## Supranta Sarma Boruah


CONTACT

PhD Candidate
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RESEARCH INTERESTS

Cosmology-Large-scale structures, Statistical inference and machine learning, Gravitational Wave cosmology

EDUCATION

**University of Waterloo**

Master's Candidate, Department of Applied Mathematics — *Sept 16-Dec 17*

- Advisors: Ghazal Geshnizjani

Ph.D. Candidate, Department of Applied Mathematics — *Dec 17-present*

- Advisors: Ghazal Geshnizjani and Michael J. Hudson

**Indian Institute of Technology (IIT) Kanpur** — *Jul 11-May 16*

B.S-M.S dual degree, Department of Physics

- *Master's project*: Anisotropic cosmologies in massive gravity

PUBLICATIONS AND PREPRINTS

1. *Cosmic flows in the nearby Universe: new peculiar velocities from SNe and cosmological constraints*, **S. S. Boruah**, M. Hudson and G. Lavaux. arXiv:1912.09383
2. *Neural physical engines for inferring the halo mass distribution function*, T. Charnock, G. Lavaux, B. Wandelt, **S. S. Boruah**, J. Jasche and M. Hudson. arXiv:1909.06379
3. *Gravitational Potential from small-scale clustering in action space: Application to Gaia DR2*, T. Yang, **S. S. Boruah**, and N. Afshordi. arXiv:1908.02336
4. *Cuscuton Bounce*, **S. S. Boruah**, H. J. Kim, M. Rouben and G. Geshnizjani. JCAP **1808**, no. 08, 031 (2018), arXiv:1802.06818
5. *Theory of Cosmological Perturbations with Cuscuton*, **S. S. Boruah**, H. J. Kim and G. Geshnizjani. JCAP **1707**, no. 07, 022 (2017), arXiv:1704.01131

ONGOING PROJECTS

- *Using Bayesian forward-modelled reconstruction to analyze the cosmic flows in the nearby Universe*

  Collaborators: Michael J. Hudson, Guilhem Lavaux and Jens Jache
- *Bayesian forward-modelled reconstruction with a conditional halo mass function*

  Collaborators: Mike Hudson and Guilhem Lavaux
- *Inferring Hubble constant from gravitational wave standard sirens without optical counterpart*

  Collaborators: Ghazal Geshnizjani and Guilhem Lavaux

## Awards and Achievements

*MITACS Globalink Research Award* 2018

Research travel assistantship worth CAD 6000 awarded to conduct research under the guidance of Dr. Guilhem Lavaux at Institut d'Astrophysique de Paris for 12 weeks

*KVPY Fellowship* 2011

Awarded to approximately 200 top students by Department of Science and Technology, India based on a competitive examination to study basic sciences.

*IIT-JEE* 2011

Ranked 974 among 400000 students in the nationwide IIT-JEE entrance examination

*Olympiads* 2009-2011

Was among the 300 students selected for the Indian National Physics Olympiad (INPhO), 2011.
Represented the state of Assam in the Indian National Mathematics Olympiad (INMO) in the years 2009-2011

## Talks

*"Cosmological perturbations with Cuscuton"*, Talk at the cosmology group meeting, Perimeter Institute for Theoretical Physics, Waterloo October 2016

*"Cuscuton perturbations and a novel bouncing scenario"*, Poster presentation, Testing Gravity 2017, Simon Fraser University, Vancouver January 2017

*"Cuscuton bounce and perturbations"*, Contributed talk, Theory Canada 12, York University, Toronto May 2017

*"Inferring the Milky Way potential using stellar motion"*, Graduate student colloquium, Department of Applied Mathematics, University of Waterloo July 2017

## Summer Schools and Workshops Attended

*Summer Institute in Philosophy of Cosmology* June 2018

Rotman Institute of Philosophy, London

*Large-Scale Astrophysics: galaxies and beyond* June 2018

McGill University, Montreal

*Tri-Institute Summer School on Elementary Particles(TRISEP)* July 2018

Perimeter Institute of Theoretical Physics, Waterloo

*Analytics, Inference and Computation in Cosmology* September 2018

Institut d'Etudes Scientifiques de Cargese, Corsica, France

## Conferences Attended

*Testing Gravity 2017* January 2017

Simon Fraser University, Vancouver

*Theory Canada 12* May 2017

York University, Toronto

*Bounce Scenarios in Cosmology* June 2017

Perimeter Institute for Theoretical Physics, Waterloo

## Computational Skills

*Advanced*: Python, Julia

*Intermediate*: TensorFlow, MATHEMATICA, C++

*Cosmological Tools*: GADGET2, CAMB, AstroPy, emcee

## Teaching Experience

Teaching Assistant:

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|---|---|
| Calculus 2 for Sciences(MATH128) | *Winter 2017, 2018* |
| Partial Differential Equations(AMATH353) | *Spring 2017* |
| Intro. to Differential Equations(AMATH250) | *Spring 2017* |
| Multivariable Calculus(MATH237) | *Fall 2017,Winter 2019, Spring 2019, Fall 2019* |
| Quantum Theory 1(AMATH373) | *Winter 2018* |
| Ordinary Differential Equations 2(AMATH351) | *Spring 2019* |