

# Saibal De

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Graduate Student Research Assistant, Department of Mathematics, University of Michigan  
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## RESEARCH INTERESTS

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High performance computing · Fast algorithms · Machine learning · Quantum Computing  
Boundary integral methods · Granular media flow · Tensor factorizations

## EDUCATION

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- University of Michigan, Ann Arbor Sep 2016 – Current  
Ph.D. in Applied and Interdisciplinary Mathematics and Scientific Computing  
Advisor: Dr. Shravan Veerapaneni, Co-advisor: Dr. Xun Huan
- Indian Institute of Science, Bengaluru Aug 2012 – May 2016  
B.Sc. (Research) in Mathematics, with a minor in Physics  
Advisor: Dr. A. K. Nandakumaran

## PUBLICATIONS

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- **Saibal De**, Hadi Salehi and Alex Gorodetsky. “Efficient MCMC sampling for Bayesian matrix factorization by breaking posterior symmetries.” Submitted: Journal of Machine Learning Research (JMLR). Preprint: arXiv:2006.04295 (2020).
- **Saibal De**, Eduardo Corona, Paramsothy Jayakumar and Shravan Veerapaneni. “Scalable solvers for cone complementarity problems in frictional multibody dynamics.” In: 2019 IEEE High Performance Extreme Computing Conference (HPEC). IEEE. 2019.

## WORKS IN PROGRESS

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- “Fast solvers for Stokes boundary integral equations on surfaces of revolutions” with Bogdan Vioreanu and Shravan Veerapaneni.
- “Compression of DEM simulation data with tensor-train decomposition for acceleration of machine learning models” with Guanchu Chen, Eduardo Corona, Paramsothy Jayakumar, Hiroyuki Sugiyama, Shravan Veerapaneni and Hiroki Yamashita.
- “Data-driven multifidelity reduced order model generation with tensor factorizations” with Eduardo Corona, Xun Huan, Paramsothy Jayakumar and Shravan Veerapaneni.
- “Fast solvers for quantum rotor Hamiltonian eigenvalue problems in context of continuous optimization” with Giuseppe Carleo, Vojtěch Havlíček, James Stokes and Shravan Veerapaneni.
- “Overcoming barriers to scalability in variational quantum Monte Carlo” with Tianchen Zhao, Brian Chen, James Stokes and Shravan Veerapaneni.

## SCHOLARSHIPS AND AWARDS

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- MICDE Fellow 2019  
*Funded by Michigan Institute for Computational Discovery and Engineering, University of Michigan*
- KVPY Fellow 2011 – 2015  
*Funded by Department of Science and Technology, Government of India*

## TALKS AND PRESENTATIONS

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### Contributed Talks

- IEEE HPEC, Waltham, MA Sep 2019  
*Scalable solvers for cone complementarity problems in frictional multibody dynamics*
- ARC Annual Meeting, Ann Arbor, MI May 2019  
*Fast algorithms and high-performance computing for high-fidelity terramechanics simulations*
- SIAM Great Lakes Section Annual Meeting, Ann Arbor, MI Apr 2019  
*A fast solver for Stokes boundary integral equations on axisymmetric surfaces*

### Poster Presentations

- (Upcoming) ARC Annual Meeting, Ann Arbor, MI May 2021  
*Tensor factorization based data compression and dimensionality reduction for autonomous mobility*
- SIAM Conference on Computational Science and Engineering Mar 2021  
*Tensor-train decomposition for data compression and data-driven reduced order modeling*
- ARC Annual Meeting, Ann Arbor, MI May 2020  
*Tensor factorization based data compression and dimensionality reduction for autonomous mobility*
- ARC Annual Meeting, Ann Arbor, MI May 2020  
*Fast algorithms and high-performance computing for high-fidelity terramechanics simulations*
- Mathematical Fluids, Materials and Biology, Ann Arbor, MI June 2019  
*A fast solver for Stokes equation in rotationally symmetric geometries*
- ARC Annual Meeting, Ann Arbor, MI May 2019  
*Fast algorithms and high-performance computing for high-fidelity terramechanics simulations*
- MICDE Annual Symposium, Ann Arbor, MI Apr 2019  
*A fast solver for Stokes equation in rotationally symmetric geometries*

### Student Seminar Talks

- MICDE PhD Seminar Series, University of Michigan Feb 2021  
*Tensor Methods for Data Compression*
- MCAIM Graduate Seminar, University of Michigan Jan 2021  
*Quantum Computing for Continuous Optimization Problems*
- Student AIM Seminar, University of Michigan Oct 2020  
*A quick tour of the Bayesian approach to low-rank matrix completion*
- SIAM Student Mini-symposium in Applied Mathematics, University of Michigan May 2020  
*Large scale simulation of non-smooth dynamics of granular media*
- Student Machine Learning Seminar, University of Michigan Feb 2019  
*Optimization for training deep neural networks*
- Student Machine Learning Seminar, University of Michigan Oct 2018  
*Adaptive submodularity and active learning*
- Student AIM Seminar, University of Michigan Feb 2018  
*On Green's functions, boundary integral equations and rotational symmetry*

## WORKSHOPS ATTENDED

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- XSEDE Summer Boot Camp Jun 2020
- Petascale Computing Institute Aug 2019

## TEACHING AND MENTORING

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### Courses

- Lab Instructor, University of Michigan  
Math 216 (Differential Equations) Fall 2018
- Primary Instructor, University of Michigan  
Math 115 (Calculus I) Winter 2018
- Primary Instructor, University of Michigan  
Math 115 (Calculus I) Fall 2017
- Primary Instructor, University of Michigan  
Math 115 (Calculus I) Winter 2017
- Primary Instructor, University of Michigan  
Math 105 (Pre-calculus) Fall 2016

### Guest Lectures

- University of Michigan  
Math 671 (Fast Algorithms and PDE-Constrained Optimization)  
*Topic:* Tensor-Train Decomposition Fall 2020
- University of Michigan  
Math 371 (Numerical Methods for Engineers and Scientists)  
*Topic:* Linear Least-Squares and QR Decomposition Fall 2019

### Mentoring

- Directed Reading Program Mentor, University of Michigan  
*Topic:* Singular Value Decomposition for Data-Driven Modeling, *Student:* Chang Wang Fall 2020
- Directed Reading Program Mentor, University of Michigan  
*Topic:* Statistical Machine Learning, *Student:* Lance Ying Summer 2020
- Directed Reading Program Mentor, University of Michigan  
*Topic:* Nonlinear Dynamical Systems, *Student:* Ziyi Zhou Winter 2019

## TECHNICAL SKILLS

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- Programming Languages:
  - Proficient in C/C++, Python, MATLAB
  - Basic knowledge of Julia, Fortran
- Parallel Programming:
  - Proficient with MPI, OpenMP
  - Basic knowledge of OpenACC, CUDA
- Software Tools:  $\text{\LaTeX}$ , Linux command line

## EXTRACURRICULAR ACTIVITIES

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- Co-organizer of Mathematics Directed Reading Program  
University of Michigan Fall 2019 – Current
- Co-organizer of Student Machine Learning Seminar  
University of Michigan Fall 2018 – Winter 2019