

# Garrett Bingham

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## RESEARCH AND EXPERIENCE

### Neural Networks Research Group Graduate Research Assistant

Austin, TX · Aug 2019 - Present

- Demonstrated that evolutionary algorithms can design novel deep learning activation functions that outperform ReLU.
- Replacing ReLU with an evolved activation function in Wide ResNet gives a statistically significant increase in accuracy on CIFAR-100.
- Showed that evolutionary algorithm discovers better activation functions more quickly than random search.
- Submission *Evolutionary Optimization of Deep Learning Activation Functions* to appear at GECCO 2020.

### Amazon Robotics AI Software Development Engineer Intern

Seattle, WA · May - Aug 2019

- Migrated production large-scale video classification workflow to internal computation framework, optimizing for specific use cases.
- Parallelized 10TB dataset construction and preprocessing; used cached results from prior datasets to incrementally build new ones.
- Created model versioning scheme to allow framework to substitute precomputed per-epoch results instead of requiring two weeks of retraining for every experiment.
- Assisted visiting scientists with onboarding and added GPU support to the framework.

### Language, Information, and Learning at Yale (LILY) Lab Undergraduate Researcher

New Haven, CT · Aug 2018 - May 2019

- Developed BiDARTS, a novel approach to automatically design bidirectional recurrent neural network architectures.
- BiDARTS approached state-of-the-art accuracy on word token part of speech tagging across 60 treebanks (91.32% vs. 91.83%).
- Empirically demonstrated that random search outperforms current gradient-based approaches to neural network architecture design.
- Improved English-Swahili and English-Tagalog cross-lingual document retrieval relevance scores by 5.2% by training support vector regressor to predict query-specific document cutoffs. Research done for IARPA MATERIAL Program; publication at ACL 2019.

### Reservoir Labs Research Intern

New York, NY · Jun - Aug 2018

- Utilized polyhedral compiler to speed up neural network inference time by 12% without sacrificing accuracy.
- Implemented methods to translate TensorFlow operations to equivalent C code, increasing percentage of optimizable operations from 84% to 99% for Inception V3/V4 and from 58% to 95% for ResNet V2 50.
- Designed algorithm to optimize disjoint subgraphs of the neural network, decreasing optimization time to less than one minute.
- Improved robustness by developing algorithms that guarantee the optimized neural network remains acyclic.

### University of North Carolina Wilmington NSF Research Experience for Undergraduates Intern

Wilmington, NC · May - Jul 2017

- Developed novel face recognition algorithm which classifies by weighting predictions made in multiple random feature subspaces.
- Improved accuracy from 60.9% to 78.8% on MORPH-II and from 90.3% to 94.8% on ORL datasets vs. related algorithms.
- Corrected 2,700 errors in the 55,000 entry MORPH-II face image dataset that previously published research missed.
- Second-author publication at the 2018 IEEE International Conference on Big Data, first-author oral presentation at the NES Mathematical Association of America Meeting, and first-author poster presentation at the Council on Undergraduate Research REU Symposium.

## EDUCATION

### The University of Texas at Austin

AUSTIN, TX · 2019 - PRESENT

Ph.D. Computer Science

GRE (V/Q/W): 96th/95th/98th percentile

### Yale University

NEW HAVEN, CT · 2015 - 2019

B.S. Computer Science & Mathematics

Graduated *cum laude* · GPA: 3.85 / 4.00

## SKILLS & COURSEWORK

Python, C, R,  $\LaTeX$ , MATLAB, TensorFlow, Docker, AWS, Neural Networks, NLP, Computer Vision, Randomized Algorithms, Optimization, Stochastic Processes, Analysis  
English: Native · Spanish: ILR 3