

# Sarasij Banerjee

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## EDUCATION

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### Arizona State University

*Ph.D. Candidate in Chemical Engineering (Machine Learning, Optimization, Control Theory)*

*Aug 2021 – Dec 2025 (Expected)*

**GPA: 4/4**

### Indian Institute of Technology Kanpur

*Bachelor of Technology in Chemical Engineering*

*Jul 2017 – May 2021*

**GPA: 3.26/4**

## TECHNICAL SKILLS

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- **Libraries:** CVXPY, Eigen, OSQP, CPLEX, Scikit-learn, PyTorch, NumPy, SciPy, Pandas, PyMongo, PySpark
- **Language, ETL, and Automation:** Python3, C++17/20, SQL, MongoDB, Airflow, Spark, Matlab and Simulink
- **ML and Math:** Statistical Machine Learning, Deep Learning, Stochastic and Convex Optimization, Signal Processing, Numerical Computational Methods, Ordinary Differential Equation, Vector Calculus, Time-Series Modeling, Stochastic Processes
- **Control:** Linear Systems, Nonlinear Control, Model Predictive Control, State Estimation, Robust and Optimal Control

## WORK EXPERIENCE

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### IFAPA Research Center, Spain - Visiting and Remote Researcher

*Nov 2023 – Present*

*Data-Efficient Predictive Modeling and Control of an Industry-Scale Wastewater Facility (Python, MATLAB)*

- Developed a novel signal optimization algorithm for an industry-scale wastewater reactor to cut response time to **one-third**, meeting tight computational and economic constraints.
- Reduced data generation costs by **64%** by designing frequency-optimized input signals for ARX time-series model learning.
- Built and validated a Model Predictive Control (**MPC**)-inspired optimization framework through **NumPy/CVXOPT** for long-horizon, constraint-aware decisions; enabled real-time large-scale deployment, lower industrial operating costs by **34%**.

### Control Systems Engineering Lab, ASU - Graduate Researcher

*Jan 2022 – Present*

*Human-Centered Predictive Modeling for Behavior-Aware Autonomous Healthcare Systems (Python, MongoDB, MATLAB)*

- Led development of smart-watch-based large-scale healthcare strategies for improving physical activity for **198** adults in the US.
- Collaborated with behavioral scientists to integrate high-dimensional and uncertain behavior prediction with stochastic gradient descent algorithms for combined feature selection and reduced-order modeling, reducing compute time from **7 hrs to 8 mins**.
- Engineered **Airflow**-orchestrated human-in-the-loop Hybrid MPC pipelines (Mixed-Integer QP) using **PyMongo, Pandas, and CPLEX**, enabling personalized interventions, boosting long-term step counts from **5,000 to 10,000** in **48** participants.

*Online Learning and Uncertainty-aware Control of Multivariable Chemical Reactor System (C++, MATLAB)*

- Designed an adaptive learning and predictive control algorithm for a nonlinear reactor network to address model drifts, eliminating costly offline global model retraining.
- Prototyped and deployed a **robust Kalman-Filter-based MPC** using **Eigen** and **OSQP**, improving trajectory tracking time from **5 hrs to 2 hrs** and **halving** the disturbance sensitivity on the reactor output, compared to standard MPC.

### Power Electronics and Control Engineering Lab, ASU - Undergraduate Intern

*May 2020 – Aug 2020*

*Deep-Learning-based Direct Inverse Control of a Step-Down Power Converter (Python, MATLAB)*

- Developed a novel **NumPy** and **PyTorch**-based deep-learning control algorithm for a datacenter power converter application.
- Achieved stable voltage output with  $\pm 3\%$  deviation under 100% load changes, meeting strict datacenter performance standards.

## AWARDS AND ACHIEVEMENTS

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- Awarded membership to the nationally recognized Tau Beta Pi Engineering Honors Society.
- Outstanding Graduate Teaching Assistant. Awarded to only 3 graduate students across the School of Engineering, ASU.
- INSPIRE scholarship, Ministry of Science & Technology, India. Awarded to the top 1% students of each state of India.

## PUBLICATIONS (SELECTED)

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- **Banerjee, S. et al.**, “A Data-Driven Hybrid Model Predictive Control Framework for Managing Epidemics Using 3DoF-KF HMPC.” *American Control Conference*, 2025.
- **Banerjee, S. et al.**, “Data-Driven Control of Highly Interactive Systems using 3DoF Model-On-Demand MPC: Application to a MIMO CSTR.” *IFAC Symposium on System Identification*, 2024.
- **Banerjee, S. et al.**, “Predicting Goal Attainment in Control-Oriented Behavioral Interventions Using a Data-Driven System Identification Approach.” *IFAC Journal of Process Control*, 2023.

## POSITIONS OF RESPONSIBILITY

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- Reviewed 7+ journal and conference papers on Bayesian optimization, Predictive Control, Statistical ML, and State Estimation.
- Mentored an MS student for the academic year 2022–2023 for an applied project on optimal control.
- Served as a Graduate Teaching Assistant of the senior-year class of 90+ students on Process Dynamics and Control.