Saifuddin Syed

University of Oxford Department of Statistics

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Research Interests

Using probability, geometry, and physics to develop theory and methodology for Bayesian inference.

Education

University of Oxford Department of Statistics — Oxford, UK
Postdoctoral Research Assistant (CoSInES project), Supervised by Dr. Arnaud Doucet — 2022 – Present

University of British Columbia Department of Statistics — Vancouver, Canada
PhD in Statistics, Supervised by Dr. Alexandre Bouchard-Côté — 2017 – 2022

- **Thesis:** "Non-reversible parallel tempering on optimized paths"

University of British Columbia Department of Mathematics — Vancouver, Canada
MSc in Mathematics, Supervised by Dr. Ed Perkins — 2014 – 2016

- **Thesis:** "Spatial diffusions with singular drifts: The construction of super Brownian motion with immigration at unoccupied sites"

University of Waterloo — Waterloo, Canada
BMath Honours Pure Mathematics & Honours Applied Mathematics — 2010 – 2014

- Graduated with distinction on the Dean's honours list.

Publications

[1] Nikola Surjanovic, **Saifuddin Syed**, Trevor Campbell, and Alexandre Bouchard-Côté. "Parallel Tempering with a variational reference" (2022), arXiv:2206.00080.
In review.

[2] Trevor Campbell, **Saifuddin Syed**, Chiao-Yu Yang, Michael I. Jordan, and Tamara Broderick. "Local Exchangeability." (2022), arXiv:1906.09507.
To appear in Bernoulli.

[3] **Saifuddin Syed**, Vittorio Romaniello, Trevor Campbell, and Alexandre Bouchard-Côté. "Parallel tempering on optimized paths" (2021), arXiv: 1905.02939.
International Conference on Machine Learning, PMLR 139:10033-10042, 2021.

[4] **Saifuddin Syed**, Alexandre Bouchard-Côté, George Deligiannidis, and Arnaud Doucet. "Non-reversible parallel tempering: a scalable highly parallel MCMC scheme" (2021), arXiv:1905.02939.
Journal of the Royal Statistical Society (Series B), DOI:10.1111/rssb.12464.

Notable Talks

(Invited) ISBA World Meeting 2022, *Montreal, Canada.* — June 2022

(Seminar) Université de Montréal Département de Mathmatiques et Statistiques, *Montreal, Canada.* — June 2022

(Seminar) University of Oxford OxCSML Seminar, *Oxford, UK.* — May 2022

(Seminar) CoSInES Seminar, *Remote.* — May 2022

(Seminar) Queensland University of Technology Department of Statistics, *Remote.* — Apr 2022

(Seminar) University of British Columbia Department of Statistics, *Vancouver, Canada.* — Mar 2022

(Seminar) Simon Fraser University Statistics Colloquium, *Burnaby, Canada.* — Mar 2022

(Contributed) Monte Carlo Methods and Applications Conference (MCM 2021), *Remote.* Aug 2021

(Contributed) ISBA 2021 World Meeting, *Remote.* Jun 2021

(Seminar) Riskfuel Analytics Inc, *Remote.* Mar 2021

(Seminar) Multidisciplinary University Research Initiative (MURI), *Remote.* Apr 2020

(Seminar) University of Oxford Department of Statistics, *Oxford, UK.* Dec 2019

(Seminar) University of Bristol Department of Mathematics, *Bristol, UK.* Dec 2019

(Invited) Computational and Methodological Statistics Conference (CMStatistics), *London, UK.* Dec 2019

(Guest Lecture) STAT 547C: Topics in Probability, *Vancouver, Canada.* Oct 2019

(Invited) Monte Carlo Methods and Applications Conference (MCM 2019), *Sydney, Australia.* Jul 2019

(Seminar) 1QBit Information Technologies Inc Seminar, *Vancouver, Canada.* Apr 2019

