

Apoorv Srivastava

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Research Interests: Applied Maths, Inverse Problems, Machine Learning, Optimization, UQ

EDUCATION

Stanford University *Sep 2021 - Present*

Ph.D. Candidate, Mechanical Engineering (minor in Computational Math) *GPA 4.02/4.00*

Developing Bayesian and optimization-based estimation algorithms for inverse problems.

Stanford University *Sep 2021 - Jun 2023*

Masters in Mechanical Engineering *GPA 4.00/4.00*

Specialization in Automatic Controls and Optimization

Indian Institute of Technology Bombay (IIT Bombay) *Jul 2016 - May 2020*

Bachelor of Technology (with Honours) in Civil Engineering *GPA 9.51/10*

Ranked first in the department, Undergraduate Research Award, and FFE Scholarship

WORK EXPERIENCE

Los Alamos National Lab - Graduate Student Researcher *Jul 2023 - Sep 2023*

Advisor(s): *Dr. Balasubramanya T. Nadiga*

– Parameter estimation using optimization in stiff systems where filtering-based methods lack.

IMAC, EPFL - Undergraduate Student Researcher [4, 5] *May 2019 - Jul 2019*

Advisor(s): *Dr. Gennaro Senatore, Prof. Ian F. C. Smith*

– Control problem for adaptive structures that undergo shape changes in response to loads.

SELECTED PROJECTS

System Identification under Binary Observations (*In Preparation*) *Oct 2023 - Present*

Advisor(s): *Prof. Wei Kang, Prof. Daniel M. Tartakovsky*

– Study of identifiability and state estimation for dynamic systems under binary observations.

Improving Particle Filters using Deep Probabilistic models *Jan 2024 - Present*

Advisor(s): *Prof. Eric Darve, Prof. Daniel M. Tartakovsky*

– Developing methods to improve the efficiency of particle filters using probabilistic models.

Diffusion Model for Learned Optimizers (Report) *Oct 2023 - Dec 2023*

Deep Generative Models / *Prof. Stefano Ermon*

– Using Denoising Diffusion Probabilistic Models to study ill-conditioned inverse problems.

Optimal Control for Grid Balancing (Report) *Mar 2023 - Jun 2023*

Optimal & Learning-based Control / *Dr. Daniele Gammelli, Spencer M. Richards*

– Model Predictive Control for minimizing a microgrid's demand variability and energy cost.

TECHNICAL SKILLS AND COURSEWORK

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|---|---|
| Mathematics & Computer Science | Optimization, Linear Algebra, Fourier Transform, Statistical Inference, Machine Learning, Parallel Programming, Deep Generative Models, Partial Differential Equations, Stochastic Differential Equations, Numerical Methods, Finite Element Method |
| Engineering | Optimal & Learning-based Control, Robot Autonomy, Control Design, Fluid Mechanics, Fluid Dynamics, Solid Mechanics |
| Teaching Assistant | Numerical Methods for Engineering |
| Programming | Python, MATLAB, C++ |
| Frameworks & Tools | Git, MPI, OpenMP, CUDA, PyTorch, Fenics, L ^A T _E X, and ROS2 |

SELECTED PUBLICATION

1. A Srivastava, DM Tartakovsky, “Computable Kinetic Defect Measure for Hyperbolic Conservation Laws”, Submitted.
2. A Srivastava, W Kang, DM Tartakovsky, “Feature-Informed Data Assimilation”, Journal of Computational Physics, 2023. (paper)
3. RB Muhammad, A Srivastava, S Alyaev, RB Bratvold, DM Tartakovsky, “High-Precision Geosteering via Reinforcement Learning and Particle Filters”, Submitted. (paper)
4. AP Reksowardojo, G Senatore, A Srivastava, C Carroll, IFC Smith, “Design and testing of a low-energy and -carbon prototype structure that adapts to loading through shape morphing”, International Journal of Solids and Structures 2022. (paper)
5. AP Reksowardojo, G Senatore, A Srivastava, IFC Smith, H Unterreiner, C Carroll, “Design and control of a prototype structure that adapts to loading through large shape changes”, IFAC-PapersOnLine, 2020. (paper)
6. RB Muhammad, Y Cheraghi, S Alyaev, A Srivastava, RB Bratvold, “Enhancing Geosteering With AI: Integrating a Decision-Making Robot Into a Cloud-Based Environment and Benchmarking Against Human Experts”, SPE Norway Subsurface Conf., 2024. (paper)

The complete list can be found on my Google Scholar page.

OTHER PROJECTS

Metabolite Dynamics in the Brain

Jan 2023 - Present

Advisor(s): Dr. Juliane Krueger, Prof. Daniel M. Tartakovsky

- Estimating metabolite diffusion-reaction dynamics using in situ concentration observation.

Kinetic Defect for Hyperbolic Conservation Laws [1]

Jan 2023 - Aug 2023

Advisor(s): Prof. Daniel M. Tartakovsky

- Identification of the Kinetic Entropy Defect measure for hyperbolic conservation laws.

Feature-Informed Data Assimilation (FIDA) [2]

Apr 2022 - Jan 2023

Advisor(s): Prof. Wei Kang, Prof. Daniel M. Tartakovsky

- Study of state and parameter estimation problems under set-valued feature observations.

State Estimation for High-Precision Geosteering [3, 6]

Nov 2022 - Oct 2023

Advisor(s): Dr. Sergey Alyaev, Prof. Daniel M. Tartakovsky

- State estimation using particle filters for improved RL-based online Decision making.

List of earlier projects

- Mechanical Metamaterials and Deployable Structures *Aug 2018 - May 2020*
- Structural Optimization using Genetic Algorithm *July 2017 - Aug 2018*
- Stress Analysis using Finite Element Method *Jan 2019 - May 2019*
- Gaussian Processes for data-driven material modeling *Sep 2021 - Dec 2021*

More details on these projects can be found on the research page of my website.

SCHOLASTIC ACHIEVEMENTS

- Awarded the Mechanical Engineering Department Fellowship. *Stanford University, 2021*
- Received the Institute Silver Medal for academic excellence. *IIT Bombay, 2020*
- Granted the Undergraduate Research Award (URA01 & URA02). *IIT Bombay, 2020*
- Recipient of the Swiss National Science Foundation (SNSF) Scholarship. *EPFL, 2019*
- Awarded the SC Mehrotra Prize for highest GPA in the class. *IIT Bombay, 2018*
- Recipient of the Foundation for Excellence (FFE) Scholarship. *IIT Bombay, 2018*