Matthew L. Bowers

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Education

B.A. in Computer Science and B.A. in Chemistry, Columbia University, New York, NY — May 2020

Junior Phi Beta Kappa, Summa cum Laude, GPA: 4.08 (Computer Science: 4.22, Chemistry: 4.17), Dean's List

Skills

- C, C++, Java, Python (PyTorch, TensorFlow, NumPy, & SciPy), CUDA, R, Git, OCaml, Bash, Vim.
- Computer Science Coursework: Machine Learning, AI, Operating Systems, Compilers, Networks, Advanced C/C++, Algorithms, CS Theory, Computation & the Brain, Linear Algebra, Discrete Math, Calc. III & IV.
- Chemistry Coursework: General Chemistry & Lab, Organic Chemistry & Lab, Adv. Organic Lab, Physical Chemistry & Lab, Inorganic Chemistry, Electricity and Magnetism, Quantum Waves, Quantum Chemistry.

Experience

Massachusetts Institute of Technology, CSAIL — **Cambridge, MA**

PhD Candidate, co-advised by Armando Solar-Lezama and Josh Tenenbaum — 2020-Present

- Research in program synthesis approaches to artificial intelligence, including neurosymbolic methods.
- Authored a paper with Max Nye & Evan Pu (*Representing Partial Programs with Blended Abstract Semantics*) presented at NeurIPS 2020 CAP Workshop and submitted to ICLR 2021.

Massachusetts Institute of Technology, Learning Matter Group — **Cambridge, MA**

Research Assistant, PI: Rafael Gomez-Bombarelli — 2019-2020

- Developed graph convolutional neural architectures for faster and more accurate chemical simulation.
- Developed TupleParallel, an internal tool for massive parallelization of graph-based learning.
- Hired to continue work remotely during the academic year on graph-based machine learning.

Columbia University, Departments of Math and Chemistry — **New York, NY**

Teaching Assistant, Discrete Mathematics, Calculus III, Chemistry Help Room — 2018-2019

- Provide individual instruction in multivariable calculus, discrete math, organic and general chemistry.

Columbia University, Theoretical Chemistry Group — **New York, NY**

Research Assistant and Programmer, PI: Angelo Cacciuto — 2017-2020

- Programmed GPU-accelerated chemical simulations in C and CUDA to understand self-assembly in active matter and designed a novel method for improving self-assembly for smart and active materials.
- Authored two publications (*Active sculpting of colloidal crystals* and *Universal reshaping of arrested colloidal gels via active doping*) published in *The Journal of Chemical Physics* in 2019 and 2020.

Columbia University, Materials Group and Spectroscopy Lab — **New York, NY**

Research Assistant, PIs: Jonathan Owen & Andrew Crowther — Summer 2017

- Synthesized & spectroscopically analyzed novel CdSe/S quantum dot nanoplatelets for use in solar cells.

Publications

- Nye, M., Pu, Y., **Lee Bowers, M**., Andreas, J., Tenenbaum, J., Solar-Lezama, A. (2020). Representing Partial Programs with Blended Abstract Semantics. *Submitted to ICLR 2021*.
- Mallory, S., **Lee Bowers, M**., & Cacciuto, A. (2020). Universal reshaping of arrested colloidal gels via active doping. *The Journal of Chemical Physics*, *153*, 084901.
- **Bowers, M.**, Wang, W., & Gomez-Bombarelli, R. (2019). Predicting Scalar Coupling Constants Through Deep Learning. *Poster at the Columbia Undergraduate Research Symposium*.
- Das, S., **Lee Bowers, M**., Bakker, C., & Cacciuto, A. (2019). Active sculpting of colloidal crystals. *The Journal of Chemical Physics*, *150*(13), 134505.

Awards

- Graduated **Summa cum Laude** (2020), Columbia University
- **Computer Science Scholarship Award** (2020), Columbia University – for academic merit (2 given).
- **Richard Bersohn Prize** (2020), Columbia University – for academics and research in chemistry (1 given).
- **Junior Phi Beta Kappa** (2019), Columbia University – awarded to top 2% of undergraduates.
- **Class of 1939 Fellowship** (2019), Columbia University
- **Columbia College Summer Funding Program Fellowship** (2019), Columbia University
- **Guthikonda Fellowship** (2018), Columbia University
- **Science Research Fellowship** (2016), Columbia University – multi-year research funding

Projects

Parser for Custom Languages (2019)

- Designed a parser capable of parsing all of Python as well as arbitrary custom languages described in a modified Backus-Naur form (BNF). Bootstrapped the BNF grammar to compile itself.

Espresso Shell (2018-2019)

- Created a Python-Bash hybrid shell combining the brevity of Bash for basic tasks with the flexibility of Python for more advanced operations. Used as my full-time replacement for Bash for over a year.

Coral: A Blazingly Fast, Gradually-Typed Python-like Language (2018)

- Worked in a team of 4 to write a compiler in OCaml for a language of our design, which combines the flexibility of Python with the speed of statically-typed compiled languages: https://github.com/ja3067/Coral

Debian Linux Scheduler & Filesystem (2018)

- Modified the Linux kernel directly to replace the default CFS process scheduler with a custom round-robin scheduler and a custom filesystem.