(Seminar) Microsoft Research Seminar, *Redmond, USA.* Jan 2019

Awards and Scholarships

Marshall Prize 2021

UBC Four Year Fellowships (FYF) For PhD Students 2017 – 2021

President's Academic Excellence Initiative PhD Award 2020

NSERC Canada Graduate Scholarship Doctorate Award (CGS-D) 2017 – 2020

Faculty of Science Graduate Award 2017 – 2020

Anona Thorne and Takao Tanabe Graduate Entrance Scholarship in Statistics 2017

NSERC Alexander Graham Bell Canada Graduate Scholarship (CGS-M) 2015 – 2016

Queen Elizabeth II Aiming for the Top Scholarship 2010 – 2014

University of Waterloo Math Faculty Deans Honours List 2010 – 2014

NSERC Undergraduate Student Research Award (USRA) 2013

University of Waterloo Research Award 2011

University of Waterloo President's Scholarship 2010

Research and Relevant Work Experience

PhD Student Supervisor: Dr. Alexandre Bouchard-Côté
University of British Columbia, Department of Statistics 2017 – 2022

- Building the theory and optimal tuning of parallel tempering, a family of methods that exploits parallel computing to speed mixing times of Markov chain Monte Carlo algorithms.
- Developing the notion of "local exchangeability" to build Bayesian models for a class of datasets approximately invariant to the order of the observations.

Graduate Research Assistant, Stochastic Analysis Supervisor: Dr. Edwin Perkins
University of British Columbia, Department of Mathematics 2014 – 2016

- Analysed the stochastic processes that arise when studying the scaling limits of evolutionary systems.
- Constructed a super-process modelling an evolutionary system undergoing random motion and critical reproduction under the immigration of a new species at locations of zero occupancy.

Undergraduate Research Assistant Supervisor: Dr. Spiro Karigiannis
University of Waterloo, Department of Pure Mathematics 2013

- Analysed extrinsic properties of minimal surfaces embedded in G_2 manifolds, a particular class of Riemannian manifolds that arises in the area of mirror symmetry and string theory.

General Manager & Co-editor-in-chief Supervisor: Dr. Frank Zorzitto
Waterloo Math Review (WMR) 2012 – 2014

- In charge of screening submissions, marketing, and production of the WMR, a peer reviewed undergraduate research journal for undergraduate mathematicians

Actuarial Analyst, Automotive Pricing Supervisor: Carl Lussier
Desjardins General Insurance Group 2012

- Analysed large amounts of online data using generalized linear models to model regions of high fraud and profitability in Ontario.

Undergraduate Research Assistant Supervisor: Dr. Kevin Hare
University of Waterloo, Department of Pure Mathematics 2011

- Determined Hausdorff dimension for variants of the Sierpinski Triangle, and researched applications of fractal geometry in the natural sciences.

Teaching Experience

Teaching Assistant, UBC Department of Statistics 2018 – 2021

- Teaching assistant and guest lecturer for STAT 547C (graduate probability)

Instructor, UBC Vantage College 2015 – 2016

- Instructor for the full year course Math 100V/Math 101V (differential/integral calculus) for the Vantage College program at UBC through the department of Mathematics

Instructor, UBC Department of Mathematics 2015

- Instructor for Math 105 (integral calculus for commerce and social sciences).

Teaching Assistant, UBC Department of Mathematics 2014

- Teaching assistant for Math 220 (introduction to proofs).

Instructor, Beat Your Course 2015

- Responsible for teaching large scale review sessions for differential calculus, vector calculus, and ordinary differential equations.

Private Tutor, Brain Boost 2014 – 2015

- Private high school math and physics tutor for children with learning disabilities.

Senior Tutor, Grade Up 2013 – 2014

- Lead math tutor for the University of Waterloo chapter of Grade Up.

Relevant Skills

Notable Advanced Machine Learning/Statistics/Probability Courses:
Machine Learning, Graphical Models, Statistical Inference, Advanced Monte Carlo Methods, Statistical Consulting, Linear Models, High Dimensional Probability (audit), Graduate Probability Theory I/II, Advanced Stochastic Analysis, Stochastic Processes in the Physical Sciences, Topics in Probability: Entropy and Ergodic Theory, High Dimensional Percolation Theory.

Notable Advanced Math Courses:
Advanced Linear Algebra, Real Analysis, Complex Analysis, Measure Theory, Fourier Analysis, Functional Analysis, Ordinary Differential Equations, Partial Differential Equations, Differential Geometry, Riemannian Geometry, Algebraic Topology, Topics in Geometry: Atiyah-Singer Index Theorems, Advanced Algebra, Representation Theory, Quantum Theory, Open Quantum Systems, General Relativity and Cosmic Inflation.

Programming: Julia, Python, R, Matlab