

Alex Duda

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Summary

Specialties	Spiking Neural Networks, Neural Cognitive Machine Intelligence, Synthetic Data Generation, Machine Learning, and Natural Language Processing
Activities	Fundamental research, applied research, tech strategy research, customer relationship building, prototypes, tech volume of proposals, trade studies, and tech development
Roles	Lifelong learner, communicator, creator, mentor, research and development engineer scientist, individual contributor, and tech lead

Education

2015	PhD, Electrical and Computer Engineering , University of Illinois at Urbana-Champaign Specialty - Signal Processing and Machine Intelligence
2009	MS, Applied Mathematics , University of Illinois at Urbana-Champaign Specialty - Optimization and Algorithms
2006	BS, Engineering Physics , University of Illinois at Urbana-Champaign

Selected Research Interests

Sci/Math	Cognitive Systems, Complex Systems, Computational Systems Neuroscience, Creativity, Networks, Nonlinear Dynamics, Sensor Resource Management, Signal Processing, Swarms, Systems Science
Engr/Tech	{Biological, Cognitive, Heuristic, Neural}-Inspired Computing, Cognitive Robotics, Computational Intelligence, Data Science, Developmental Embodied Systems, Event-Based Asynchronous Spatio-Temporal {Processing, Sensing}, Human-Machine Integration/Interaction, Machine {Creativity, Curiosity, Emotion, Imagination, Improvisation, Originality, Play}, Neuromorphics, Neurorobotics, Reinforcement Learning, Soft Computing, Swarm Intelligence
Machine Learning	Adversarial/Secure Machine Learning, Ensemble Methods, Event-Based Asynchronous Spatio-Temporal Algorithms, Explainable AI, Interpretable AI, Low-Shot Learning, Natural Language Processing, On-Chip In-Field Learning, Reinforcement Learning, Supervised Learning, Synthetic Data Generation, Unsupervised Learning
Neural Networks	Artificial Neural Networks, Convolutional Neural Networks, Deep Artificial Neural Networks, Deep Learning, Generative Adversarial Networks, Recurrent Neural Networks, Spiking Neural Networks
Organizational	Developing/Nurturing Collaborative, Creative, Ecosystems

Selected Computer Skills

Languages	Python, C, C++, Tcl
Python Packages	argparse, Augmentor, csv, datetime, glob, json, keras, logging, math, matplotlib, multiprocessing, NetworkX, numpy, operator, os, pandas, pickle, pillow (PIL), PyTorch, random, re, scikit-learn, seaborn, string, tensorflow, tensorflow_datasets, tensorflow_hub, time, torch, torchvision, warnings
Applications	Inkscape, Java tool for Address-Event Representation (jAER), Jupyter Notebook, \LaTeX , LMMS, Mathematica, MATLAB, Microsoft Office, Open Office, NeuroXyce, Pro Tools, Reason, ROS, Simulink, STELLA, VCV Rack
OS	Linux, macOS, Windows
Cloud	Amazon SageMaker, AWS Elastic Compute Cloud (EC2), Amazon Machine Images (AMI)

Selected Awards and Honors

20(20 - 21)	Artificial Intelligence Advanced Academy (AIAA) at Northrop Grumman Corporation
20(17 - 18)	Mentoring the Technical Professional (MTP) Program at Northrop Grumman Corporation
20(14 - 17)	Future Technical Leaders (FTL) Program at Northrop Grumman Corporation
2013 F -	Eta Kappa Nu (HKN) Electrical and Computer Engineering Honor Society, Alpha Chapter

- 2011 Su International Conference on Complex Systems Best Poster Award Winner
- 2010 W IEEE International Conference on Machine Learning and Applications Best Poster Award Nominee
- 20(09, 10) F List of Teachers Ranked as Excellent by their Students
- 2010 Su New England Complex Systems Institute Summer School Scholarship Recipient

Selected Leadership Experience

Mentor

- 2021 1 junior engineer (NGMS), 1 junior engineer (NGDS)
- 2020 New-hires (2 PhD FTLs, 1 PhD senior engineer, 1 junior engineer), 1 PhD FTL (NGMS)
- 2019 1 senior engineer (NGMS)
- 2018 3 junior engineers (NGMS)
- 2017 1 undergraduate summer intern, 1 junior engineer (NGES)
- 2016 1 PhD student research intern, 1 junior engineer (NGAS)
- 2015 1 PhD student summer research intern, 1 PhD senior engineer (NGIS)
- 2014 Multiple junior engineers (NGIS)
- 20(13 Su - 13 S) UIUC CS Senior Thesis: *Controlling an Autonomous Car with a Spiking Neural Network*
- 20(10 F - 11 S) UIUC ECE Senior Thesis: *Analysis of an AB Initio Multi-Scale Model of Associative Memory*

