

Education

Harvard University (Cambridge, MA)	2017-
<i>PhD Candidate in Applied Mathematics</i>	
<i>MS in Applied Mathematics</i>	2017-2019
University of Washington (Seattle, WA)	2012-2017
<i>BS in Applied and Computational Mathematical Sciences</i>	
<i>BS in Computer Science with Honors</i>	

Work Experience

Software Engineering Intern at MathWorks	Summer 2021
<ul style="list-style-type: none"> Working with the Control Design and Reinforcement Learning teams, prototyped data-driven learning of Koopman embeddings for simulation and control of nonlinear dynamical systems (<i>MATLAB Deep Learning Toolbox, LQR, Model Predictive Control</i>). 	
Research Intern at the Honda Research Institute	Summer 2020
<ul style="list-style-type: none"> As part of HRI's Curious Minded Machines program, designed and evaluated structured latent representations of high-dimensional environments. Then, formalized and implemented curious exploration for RL agents (<i>disentangled VAEs, contrastive learning, OpenAI Gym, PyTorch, Stable Baselines</i>). 	

Graduate Research

Soft Math Laboratory	2019-
<ul style="list-style-type: none"> Advised by Prof. Lakshminarayanan Mahadevan. In collaboration with Prof. Holger Klinck (Cornell Lab of Ornithology), utilizing multi-channel microphones for sound source localization and separation to assist passive acoustic biodiversity monitoring (<i>MUSIC algorithm, PCA/ICA/NMF, acoustic vector-sensor, beamforming, spectral analysis</i>). Employing techniques in elastic functional data analysis for characterizing the response of post-stroke participants to rehabilitative training with a soft exosuit (<i>curve and image registration, optimal transport, dynamic programming</i>). Extended analysis of normalized contour curvature as a quantitative model for underlying neural processing of natural images, showing discrimination between cognitive categories such as animacy, size, and type. Applied pre-trained audio embeddings (<i>Wavegram-Logmel-CNN</i>) to understand latent structure and clustering (<i>k-means</i>) within large datasets of birdsong recordings. 	
Agile Robotics Laboratory	2017-2019
<ul style="list-style-type: none"> Advised by Prof. Scott Kuindersma. Developed novel non-convex trajectory optimization algorithm (<i>ADMM, augmented Lagrangian methods</i>), benchmarked in simulation for multiple robot platforms (<i>quadrotor, Kuka Arm, RoboBee</i>) against commonly used solvers (<i>SNOPT, IPOPT</i>), and integrated with the Drake robotics toolbox (C++). [link] Implemented hybrid control algorithm for fixed-wing UAVs in simulation. 	
Other Graduate Projects	2017-
<ul style="list-style-type: none"> Trained a convolutional denoising autoencoder for signal enhancement of birdsong within outdoor recordings (<i>PyTorch, Librosa</i>). [link] Demonstrated high classification accuracy in training a multilayer perceptron to detect adversarial noise (<i>Fast Gradient Sign, DeepFool</i>). [link] 	

Undergraduate Research**Computer Science Senior Thesis**

2016-2017

- Co-advised by Prof. Dieter Fox and Prof. Behcet Acikmese.
- Adapted and demonstrated successive convexification algorithm for real-time trajectory planning for quadrotor drones. Additionally, constructed perception collection framework including point cloud processing and segmentation (*ROS*, *PCL*) for graph-based inverse optimal control for learning manipulation tasks from demonstration on the Baxter robot. [\[link\]](#)

NSF REU: University of California San Diego

2016

- Devised and completed a pipeline for classification of humpback whale calls by processing large-scale acoustic data, de-noising signals, and applying machine learning techniques (*spectrogram analysis*, *PCA*, *SVM*, *HMM*). [\[link\]](#)

NSF REU: Hatfield Marine Science Center

2015

- Proposed and implemented a novel method for behavioral segmentation of GPS tracking data (*R*, *C*). [\[link\]](#)

NSF REU: Oregon State University

2014

- Performed statistical analysis and modeling over large datasets for quantitative fisheries analysis (*R*, *GAMMs*). [\[link\]](#)

Publications

Chandra J*, Muthupalaniappan S*, Shang Z*, Deng R*, Lin R, **Tolkova I**, Butts D, Sul D, Marzouk S, Bose S, Chen A. "Screening of Parkinson's Disease Using Geometric Features Extracted from Spiral Drawings". *Brain sciences*. 2021.

