

Research interests: Artificial Intelligence (AI), Machine Learning (ML), Deep Learning (DL), and their applications to the analysis of medical data

EDUCATION

Princeton University

PhD candidate, Department of Electrical and Computer Engineering
GPA: 3.9/4.0

Princeton, NJ
Sept. 2019-present

Massachusetts Institute of Technology (MIT)

Master of Engineering in Electrical Engineering and Computer Science
Concentration: AI, GPA: 5.0/5.0

Cambridge, MA
Sept. 2017-May 2019

Thesis: Convolutional Neural Networks for Image Reconstruction and Image Quality Assessment of 2D Fetal Brain MRI

Bachelor of Science in Electrical Engineering and Computer Science
Minor: Economics, GPA: 4.9/5.0

Sept. 2013-May 2017

Relevant MIT, Princeton coursework

Dynamics in Cognition, Computational Cognitive Science, Probabilistic Models of Cognition, Reinforcement Learning, Robotics, Optimization, AI, ML, Deep Learning, Computer Vision, MRI, Signals and Systems, Algorithms, Discrete Math, Probability, Statistics, Linear Algebra

Notre Dame High School

GPA: 4.68/4.0 (Valedictorian), SAT: 2340

San Jose, CA
June 2013

PUBLICATIONS & PRESENTATIONS

J. Xu, **S. Lala**, B. Gagoski, E. A. Turk, P. E. Grant, P. Golland, E. Adalsteinsson, "Semi-supervised learning of fetal brain MRI quality assessment with ROI consistency," in *Proc. of Intl. Conf. on Medical Image Computing and Computer-Assisted Intervention*, Oct. 2020.

B. Gagoski, J. Xu, P. Wighton, D. Tisdall, R. Frost, **S. Lala**, W. Lo, P. Golland, A. van de Kouwe, E. Adalsteinsson, "Automatic detection and reacquisition of motion degraded images in fetal HASTE imaging at 3T", in *Proc. of 2020 Joint Annual Meeting ISMRM-ESMRMB*, Aug. 2020.

S. Lala, E. Gong, "Use of AI and neural networks in medical imaging enhancement", IEEE Santa Clara Valley Consumer Electronics Society, July, 2019. (presentation)

S. Lala, N. Singh, B. Gagoski, E. A. Turk, P. E. Grant, P. Golland, E. Adalsteinsson, "A deep learning approach for image quality assessment of fetal brain MRI" in *Proc. of the 2019 Joint Annual Meeting ISMRM-ESMRMB*, May 2019. (presentation)

S. Lala, M. Shady, A. Belyaeva, M. Liu, "Evaluation of mode collapse in generative adversarial networks", in *Proc. of the 2018 IEEE High Performance Extreme Computing Conf.*, Sept. 2018. (poster)

S. Lala, B. Gagoski, J. Stout, B. Bilgic, B. Zhao, E. P. Grant, P. Golland, E. Adalsteinsson, "A machine learning approach for mitigating artifacts in fetal imaging due to an undersampled HASTE sequence," in *Proc. of the 2018 Joint Annual Meeting ISMRM-ESMRMB*, June, 2018. (poster)

RECOGNITIONS/SOCIETIES

- Outstanding Assistant in Instruction Award in Electrical Engineering and Computer Engineering (ELE364) (2021)
- The Anthony Ephremides Fellowship in Electrical Engineering (2019-2020)
- National Science Foundation Graduate Research Fellowship Program Honorable Mention (2019)
- Honor societies: Member of MIT's Tau Beta Pi, Eta Kappa Nu, Sigma Xi (invited)
- Professional organizations: Society of Women Engineers, IEEE

SKILLS

Programming: Python (e.g., Keras, TensorFlow, PyTorch, NumPy, SciPy, Scikit-Learn, Matplotlib), MATLAB, Java, C++, Bash, Linux, AWS, Google Cloud

RESEARCH EXPERIENCE

Princeton University, Department of Electrical Engineering Machine Learning and Smart Healthcare

Princeton, NJ
May 2020-present

Advisor: Prof. Niraj K. Jha

- Investigating deep learning based methods (GANs) for synthesizing medical images and training classifiers on the synthesized images to improve classification performance
- Preliminary results showed increased classifier performance for low data regimes (<5K images) on a diabetic retinopathy dataset when trained on our method's synthesized images

