the universe
 - Focus: General Relativity, Quantum Field Theory

WORK EXPERIENCE

Applied Research Laboratory, State College, PA

- Walker Fellow Oct 2014 – Feb 2018
 - Project: Identify appliances with electric field signal
 - Project: Identify anomalies in 3D printed materials
 - Focus: Digital signal processing, computer vision, machine learning

PUBLICATIONS

- [6] [M. Hauser](#), S. Gunn, S. Saab and A. Ray, “State Space Representations of Deep Neural Networks,” in *arXiv (preprint)* Jun 2018.
- [5] [M. Hauser](#) and A. Ray, “Principles of Riemannian Geometry in Neural Networks,” in *Advances in Neural Information Processing Systems (NIPS)*, Long Beach, California, USA Dec 2017.
- [4] [M. Hauser](#), Y. Fu, S. Phoha, and A. Ray, “Probabilistic forecasting of symbol sequences with Long Short-Term Memory,” *Journal of Dynamic Systems, Measurement and Control*, ASME
- [3] [M. Hauser](#), Y. Fu, Y. Li, S. Phoha, A. Ray, “Probabilistic forecasting of symbol sequences with deep neural networks,” in *American Controls Conference (ACC)*, Seattle, Washington, USA, Jul 2017.
- [2] [M. Hauser](#), Y. Li, J. Li, and A. Ray, “Real-time combustion state identification via image processing: A dynamic data-driven approach,” in *American Controls Conference (ACC)*, Boston, Massachusetts, USA, Jul 2016.
- [1] [M. Hauser](#), and K. Vafai, “Analysis of the multidimensional effects in biofilm,” *International Journal of Heat and Mass Transfer*, Elsevier, vol. 56, no. 1, pp. 340–349, Jan 2013.

AWARDS & SCHOLARSHIPS	<ul style="list-style-type: none"> ▪ Walker Fellow at the Applied Research Laboratory ▪ Research Fellowship from the Pennsylvania State University (\$5,000) ▪ Teaching Fellowship from the Pennsylvania State University ▪ Dean's Distinguished Fellowship from the University of California (\$24,640) ▪ NYU Steinhardt Intensive Classical Brass Summer Workshop full scholarship (\$600) 	<p>2013 – 2018</p> <p>2012</p> <p>2012– 2013</p> <p>2010– 2012</p> <p>2008</p>
TECHNICAL SKILLS	<ul style="list-style-type: none"> ▪ Languages <ul style="list-style-type: none"> • Python (numpy, scipy, sklearn, tensorflow, theano, matplotlib, cv2, PIL, pandas), Matlab, L^AT_EX. ▪ Applications <ul style="list-style-type: none"> • Mathematica, Maple, Adobe Photoshop, Microsoft Word, Microsoft Excel, Microsoft PowerPoint. ▪ Operating Systems <ul style="list-style-type: none"> • Linux (Ubuntu, Redhat, Fedora), Windows, macOS, Chrome. 	
TEACHING EXPERIENCE	<ul style="list-style-type: none"> ▪ ME010 - Statics ▪ ME004 - Energy and the Environment ▪ ME200 - Methods of Engineering Analysis ▪ ME153 - Finite Element Methods ▪ ME 370 - Vibrations ▪ ME 450 - Modeling of Dynamic Systems 	<p>2010 – 2011</p> <p>2010 – 2011</p> <p>2011 – 2012</p> <p>2011 – 2012</p> <p>2012 – 2013</p> <p>2012 – 2013</p>
REVIEWING EXPERIENCE	<ul style="list-style-type: none"> ▪ American Controls Conference (ACC) ▪ Conference on Decision and Control (CDC) 	
PERSONAL INTERESTS	<ul style="list-style-type: none"> ▪ Backpacking <ul style="list-style-type: none"> • All season backpacking and camping through mountain ranges in the northeast and out west. ▪ Music (drums, percussion, tuba, sousaphone, guitar, piano) <ul style="list-style-type: none"> • The Pennsylvania State University Concert Band • The University of California Riverside Concert Band • The Hart House Concert Band at the University of Toronto • New York State All State Musician in high school ▪ Powerlifting <ul style="list-style-type: none"> • Squat, bench and deadlift of 375lbs, 305lbs and 465lbs (1,145lbs total) at 190lbs bodyweight. ▪ Favorite books recently read <ul style="list-style-type: none"> • Godel, Escher Bach (Hofstadter), Peoples History of the United States (Zinn), Voices of a Peoples History of the United States (Zinn), Into Thin Air (Krakauer) Manufacturing Consent (Chomsky), Capital (Marx); Hitchikers Guide to the Galaxy (Adams) 	<p>2012 – 2017</p> <p>2010 – 2012</p> <p>2006 – 2010</p> <p>2009</p>
REFERENCES	<ul style="list-style-type: none"> ▪ Professor Asok Ray Distinguished Professor of Mechanical Engineering and Mathematics Pennsylvania State University State College, Pennsylvania 16802 axr2@psu.edu ▪ Dr. Shashi Phoha Information Science and Technologies, Division head The Applied Research Laboratory State College, Pennsylvania 16802 sxp26@arl.psu.edu 	