Founder

- 2021 - Big Ideas Meeting (Monthly); members from across academia, industry, and national labs
- 2019 - FTL/UIUC Meeting (Quarterly)
- 2016 Su *NG/Next* All Minds Meeting
- 20(15 -16) S Cyber Analytics & Research Department Webinar Series at NGC (Monthly)
- 20(13 Su - 14 F) Big Ideas Meeting at UIUC (Weekly); members from across fields

Reviewer

- 20(14, 15) Complex Adaptive Systems Conference, Procedia Computer Science

Selected Work Experience

- 2021 - **Artificial Intelligence Engineer Software**
Northrop Grumman Mission Systems, Baltimore, MD
 - Leading algorithm development for testing novel neuromorphic sensor on DARPA program
 - Developing event-based asynchronous spatio-temporal machine learning algorithms for novel event-based asynchronous neuromorphic sensor
 - Serving as SME for spiking neural network applications on multiple S&T proposals
 - Serving as SME for commercial tech trend study on explainable AI and interpretable AI
 - Serving as SME for commercial tech trend study on low-SWAP smart adaptive edge processing via artificial general intelligence capabilities on neuromorphic hardware
- 20(19 - 20) **Research and Development Engineer Scientist**
Northrop Grumman Mission Systems, Baltimore, MD
 - Led six+ person team designing, implementing, and applying a synthetic data generator to improve performance of deep artificial neural network object detectors for multiple programs
 - Served as SME for IR&D focused on applications of spiking neural networks that led to customer-delivered whitepaper and publication
 - Served as SME on cognitive systems-enabled technology for winning DARPA proposal
 - Served as SME for mission-level applications for novel neuromorphic sensor for winning DARPA proposal
- 2018 **Research and Development Engineer Scientist**
Northrop Grumman Mission Systems, Baltimore, MD
 - Supported architecture, algorithm, design for multiple IR&Ds (03/28/18 - 12/31/18)
 - Reviewed and evaluated techniques for supervised and unsupervised machine learning
 - Reviewed and evaluated neuromorphic hardware options optimized for spiking neural networks, as well as artificial neural networks

- Investigated next-generation hardware options for next-generation machine learning
- 20(17 - 18) **Research and Development Engineer Scientist**
Northrop Grumman Mission Systems, Baltimore, MD
- Completed first post-FTL position (06/19/17 - 03/28/18)
 - Served as *Tech Lead* of six person IR&D team
 - Led architecture and algorithm design efforts for component focused on contextualized, holistic, situational awareness driven sensor resource management
 - Applied work from combinatorial optimization, reinforcement learning, decision theory, and cognitive models for multiple time scale adaptive closed-loop learning and control
- 2016 - **Future Technical Leaders Program - Alumni Recruiter at UIUC**
Northrop Grumman Corporation, Baltimore, MD
- Lead recruiter from 2019 to present
 - Assistant recruiter from 2016 to 2018
 - Establish and nurture relationships with contacts across university
 - Market, present, coordinate 6+ person team for information sessions
 - Interview, evaluate, select high potential (graduate degree and post-doc) candidates
 - Present candidates to FTL program office decision committees
 - Provide ongoing guidance to candidates
 - Present detailed recruiting retrospective to help improve process
- 20(16 - 17) **Future Technical Leaders Program - Rotation #3**
Northrop Grumman Electronic Systems, Linthicum, MD
- Completed third FTL rotation (08/08/16 - 06/16/17) in Advanced Concepts & Technologies Division
 - Primarily supported shaping, capture, proposal, on multiple DARPA efforts
 - Technical areas focused on next-generation machine learning, stochastic computing, cognitive frameworks, and context-sensitive adaptive edge perception/computation/control
- 20(15 - 16) **Future Technical Leaders Program - Rotation #2**
Northrop Grumman Aerospace Systems, Space Park, CA.
- Completed second FTL rotation (07/20/15 - 07/29/16) in *NG/Next* Basic Research supporting the Biologically-Inspired Processing and Sensing (BIPS) group
 - Contributed to founding whitepaper for BIPS group
 - Provided tours/demos for *NG/Next* Lab to various NGC personnel, across a wide range of backgrounds including corporate directors, engineers, executives, and R&D managers
 - Conducted neurorobotics basic research that included cellular (dynamical) spiking neural networks with plastic synapses
 - Developed and nurtured academic collaborations
 - Helped to propose and supported topic area at Telluride Neuromorphic Cognition Engr. Workshop
 - Represented *NG/Next* BIPS group at Design & Emergent Systems Sidebar at *NGC* TechExpo
- 20(14 - 15) **Future Technical Leaders Program - Rotation #1**
Northrop Grumman Information Systems, Annapolis Junction, MD
- Conducted tech strategy research on potentially disruptive low-TRL hardware trends for big data processing systems
 - Completed state-of-the-art trade study on streaming and in-memory engines
 - Attended and documented 2014 IEEE Big Data Conference in Washington DC, 2015 Solid Conference (HW, SW, and IoT) in San Francisco, 2015 In-Memory Computing Summit in San Francisco.
 - Provided technical writing support and innovation ideas for business proposal tech volume
- 20(11 - 14) **Graduate Researcher**
Beckman Institute for Advanced Science and Technology, UIUC, Urbana, IL
- Worked on Sandia National Labs funded *Computational Models of Neural Population Dynamics*
 - Designed canonical cellular-resolution spiking neural network

