

Garrett Bingham

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

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Neural Architecture Search for NLP

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

New Haven, CT · Fall 2018

- Individual neural architecture search research (First-author paper submitted to **NAACL 2019**):
 - Created BiDARTS, the first approach to automatically designed bidirectional neural network architectures.
 - Applied to part of speech tagging, BiDARTS is **competitive with the state of the art**.
- 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 2,700 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
Council on Undergraduate Research REU Symposium
REU Research Showcase

Sacred Heart University
The Westin Alexandria
UNC Wilmington

Nov. 17-18, 2017
Oct. 22-23, 2017
Jul. 24, 2017

Oral
Poster
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

Harrisville, UT · Mar - May '14

that raised \$900 and collected 300 pairs of reading glasses which were sent to Vanuatu.

Coursework

GPA (Overall) 3.86

CS & Math 3.91

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