Tolkova I*, Chu B*, Hedman M*, Kahl S and Klinck H (2021). "Parsing Birdsong with Deep Audio Embeddings." AI for Social Good Workshop, *IJCAI 2021*.

Tolkova I (2021). "Feature Representations for Conservation Bioacoustics: Review and Discussion." AI for Social Good Workshop, *IJCAI 2021*.

Ciannelli L, **Tolkova I**, Lauth R, Puerta P, Helser T, Gitelman A, & Thompson G (2019). "Spatial, Interannual, and Generational Sources of Trait Variability in a Marine Population." *Ecology*.

Torres LG, Orben RA, **Tolkova I**, Thompson DR. (2017) "Classification of Animal Movement Behavior through Residence in Space and Time." *PLOS ONE*. 12(1):e0168513.

* equal contribution

Presentations

Oral presentation at IJCAI 2021 AI for Social Good Workshop
"Parsing Birdsong with Deep Audio Embeddings"

Aug. 2021

Oral presentation at UCI CMCF Early Career Researcher Symposium
"Acoustic Source Separation for Avian Biodiversity Monitoring"

Apr. 2021

Oral presentation at IJCAI 2021 AI for Social Good Workshop
"Feature Representations for Conservation Bioacoustics: Review and Discussion"

Jan. 2021

Presentations	Oral presentation at Acoustics '17 Boston June 2017 “Automatic classification of humpback whale social calls” Culmination of NSF REU at UCSD (Summer 2016).
	Poster presentation at Annual Science Conference, Copenhagen Sept. 2015 “Spatial and Temporal Variation in the Size-At-Age of Pacific Cod in the Eastern Bering Sea: Implications for Sampling Strategies” Culmination of NSF REU at Oregon State University (Summer 2014).
Awards	<i>Quantitative Biology Fellowship</i> (Harvard NSF Simons Center) 2021-2022
	<i>Quantitative Biology Fellowship</i> (Harvard NSF Simons Center) 2020-2021
	<i>Certificate of Distinction in Teaching</i> (Harvard Derek Bok Center) Fall 2020
	<i>Certificate of Distinction in Teaching</i> (Harvard Derek Bok Center) Fall 2019
	<i>Outstanding Graduating Senior</i> (Applied Math Department, UW) 2017
	<i>Paradise Scholarship Recipient</i> (Robinson Center for Young Scholars, UW) 2015
	<i>Annual Dean's List</i> (UW) 2012-2017
Teaching	Teaching Fellow for GENED 1080: Engineering the Acoustical World Fall 2021 Led laboratory sessions, developed assignments, held office hours, graded homework.
	Head Teaching Fellow for APMTH 22a: Solving and Optimizing Fall 2020 Prepared weekly materials, held office hours, graded homework.
	Teaching Fellow for ES 159/259: Introduction to Robotics Spring 2020 Led laboratory sessions, developed assignments, held office hours, graded homework.
	Head Teaching Fellow for APMTH 22a: Solving and Optimizing Fall 2019 Prepared weekly materials, taught section, held office hours, graded homework.
	Teaching Fellow for CS 182: Introduction to Artificial Intelligence Fall 2018 Prepared weekly section materials, taught section, held exam review and office hours.
Outreach	Lead organizer for Quantitative Ecology/Ethology/Evolution seminar series. [link] 2020-
	Mentor for undergraduate project at the Global Alliance for Medical Innovation. 2020-
	CovEd tutor for public school student. 2020-2021
	Tutor for APMTH 104: Complex and Fourier Analysis. 2020
	Weekly tutor at local public school through Cambridge School Volunteers. 2018-2019
	Volunteer at math competitions (GEMS, MathDay, Math Hour Olympiad). 2013-2017
Hobbies	President of the Harvard GSAS Photography Society : organized trips, photo competitions, guest speakers, and photographed events and performances for numerous organizations on campus. Enjoy hiking, biking, and spending time outdoors.
Skills	Proficient in Python, C++, C, MATLAB, Java, R. Experienced with TensorFlow, PyTorch, ROS, Drake, CVX, Arduino, BeagleBone, OpenMP, CMake, Bazel, Ubuntu, Git. Fluent in English and Russian.