- Incorporated adaptive synapses with plasticity
 - Empirically studied extent to which summary statistics were information-preserving
 - Explored techniques to establish similarity measures between phase portraits
 - Used emergent dynamics of spiking neural networks for multi-sensory associative memory
 - Examined methods of processing high-throughput data with finite resources
 - Employed visualization techniques for high-dimensional systems
- 2012 Su **Graduate Research Intern**
Computer Science Research Institute, Sandia National Laboratories, Albuquerque, NM
- Worked on PhD dissertation, which included NeuroXyce development
 - Identified important features in conductance-based adaptation-enabled synapse model
 - Adapted spike-timing dependent plasticity (STDP) model for NeuroXyce synapse device
 - Simulated, tuned, and debugged NeuroXyce synapse device
- 20(10 - 11) **Graduate Researcher**
Beckman Institute for Advanced Science and Technology, UIUC, Urbana, IL
- Worked on Navy Research Lab funded *The Role of Sensorimotor Function, Associative Memory, and Reinforcement Learning in Automatic Acquisition of Spoken Language by an Autonomous Robot*
 - Conducted scholarly research on use of spiking neural networks for sensory integration
 - Determined minimal required features of canonical cellular-resolution spiking neural network
 - Explored ways to use dynamics of spiking neural networks as basis for associative memory
- 2010 Su **Graduate Researcher**
NECSI Summer School, MIT, Cambridge, MA
- CX 201: Complex Physics, Biological, and Social Systems
 - CX 102: Computer Programming and Complex Systems
 - CX 202: Complex Systems Modeling and Networks
 - Completed exploratory computational project in Python
 - Focused on the Kuramoto Model for synchronization behavior of coupled oscillators
- 2010 S - Su **Graduate Researcher**
Beckman Institute for Advanced Science and Technology, UIUC, Urbana, IL
- Worked on Sandia National Laboratories funded *Mathematical Models of Neocortical Circuits*
 - Numerically integrated Hodgkin-Huxley neuron model; explored variety of nonlinear behaviors
 - Investigated statistical methods to create reduced-order models of spiking neural networks
 - Implemented small-scale spiking neural network (25+ neurons, 120+ synapses)
- 20(09 - 10) S **Graduate Researcher**
Beckman Institute for Advanced Science and Technology, UIUC, Urbana, IL
- Investigated recurrent artificial neural networks for associative learning
 - Analyzed state transition dynamics and emergence of basins of attraction
 - Explored attractor topology
 - Compared behavior to that predicted by presence of feedback cycles (number, type)
- 20(07 - 08) F **Graduate Researcher**
Siebel Center for Computer Science, UIUC, Urbana, IL
- Investigated variants of Kauffman's NK model
 - Reviewed analytical and simulation results
 - Simulated deterministic and stochastic variants
 - Analyzed N, K value impact on fitness landscape
 - Evaluated effectiveness of different search algorithms to approach optima
- 2007 F **Graduate Researcher**
Siebel Center for Computer Science, UIUC, Urbana, IL
- Optimal path planning through probabilistic digraph
 - Investigated analytical and computational approaches