MIT, Center for Brains, Minds, and Machines Brains, Minds, and Machines Course

Woods Hole, MA
Aug. 2019

- Conducted a research project training a 1D Convolutional Neural Network to classify human speech properties (speaker identity) from ECoG measurements
- Preliminary results demonstrated above chance performance. Ablation studies showed that measurements obtained from electrodes in the language processing regions yielded higher predictive performance

MIT, Department of Electrical Engineering and Computer Science Magnetic Resonance Imaging Group, Research Lab of Electronics

Cambridge, MA
Sept. 2017-Aug. 2019

Advisor: Prof. Elfar Adalsteinsson

Fetal Brain MR Image Quality

- Developed and deployed a scalable pipeline for labeling a fetal brain MRI quality dataset, visualizing the dataset's quality distribution, then training a Convolutional Neural Network (CNN) to detect whether an image contained an artifact or not
- Under the guidance of a fetal brain MRI radiologist and clinical fellows at Boston Children's Hospital, I labeled a novel fetal brain MRI quality dataset of 12K+ images pooled from 60+ mothers. I provided novel statistics on the quality distribution (e.g., 20%+ images contained artifacts)
- Trained a CNN on the labeled dataset which attained 0.86 area under the receiver operating characteristic curve. I demonstrated that the CNN learns to focus on the small brain region of interest in the image (<20% of the image pixels), using a state-of-the-art saliency map algorithm (Grad-CAM)
- Helped initiate work to build a tool deploying the classifier for low-latency evaluation of slice quality during scanning. Our results showed that the classifier can be used to efficiently flag poor quality images, with subsequent reacquisition of such slices improving the image quality

Fetal Brain MR Image Reconstruction

- Trained a CNN-based architecture to remove aliasing artifacts from fetal brain MR images that were retrospectively undersampled
- Demonstrated that the CNN-based reconstructions were higher quality than compressed sensing reconstructions, attaining 3% normalized root mean square error (NRMSE) and 12% NRMSE at 2x and 8x undersampling respectively, compared to 12% NRMSE and 32% NRMSE under compressed sensing (competing baseline approach)

MIT, Department of Electrical Engineering and Computer Science Genesis Research Group, Computer Science Artificial Intelligence Lab

Cambridge, MA
Feb. 2015-May 2016

Advisor: Prof. Patrick H. Winston

- Developed an Automated Question Generation module enabling the Genesis system (a natural language processing system modeling human story comprehension) to generate and prioritize questions over stories represented as text

TEACHING EXPERIENCE

Princeton University, Department of Electrical Engineering

ELE364 Machine Learning for Predictive Data Analytics, Head Teaching Assistant

Princeton, NJ

Aug.-Dec. 2020

- Held office hours reviewing lecture material and resolving homework/lecture questions
- Led discussion sections teaching advanced concepts beyond lectures (e.g., deep learning)
- Coordinated assignment grading among 5 teaching assistants
- Developed a suite of coding assignments with exercises on Deep Learning (e.g., Multi-Layer Perceptron), Error-based learning (e.g., Logistic Regression), Information-based learning (e.g., Decision Trees), Probability-based Learning (e.g., Bayes Nets), Similarity-based learning (e.g., Nearest neighbors)
- Awarded Outstanding Assistant in Instruction from the Electrical Engineering and Computer Engineering Dept.

PROFESSIONAL EXPERIENCE

NASA Ames Research Center

Data Sciences Group

Mountain View, CA

May. 2015-Sept. 2017 (summer; winter)

Research intern

- Developed an algorithm based on multiple kernel learning for Support Vector Machines (SVMs) to automatically construct features for anomaly detection
- Explored methods for integrating multiple kernel learning into an active learning framework used to train an SVM for anomaly detection on flight data
- Work featured in NASA's ML workshop (<https://ntrs.nasa.gov/api/citations/20190030497/downloads/20190030497.pdf>)

Apple Maps

Data science Intern

Sunnyvale, CA

May-Sept. 2016

- Experimented with machine learning algorithms (e.g., gradient boosted decision trees) for anomaly detection