

Garrett Bingham

YALE UNIVERSITY '19
B.S. COMPUTER SCIENCE & MATHEMATICS

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Neural Architecture Search for Morphology

Language, Information, and Learning at Yale (LILY) Lab

New Haven, CT · Fall 2018

- Individual neural architecture search (NAS) research (NAACL submission in preparation):
 - Developed BiDARTS, a novel NAS approach that searches for bidirectional recurrent cells.
 - Using NAS to automatically discover neural networks for morphological tagging.
- IARPA MATERIAL (Machine Translation for English Retrieval of Information in Any Language) Program:
 - Trained support vector regressor on query pre-retrieval features to predict query-specific document cutoffs, **increasing system's performance metric by 5.2%**.
 - Used t-SNE projection to automatically identify difficult queries.
- Gave lecture on morphology for the graduate-level Advanced Natural Language Processing class.
- Wrote book chapter surveying recent approaches to neural computational morphology (on arXiv this winter).

TensorFlow Graph Optimization

Reservoir Labs

New York, NY · Summer 2018

- Extended capabilities of R-Stream-TF, a tool which parallelizes and optimizes TensorFlow (TF) subgraphs:
 - Increased robustness by developing algorithms that guarantee the optimized graph remains acyclic.
 - Added support for additional TF operations, increasing the percentage of optimizable operations **from 84% to 99%** on the Inception V3/V4 networks and **from 58% to 95%** on the ResNet V2 50 network.
 - Enabled R-Stream-TF to partition large subgraphs into smaller chunks, speeding up optimization time to a **minute or less** and satisfying memory constraints.
 - Improved overall performance by tailoring the subgraph selection strategy to the target architecture.
- As a result, **R-Stream-TF improved from a 70% slowdown to a 12% speedup** vs. the unoptimized graph.
- Manuscript "Polyhedral Optimization of TensorFlow Subgraphs" in preparation.

Face Recognition

University of North Carolina Wilmington

Wilmington, NC · Summer 2017

- Developed RS-2DLDA, a novel face recognition algorithm which outperformed similar approaches.
- RS-2DLDA improved accuracy from 60.9% to **78.8% on MORPH-II** and from 90.3% to **94.8% on ORL** datasets.
- Corrected 1,800 errors in the 55,000 entry MORPH-II dataset that previously published research had missed.
- Gave weekly presentations and tutorials on RMarkdown, \LaTeX , and 2D-PCA to program students and faculty.

PAPERS

- Yip, B., **Bingham, Garrett**, et al. "Preliminary Studies on a Large Face Database." 5th National Symposium for NSF REU Research in Data Science, Systems, and Security at the 2018 IEEE International Conference on Big Data.
- Bingham, Garrett**. "Random Subspace Two-Dimensional LDA for Face Recognition." ArXiv.org e-Print Archive, 2017, arxiv.org/abs/1711.00575. (Submitted to Pattern Analysis and Applications.)
- Bingham, Garrett**, et al. "MORPH-II : Inconsistencies and Cleaning Whitepaper." North Carolina Digital Online Collection of Knowledge and Scholarship, 2017, libres.uncg.edu/ir/uncw/listing.aspx?id=22243.

PRESENTATIONS (RS-2DLDA)

NES Mathematical Association of America Meeting	Sacred Heart University	Nov. 17-18, 2017	Oral
Council on Undergraduate Research REU Symposium	The Westin Alexandria	Oct. 22-23, 2017	Poster
REU Research Showcase	UNC Wilmington	Jul. 24, 2017	Poster

Extracurriculars / Service

- Calculus Tutor:** Held weekly one-on-one tutoring sessions. *Yale University · Aug '16 - May '17*
- Demos:** Conducted weekly science experiments with local 4th graders. *New Haven, CT · Aug '16 - May '17*
- Bridges ESL:** Gave weekly English lessons to New Haven immigrants. *New Haven, CT · Jan - May '17*
- Daycare Assistant:** Read books and learned with class of 3-year-olds. *Calvin Hill Daycare · Aug - Dec '16*
- BSA Eagle Scout Award:** Awarded for organizing service project that raised \$900 and collected 300 pairs of reading glasses which were sent to Vanuatu. *Harrisville, UT · Mar - May '14*

Coursework

GPA: 3.86

COMPUTER SCIENCE

- Advanced Natural Language Processing
- Systems Programming & Computer Organization
- Computational Vision & Biological Perception
- Theory of Computing
- Algorithms
- Data Structures & Programming Techniques

MATHEMATICS

- Optimization Techniques
- Abstract Algebra
- Quantum Probability & Quantum Logic
- Topics in Analysis
- Discrete Mathematics
- Probability Theory
- Linear Algebra & Matrix Theory
- Multivariable Calculus

Skills

PROGRAMMING

Experienced:

Python · C · R · \LaTeX

Familiar:

MATLAB · HTML/CSS · CUDA

LANGUAGES

English Native ●●●●●
Spanish ILR 3 ●●●○○
Hungarian ILR 1 ●○○○○

Study Abroad

Budapest, Hungary
Aquincum Institute of Tech.
Computer Science & Math
Spring 2018

Bilbao, Spain
University of Deusto
Spanish Language & Culture
Summer 2016