- Compared shortest path algorithms
- 2006 Su **Undergraduate Researcher**
Loomis Laboratory of Physics, UIUC, Urbana, IL
- Experimental biophysics
 - Prepared DNA samples for use in single-molecule optical experiments
 - Applied specialized optical techniques, such as FIONA (Fluorescence Imaging with One-Nanometer Accuracy), to study DNA molecules
 - Developed program for tracking microtubules that enabled automated analysis of collected frame-data and increased precision in molecular dynamics studies
- 2005 F **Undergraduate Researcher**
Loomis Laboratory of Physics, UIUC, Urbana, IL
- Computational biophysics
 - Programmed simulations of enzymes using Tcl scripting language
 - Generated simulation visualizations using VMD (Visual Molecular Dynamics) software
 - Examined thermodynamic behavior of enzymes during equilibration
 - Prepared statistical analysis of enzyme's behavior during simulation
- 2005 S **Undergraduate Researcher**
Altgeld Hall, UIUC, Urbana, IL
- Applied linear algebra
 - Investigated information retrieval, population migration, and computer graphics
 - Determined coding matrices using Mathematica

Selected Publications

Spiking Neural Networks

- [7] P. Tschirhart, A. Duda, and K. Segall, "Architecture Considerations for Superconducting Neuromorphic Systems: Programmability, Scalability, Area, and Latency", 2020 29th Applied Superconductivity Conference (Special Session on Novel Computing – Reversible and Neuromorphic), 2020, pp. 1 - 21.
- [6] A. Duda, "Towards a Neocortically-Inspired Ab Initio Cellular Model of Associative Memory", PhD dissertation, Department of Electrical and Computer Engineering, University of Illinois at Urbana-Champaign, Urbana-Champaign, IL, 2015, URI: <http://hdl.handle.net/2142/78735>.
- [5] A. M. Duda and S. E. Levinson, "Information-Preserving Transforms: Two Graph Metrics for Simulated Spiking Neural Networks", *Procedia Computer Science*, vol. 20, 2013, pp. 14 - 21, doi: 10.1016/j.procs.2013.09.232.
- [4] A. M. Duda and S. E. Levinson, "Complex Networks of Spiking Neurons: Collective Behavior Characterization", 2011 Eighth International Conference on Complex Systems, Quincy, MA, 2011, pp. 1627 - 1629, doi: 10.1.1.409.5105, ([Best Poster Award Winner](#)).
- [3] A. M. Duda and S. E. Levinson, "Characterizing Populations of Spiking Neurons", 2011 Fifteenth International Conference on Cognitive and Neural Systems, Boston, MA, 2011, pp. 87, doi:10.1.1.409.5105.
- [2] A. M. Duda and S. E. Levinson, "Nonlinear Dynamical Multi-Scale Model of Associative Memory", 2010 Ninth International Conference on Machine Learning and Applications, Washington, DC, 2010, pp. 867 - 872, doi: 10.1109/ICMLA.2010.135, ([Best Poster Award Nominee](#)).
- [1] L. Majure, L. Niehaus, A. Duda, A. Silver, L. Wendt, and S. Levinson, "Integrating Language and Motor Function on a Humanoid Robot", 2010 Twenty Third IEEE/RSJ International Conference on Intelligent Robots and Systems, RobotCub Workshop, 2010, pp. 1 - 5, doi: 10.1.1.409.9064.

Selected Tech Reports

Machine Learning

- [3] A. Duda, "Some Brief Notes on Ensemble Methods: AdaBoost, Random Forest, and Gradient Boosting", Tech. Rep., 2020, p. 1 - 6. [[PDF](#)]

- [2] A. Duda, "Ensemble Methods for High Dimensional Data: Primary Considerations for a Principled, Advanced, Approach", NGMS, Baltimore, MD, Tech. Rep., 2019, pp. 1 - 4.
- [1] A. Duda, "DARPA SAGA - Recommendations and Insights", NGES, Linthicum, MD, Tech. Rep., 2017, pp. 1 - 7.

