Apoorv Srivastava

Email: apoorv1@stanford.edu

Research Interests: Bayesian Estimation, Machine Learning, Uncertainty Quantification

Education

Stanford University *Sep 2021 - Present*
Ph.D. Candidate, Mechanical Engineering (minor in Applied Math) *GPA 4.02/4.00*
Developing Bayesian estimation algorithms for non-linear systems.

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*
Institute Siver Medal, Undergraduate Research Award, and FFE Scholarship

Publications and Conferences

1. A Srivastava, DM Tartakovskty, "Computable Kinetic Defect Measure for Hyperbolic Conservation Laws", Submitted.
2. A Srivastava, W Kang, DM Tartakovskty, "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)
7. (Conf. Presntation) "Inference of Neuroactivity from Measurements of Nutrient Concentration", 17th U.S. National Congress on Computational Mechanics (USNCCM17), 2023.

Selected Projects

System Identification under Binary Observations *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.

Work Experience

Los Alamos National Lab - *Graduate Student Researcher* *Jul 2023 - Sep 2023*
Advisor(s): *Dr. Balasubramanya T. Nadiga*

– Parameter estimation in stiff systems where filtering-based methods fall short.

IMAC, EPFL - *Undegraduate 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.

Technical Skills and Coursework

Courses Taken	Convex Optimization, Deep Generative Models, Statistical Inference, Machine Learning, Stochastic Differential Equations, Linear Algebra, Fourier Transform, Parallel Programming, Numerical Methods, Finite Element Method, Optimal & Learning-based Control, Robot Autonomy, Control Design, Statistical Mechanics, Continuum Mechanics, Structural Dynamics
Courses Taught(CA)	Numerical Methods for Engineering
Programming	Python, MATLAB, C++, Julia
Frameworks & Tools	Git, CUDA, LaTeX, PyTorch, Scipy, Numpy, Matplotlib, FreeFEM++, MPI, OpenMP, CUDA, ROS2

Research Projects

Metabolite Dynamics in the Brain [7] *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.

Additional 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 *Sept 2021 - Dec 2021*
– Jekyll and Liquid-based webpage (Github) *May 2021 - Jul 2021*

Extracurricular Involvements

– Reviewer for Computational Geosciences journal. *2023*
– Mentor for the ME PhD peer mentorship program at Stanford University. *2022-2023*
– Mentor for department academic mentorship program at IIT Bombay. *2018-2020*
– Served as subsystems head and design engineer for Team Shunya. *2017-2020*