

# George Matheos

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## EDUCATION

### MASSACHUSETTS INSTITUTE OF TECHNOLOGY

- PhD Candidate, Computer Science.

CAMBRIDGE, MA

09/2023-

### UNIVERSITY OF CALIFORNIA, BERKELEY

- BA in Mathematics (high honors) & Computer Science (highest honors). GPA: 3.986.
- Graduate courses (year-long): probability theory, analysis/topology/functional Analysis
- Advanced undergraduate courses (semester-long): machine learning, advanced algorithms, compilers, mathematical logic, CS theory, complex analysis, algebraic topology.

BERKELEY, CA

08/2018-05/2020

08/2021-05/2023

## EXPERIENCE

### Artificial Intelligence Researcher, UC Berkeley

- Advised by Stuart Russell, director of the Center for Human-Compatible AI.
- Developed the SMCP3 family of sequential Bayesian inference algorithms, and an automated implementation in the probabilistic programming language Gen. (Paper at AISTATS'23.)
- Developed a “backward particle Gibbs” algorithm for Bayesian inference in state-space models. This corrects mistakes in inferences from time-series data by processing data backwards in order to avoid “garden-pathing”. (Not yet published.)

BERKELEY, CA

11/2019 – 05/2020

08/2021 – PRESENT

### Artificial Intelligence Researcher, MIT - PROBABILISTIC COMPUTING PROJECT

- Advised by Vikash Mansinghka, PI of the MIT Probabilistic Computing Project.
- Developed the GenWorldModels probabilistic programming language. This extends the Gen probabilistic programming system with support for object-oriented “open-universe” probabilistic programs. (Paper at AABI'20.)
- Contributed to development of the Gen probabilistic programming system. Developed new inference-programming DSL, new “update specification” semantics for inference programming.
- Developed a new computational neuroscience theory explaining how brain-like spiking neural networks may implement scalable Monte Carlo inference in probabilistic graphical models. Developed a compiler from probabilistic programs to spiking neural networks. (Poster at CSHL.)

CAMBRIDGE, MA

05/2020 – 08/2021

### Data Science & Machine Learning Intern, SPACEMAKER AI (now acquired by AutoDesk)

- Developed novel “progressive-bicycle GAN” architecture. Applied this to generate realistic architectural proposals for apartment sites based on post-processed satellite data.

CAMBRIDGE, MA

06/2019 – 08/2019

## PUBLICATIONS

### Papers

**Alexander K. Lew\***, **George Matheos\***, Matin Ghavamizadeh, Nishad Gothoskar, Stuart Russell, Vikash K Mansinghka. “SMCP3: SMC with Probabilistic Program Proposals”. AISTATS 2023.

**George Matheos\***, **Alexander K. Lew\***, Matin Ghavamizadeh, Stuart Russell, Marco Cusumano-Towner, Vikash K Mansinghka. “Transforming Worlds: Automated Involutive MCMC in Open Universe Probabilistic Models”. At Advances in Approximate Bayesian Inference 2020.

### Posters

**George Matheos \***, **Andrew D. Bolton\***, McCoy Becker, Cameron Freer, Vikash K Mansinghka. “Brain computation as fast spiking neural Monte Carlo inference in probabilistic programs”. At “From Neuroscience to Artificially Intelligent Systems” conference at the Cold Spring Harbor Laboratory, August 2022.

\*Equal contribution

## MISC.

### Expertise

Probabilistic Computing, including: Bayesian Statistics, Monte Carlo Methods, MCMC, Sequential Monte Carlo, Particle Filtering, Particle Gibbs. Computer system & programming language design. Machine learning (including experience with PyTorch, Tensorflow, etc.)

**Programming Languages** Python, C, OCaml, Java, Julia, Javascript, Haskell, Lisp.

### Honors & Awards

Cox Medal, Phillips Exeter Academy, 2018. Awarded to 5 students with highest academic rank in class of over 300.