Natural Language Processing

- [3] A. Duda, "HMM as Building Block in Models of Brain, Language, and Mind", Beckman Institute, Urbana, IL, Tech. Rep., 2013, pp. 1 - 6. [PDF]
- [2] A. Duda, "The Importance of Being Parsed", Beckman Institute, Urbana, IL, Tech. Rep., 2013, pp. 1 - 14. [PDF]
- [1] A. Duda, "Symbols \Leftrightarrow Models", Beckman Institute, Urbana, IL, Tech. Rep., 2013, pp. 1 - 45. [PDF]

Neural Cognitive Machine Intelligence

- [3] A. Duda, "From Natural Intelligence to Machine Intelligence: Augmented Cattell-Horn-Carroll (CHC) Theory of Cognitive Abilities as Framework for Progress", NGMS, Baltimore, MD, Tech. Rep., 2019, pp. 1 - 12.
- [2] A. Duda, "Towards A More Natural Machine Intelligence: For Those Looking to Enhance Machines with Neuroscience", NGMS, Baltimore, MD, Tech. Rep., 2019, pp. 1 - 22.
- [1] A. Cobb, A. Duda, S. Kelly, J. Shepanski, and G. Tseng, "Biologically Inspired Processing and Sensing (BIPS) Group Founding Whitepaper ", NGAS, Space Park, CA, Tech. Rep., 2015, pp. 1 - 75.

Next-Generation Hardware for Big Data Processing, Machine Intelligence, etc.

- [3] A. Duda, "Towards a Streaming Analytics Platform: Hardware Considerations, Predictions, and Recommendations", NGIS, Annapolis Junction, MD, Tech. Rep., 2015, pp. 1 - 23.
- [2] A. Duda, "Memristors in Big Data", NGIS, Annapolis Junction, MD, Tech. Rep., 2015, pp. 1 - 35.
- [1] A. Duda, "Important Opportunities for M2M/IoT in 2020", NGIS, Annapolis Junction, MD, Tech. Rep., 2014, pp. 1 - 3.

Sensor Resource Management

- [3] A. Duda, "SRM Technology Readiness Demo Assessment and Recommendations", NGMS, Baltimore, MD, Tech. Rep., 2018, pp. 1 - 6.
- [2] A. Duda and C. Lefler, "Interest-Level Assessor: A Holistic, Contextual, Approach", NGMS, Baltimore, MD, Tech. Rep., 2018, pp. 1 - 18.
- [1] A. Duda and C. Lefler, "Command Selection for Real Benefit: Short Time-Horizon Capability Command Down-Selector", NGMS, Baltimore, MD, Tech. Rep., 2018, pp. 1 - 12.

Signal Processing

- [1] A. Duda, "Over the channel and through the noise: A Study in Adaptive Filter Design with DFE", Beckman Institute, Urbana, IL, Tech. Rep., 2011, pp. 1 - 6. [PDF]

Spiking Neural Networks

- [6] A. Duda, "Embodied Adaptive Spiking Neural Networks: Emergent Weighted Directed Graph Structure and its Applicability to Novelty Detection", NGAS, Space Park, CA, Tech. Rep., 2016, pp. 1 - 34.
- [5] A. Duda, "Desirable Features of a Neocortically-Inspired Ab Initio Model of Associative Memory", Beckman Institute, Urbana, IL, Tech. Rep., 2012, pp. 1 - 86. [PDF]
- [4] A. Duda, "NeuroXyce Synapse Device with STDP and Stochastic Transmission Reliability", Beckman Institute, Urbana, IL, Tech. Rep., 2012, pp. 1 - 11. [PDF]
- [3] R. Schiek, C. Warrender, C. Teeter, J. Aimone, H. Thornquist, T. Mei, and A. Duda, "Simulating neural systems with Xyce", Sandia National Laboratories, Albuquerque, NM, Tech. Rep., 2012, pp. 1 - 78, doi: 10.2172/1096952.
- [2] A. Duda, "Multimodal Memory Encoding with Large Populations of Spiking Neurons", Beckman Institute, Urbana, IL, Tech. Rep., 2010, pp. 1 - 76. [PDF]

- [1] A. Duda, "Simulink Implementation of Hodgkin-Huxley Spiking Neuron Model", Beckman Institute, Urbana, IL, Tech. Rep., 2010, pp. 1 - 15. [PDF]

Synthetic Data Generation

- [1] A. Duda, "Synthetic Data Generator (sdg) for Improved Deep Learning Based Object Detectors", NGMS, Baltimore, MD, Tech. Rep., 2020, pp. 1 - 10.

