Jacob Moorman

Applied Math Ph.D. Candidate at UCLA

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EDUCATION

Ph.D. in Mathematics
2016 - June 2021

M.A. in Mathematics
June 2018

University of California, Los Angeles (UCLA) — *Los Angeles, CA*

Advisors: Deanna Needell and Andrea Bertozzi
Research focus: stochastic optimization and subgraph matching

B.S. in Mathematical Sciences
May 2016

B.S. in Computer Science
May 2016

New Jersey Institute of Technology (NJIT) — *Newark, NJ*

SKILLS

Programming languages: Python, JavaScript, SQL, C++, Bash, LaTeX
Operating systems and other tools: Linux, macOS, Windows, SVN, Git
Research expertise: optimization, machine learning, statistics, network analysis, numerical linear algebra

EXPERIENCE

Graduate Student Researcher
Sept 2016 – Present

University of California, Los Angeles (UCLA) — *Los Angeles, CA*

- Developed top performing subgraph matching algorithms for the DARPA Modeling Adversarial Activity program.
- Extended the subgraph matching algorithms to knowledge graphs and noisy/inexact data.
- Showed that adaptive variants of stochastic gradient descent (SGD) enjoy accelerated convergence.
- Created open-source Python packages for subgraph matching, optimization algorithms, and more.
- Led special interest groups in SGD, matrix and tensor factorization, and Python package development.
- Acted as assistant mentor to a team of 13 students in the 2018 UCLA CAM REU program.
- Completed courses in numerical analysis, statistics, optimization, and machine learning.

Computer Vision Research Intern
Summer 2019

HRL Laboratories — *Malibu, CA*

- Created a calibration procedure for dynamic multi-sensor systems.
- Integrated the calibration procedure into a hands-off system to automatically calibrate sensors.
- Established benchmark tests to reliably measure calibration accuracy.

Artificial Intelligence Research Intern
Summer 2017

NovaSignal (formerly, Neural Analytics) — *Los Angeles, CA*

- Developed search algorithms for NovaGuide, an automatic cerebral ultrasound robot.
- Created cerebral bloodflow simulations to reduce the need to physically scan people when testing algorithms.

Software Engineering Intern
Jan 2015 – May 2016

Trillium Labs — *New York, NY*

- Built an interactive web application (Surveyor Web) to view full historical order book market data.
- Surveyor Web serves as a "lite" version of Surveyor Enterprise and can be accessed at surveyor.trlm.com.
- Created an automatic outlier detection system to find anomalous market events for analysts to investigate.

Undergraduate Researcher
Jan 2014 – Dec 2014

NJIT Department of Mathematics — *Newark, NJ*

- Developed an algorithm to simultaneously identify and track acoustic sources in passive sonar applications.
- Used C++ and MATLAB simulations to generate synthetic datasets as benchmarks for the algorithm.

Game Development Consultant
2012 - 2013

Mission Critical Studios — *Farmingdale, NJ*

- Designed game mechanics and prototyped levels for a video game published on Steam.

RESEARCH

Journal Publications

- **Jacob D. Moorman**, Thomas K. Tu, Denali Molitor, Deanna Needell,
  "*Randomized Kaczmarz with Averaging*."
  BIT Numerical Mathematics, Aug. 2020.

Conference Publications

- Thomas K. Tu, **Jacob D. Moorman**, Dominic Yang, Qinyi Chen, Andrea L. Bertozzi,
  "*Inexact Attributed Subgraph Matching*."
  Proc. GTA³ 4.0 at IEEE International Conference on Big Data, Atlanta, GA, Dec. 2020.
- Zhaojun Nie, Michael O'Brien, Mina Ranjbaran, **Jacob D. Moorman**, Nic Canac, Shankar Radhakrishnan, Zsolt Garami, Robert Hamilton,
  "*Neural Echo Simulator (NES) for Real-Time Simulation of Transcranial Doppler Ultrasound (TCD) Signal Responses of Cerebral Hemodynamics From High-Resolution 3D Imaging Head-Models*."
  Proc. 24th Meeting of the Euro. Soc. of Neurosonology and Cerebral Hemodynamics, Linz, Austria, Apr. 2019.
- **Jacob D. Moorman**, Thomas K. Tu, Denali Molitor, Deanna Needell,
  "*Randomized Kaczmarz with Averaging*."
  Proc. Information Theory and Applications Workshop, La Jolla, CA, Feb. 2019.
- **Jacob D. Moorman**, Qinyi Chen, Thomas K. Tu, Zachary M. Boyd, Andrea L. Bertozzi,
  "*Filtering Methods for Subgraph Matching on Multiplex Networks*."
  Proc. GTA³ 2.0 at IEEE International Conference on Big Data, Seattle, WA, Dec. 2018.

Preprints

- **Jacob D. Moorman**, Qinyi Chen, Thomas K. Tu, Xie He, Andrea L. Bertozzi,
  "*The Subgraph Matching Problem on Multiplex Networks*."
  Submitted Feb. 2020.
- Robert M. Gower, Denali Molitor, **Jacob D. Moorman**, Deanna Needell,
  "*Adaptive Sketch-and-Project Methods for Solving Linear Systems*."
  Submitted Sept. 2019.

Presentations

- "*Comparing Adaptive Sketch-and-Project Methods*." (Oral)
  SIAM Conference on Imaging Science (IS20), Virtual, Jul. 2020.
- "*On Comparing Adaptive Sampling Rules for Sketch-and-Project Methods*." (Oral)
  Joint Mathematics Meeting, Denver, CO, Jan. 2020.
- "*Randomized Kaczmarz with Averaging*." (Poster)
  Information Theory and Applications Workshop, La Jolla, CA, Feb. 2019.
- "*Identifying and Tracking Multiple Underwater Acoustic Sources Using Characteristic Signatures*." (Poster)
  SIAM Conference on Computational Science and Engineering, Salt Lake City, Utah, Mar. 2015.

Awards

- 2018-2019 MENTOR NSF Research Traineeship $34,000
- 2020-2021 UCLA Dissertation Year Fellowship $20,000

Reviewer

- Elsevier Applied Mathematics and Computation
- Elsevier Linear Algebra and its Applications
- IEEE Big Data GTA³ 4.0 Workshop (Program Committee Member)
- SIAM Journal on Matrix Analysis and Applications
- SIAM Journal on Scientific Computing
- Springer Calcolo
- Springer Numerical Algorithms

TEACHING

Teaching Assistant

Sept 2016 – May 2018
Los Angeles, CA

UCLA Department of Mathematics

- Math 174E: Mathematics of Finance (S'18)
- Math 171: Stochastic Processes (S'18, W'18, F'17)
- Math 155: Mathematical Imaging (W'18)
- Math 142: Mathematical Modeling (F'17)

- Math 170B: Probability Theory (S'17)
- Math 170A: Probability Theory (F'16)