Paul **Liu**

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Education

PhD in Computer Science — *Stanford, California*

Stanford University — *2017–Present*

Thesis: *In progress.*

Advisors: Moses Charikar and Jan Vondrák

Masters in Computer Science — *Vancouver, British Columbia*

University of British Columbia — *2015–2017*

Thesis: Characterizing minimum-length coordinated motions for two discs

Advisor: David Kirkpatrick

Bachelors in Mathematics and Physics — *Vancouver, British Columbia*

University of British Columbia — *2010–2015*

Thesis: Searching for the vector-like quark TA – study of multivariate analysis techniques

Advisor: Alison Lister

Work Experience

Computer Science Department, Stanford — *Stanford, USA*

Research Assistantship — *Fall 2017 - Present*

Ongoing research in distributed computing models and large-scale graph algorithms as part of my Ph.D. work.

Adobe — *Toronto, Ontario*

Computer Vision Research Intern — *July 2021 – September 2021*

Currently working on an automated annotation / strategy system for racket sports. See `https://cs.stanford.edu/people/paulliu/badminton/` for more information.

Microsoft — *Sunnyvale, USA*

Applied Data Scientist Intern — *July 2020 – September 2020*

Created recommendation / selection algorithms for `msn.com`. Created streaming algorithms for Bing search leveraging recent research in determinantal point processes (code and paper for WWW 2021 can be found on my website).

Microsoft — *Sunnyvale, USA*

Applied Data Scientist Intern — *July 2019 – September 2019*

Improved advertising relevance for search queries to the Bing search engine. Improved text classification accuracy by 15% (relative increase) through CNN-based models (to be implemented in production). Also showed promising gains in few-shot learning accuracy through Graph Convolutional Network models.

Adobe — *Seattle, USA*

Creative Labs Intern — *June 2018 – Sept 2018*

Worked on the simulation of water bubble sounds for graphics applications. Previous works takes weeks of compute time to generate realistic acoustical simulations of liquid sounds and leverages complicated but accurate CFD codes. In this project, we aim to create new algorithms that creates acoustically plausible water sounds while bringing computational speed closer to realtime.

Vital Mechanics — *Vancouver, Canada*

Research Engineer — *Jan 2014 – Aug 2017*

Produced mathematical models of the human body for digital simulations. As one of the first two engineers, my work varied widely, from setting up testing and CI infrastructure to building complex physical models and optimizing solvers for specialized large and sparse linear systems. This work was spun off into a Government of Canada funded startup (Vital Mechanics Research).

Computer Science Department, UBC — *Vancouver, Canada*

Research Assistant — *Jan. 2016 – Feb. 2018*

Research in 2-body coordinated motion. Given two robots on an obstacle-free plane and two destination points, what is the shortest path each robot should take so that the two robots are not within unit distance of each other? We have classified optimal motions for a large variety of cases and have fully solved the problem when the robots are simple geometric shapes.

Facebook *Menlo Park, USA*

Software Engineering Intern *May 2015 – Aug 2015*

Worked on statistical algorithms for detecting anomalies in time-series data. This algorithm was released to all Facebook engineers through a widely used computational backend for logging data. The algorithm was also taken up by internet.org, where it was used to detect abnormal patterns in traffic data.

Google *Los Angeles, USA*

Software Engineering Intern *May 2013 – Sept 2013*

Created a stochastic model for proposed ads by potential advertisers. Purpose of the model was to predict an ad's performance before the ad is released to the public. Additionally created pipelines to automatically validate accuracy of model.

Scientific Computing Lab, UBC *Vancouver, Canada*

NSERC Research Assistantship *May 2012 – May 2015*

Created a high-performance C++ software package for performing incomplete factorizations of symmetric indefinite matrices. The complete source code, as well as extensive documentation, can be found at `https://github.com/inutard/matrix-factor`.

Publications

See `https://cs.stanford.edu/people/paulliu/papers` for a complete list.

Service

Reviewer for Electronic Transactions on Numerical Analysis (**ETNA**, 2015), Symposium on Computational Geometry (**SoCG**, 2016), European Symposium on Algorithms (**ESA**, 2019), Innovations in Theoretical Computer Science (**ITCS**, 2021).

Awards

2017 **Stanford School of Engineering Fellowship**
2017 **Mackenzie King Open Scholarship**
2016 **David W. Strangway Fellowship**
2015–2016 **Walter C. Koerner Fellowship**
2015 **Computer Science Merit Scholar**
2015-2017 **NSERC CGS-M Grant**
2015 **GSS Open Scholar Award**
2015 **Physics and Astronomy Undergraduate Scholarship**
2014–2015 **Reginald Palliser-Wilson Scholarship**
2014 **John Collison Memorial Scholarship**
2014 **Dharma Master Chuk Mor Memorial Scholarship**
2013 **Dorothy Gladys Studer Memorial Scholarship**
2013 **Volkoff Scholarship**
2013 **Rick Sample Memorial Scholarship**
2012 **W.H. MacInnes Scholarship**
2012 **NSERC USRA Research Award**
2011–2013 **Trek Excellence Scholarship**
2010 **President's Entrance Scholarship**
2010 **BC Provincial Examination Scholarship**

Teaching experience

CS 368 Algorithmic Techniques for Big Data *Stanford*

Teaching Assistant *2020*

Designed assignments and held office hours. To encourage competition and actual implementations of algorithms, I created a set of automatically graded programming assignments complete with a functional public scoreboard.

CS 348C Computer Graphics: Animation and Simulation

Stanford

Teaching Assistant — *2019*

Designed assignments and held office hours. One cool aspect of this course was that all assignments were animated videos. Created weekly video composites of class assignments synced to music.

CS490, Problem Solving Seminar

University of British Columbia

Instructor — *2014*

Taught a full-credit course to expose students to computing contest problems. Designed curriculum and materials that are still currently in use.

Science One

UBC

Teaching Assistant — *2012*

Science One is an inter-disciplinary course at UBC encompassing all first-year science courses (equivalent of at least six full-credit courses). Designed assignments and taught review sessions for the Math portion of the program.

Honours

2016–2019 **Coach**, ACM-ICPC Contest World Finals

2012–2014 **Canada Site Winner**, ACM ICPC Pacific Northwest Regionals

2013 **Finalist**, ACM ICPC World Finals

2013 **Bronze Medal**, U. Chicago Invitational Contest

2012 **Bronze Medal**, International University Physics Competition

2011 **7th nationally**, Google AI Contest

Extracurricular Activity

UBC Programming Team

Vancouver, Canada

Coach (2014–Present), Contestant (2011–2017) — *2014–Present*

- Competed on contests across North America.
- Created structured practices for team members.
- Wrote original contest problems for local contests.
- Created a training for local high school contestants.

UBC Math Circle

Vancouver, Canada

Organizer — *2012–2015*

- Created structured practices for high school students competing in math contests.
- Arranged for special faculty lectures every week.

UBC & Stanford Badminton Team

Team member — *2016–Present*

- Represented UBC and Stanford in badminton games against different schools.
- Provincially and nationally ranked in individual competition.