Selected Presentations

- 2019-04-11 Towards A More Natural Machine Intelligence: For Those Looking to Enhance Machines with Neuroscience, NGMS, Linthicum, MD
- 2016-07-14 *NG/Next* BIPS Group Demo, Telluride Neuromorphic Cognition Engr. Workshop, Telluride, CO
- 2016-06-24 *NG/Next* All Minds Meeting, NGAS, Manhattan Beach, CA
- 2016-06-(7,8) *NG/Next* Basic Research BIPS group Demo/Talk, NGC TechExpo, McLean, VA
- 2016-03-21 Embodied Adaptive Spiking Neural Networks: Emergent Weighted Directed Graph Structure and its Applicability to Novelty Detection, *NG/Next* Basic Research Series, Redondo Beach, CA
- 2016-03-10 MUNDANE: Multisensory Adaptive Data Experience Technology, NGC FTL/SEA Spring Learning Forum, Baltimore, MD
- 2015-06-16 Memristors in Big Data, NGIS Cyber Division Operations Webinar Series, AJ, MD
- 2015-06-(9,10) NGC IR&D Big Data 2020 Demo/Talk, NGC TechExpo, McLean, VA
- 2015-04-23 Towards a Streaming Analytics Platform: Hardware Focus, NGIS, AJ, MD
- 2015-02-20 IEEE Big Data Conference 2014 Overview, NGIS Cyber Analytics & Research Department Webinar Series, AJ, MD
- 2014-09-05 PhD Final Examination, Urbana, IL
- 2013-12-02 Unsupervised Machine Learning with Spiking Neural Networks, MIT Lincoln Lab, Lexington, MA
- 2013-11-21 Graduate School Advice Talk, HKN ECE Honor Society, Urbana, IL
- 2013-11-13 Information-Preserving Transforms: Two Graph Metrics for Simulated Spiking Neural Networks, Complex Adaptive Systems Conference, Baltimore, MD
- 2013-03-08 Language Acquisition and Robotics Group Demo/Talk, Beckman Institute Open House, Urbana, IL
- 2013-03-07 PhD Preliminary Examination, Urbana, IL
- 2012-02-09 Desirable Features of a Neocortically-Inspired Ab Initio Model of Associative Memory, Language Acquisition and Robotics Group Research Meeting, Beckman Institute, Urbana, IL
- 2011-06-30 Complex Networks of Spiking Neurons: Collective Behavior Characterization, International Conference on Complex Systems, Boston, MA
- 2011-05-14 Characterizing Populations of Spiking Neurons, International Conference on Cognitive and Neural Systems, Boston, MA
- 2011-03-11 Language Acquisition and Robotics Group Demo/Talk, Beckman Institute Open House, Urbana, IL
- 2010-12-12 Nonlinear Dynamical Multi-Scale Model of Associative Memory, International Conference on Machine Learning and Applications, Washington DC
- 2010-11-18 Neuroengineering IGERT @ Illinois Seminar Series, Urbana, IL
- 2010-10-13 Beckman Graduate Student Seminar, Urbana, IL
- 2010-06-24 Nonlinear Dynamical Models of Associative Memory, Computer Science Research Institute Seminar at Sandia, Albuquerque, NM
- 2010-06-18 Computational Explorations of the Kuramoto Model, New England Complex Systems Institute Summer School at MIT, Cambridge, MA

Selected Protégé Publications

- [1] F. Wang, "Implementation and Analysis of an AB Initio Multi-Scale Model of Associative Memory", Senior thesis, Department of Electrical and Computer Engineering, University of Illinois at Urbana-Champaign, Urbana-Champaign, IL, 2011, [PDF].

Memberships

2013- IEEE {Computational Intelligence; Information Theory; Signal Processing} Society

Selected Teaching Experience

- 20(13 F, 14 S) **Teaching Assistant.** ECE 110 Lab: Introduction to ECE.
2013 S **Teaching Assistant.** ECE 101: Exploring Digital Information Technology.
20(09, 10) F **Teaching Assistant.** COE/LAS Honors Calculus II Project.
2008 F **Teaching Assistant.** Introductory Control Systems Lab.
20(06 - 08) **Tutor.** Department of Mathematics.
20(05 - 07) **Tutor.** Department of Physics.

Selected Personal Interests

- Music**
- Composition, songwriting, arrangement, improvisation
 - Capturing/communicating a concept, an emotion, a mood in/through music
 - Production, recording
 - Experimenting with a variety of acoustic, electronic, and software instruments, processing chains, sound design approaches
 - Exploring generative composition
 - Project management of tracks, EPs, LPs, etc.
 - Creative direction for a variety of music projects
 - Design/implementation of machine intelligence for many of the above

Security Clearances

Active clearance. Details available upon request.

Version

2021-09-15