# Sai varun aduru


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## Education

**University of Rochester, Rochester, NY, USA** **Aug 2022 - Present**
PhD., Chemical Engineering

**University of Washington, Seattle, WA, USA** **Dec 2017**
MS., Chemical Engineering (Data Science Option)

**Andhra University, Visakhapatnam, India** **June 2016**
BTech., Chemical Engineering

## Interests

First principles modeling, Data-driven modeling, Model predictive control, Process control, Machine Learning, Deep learning

## Skills

- Programming : Python, MATLAB, Maple, Mathematica
- Softwares : Pandas, NumPy, scikit learn, Keras, Git Bash, Simulink
- Algorithms and Statistical methods : Linear and Nonlinear Model Predictive Control, Regression Analysis, Decision Trees, Random Forests, Support Vector Machines, Artificial Neural Networks, Bayesian forecasting methods

## Research Experience

**Research Engineer - Chemical Engineering and Science**
*SUEZ Water Technologies & Solutions, Bengaluru* **Dec 2019 - July 2022**
*General Electric Power & Water, Bengaluru* **May 2019 - Nov 2019**

- Developed a first principles based mathematical tool for monitoring and predicting the performance and degradation of a steam surface condensers in industrial steam power plants
- Developed a simulation platform for modeling and simulation ion exchange units for water treatment processes
- Developed a data driven analytics tool for predicting and monitoring the performance of process gas compressors in ethylene manufacturing plants
- Developed Bayesian forecastering methods for monitoring and predicting the chemical storage tank levels

**Research Scientist**
*M.A.P.L.E Lab, University of Washington, Seattle* **Jan 2019 - Apr 2019**
**Battery Control Engineer**
*BattGenie Inc, Seattle* **July 2018 - Dec 2018**

- Developed nonlinear model predictive control (NMPC) strategies, as a part of battery management systems (BMS), for deriving optimal fast charging protocols for lithium-ion batteries, using a detailed psuedo two dimensional (P2D) model
- Developed health-conscious NMPC charging profiles for lithium-ion batteries by restricting the anodic side reaction over-potential and cell voltage of a lithium-ion battery
- Worked in collaboration with the software and hardware development teams for implementing these control strategies on embedded platforms such as STM32, Raspberry Pi, Beagle Bone etc.,

**Research Associate**
*Dept. of Chemical Engineering, University of Washington* **Apr 2018 - July 2018**

- Worked on linear model predictive control algorithms (DMC, QDMC, for developing optimal fast charging protocols while ensuring safety by applying suitable constraints on temperature and voltage
- Developed an Internal Model Control (IMC) based PID strategy for controlling systems defined by Differential Algebraic Equations (DAEs)
- Worked on implementing ML algorithms on Quantitative Structure Activity Relation(QSAR)/ Quantitative Structure Property Relation (QSPR) datasets

## Papers

1. Suryanarayana Kolluri, **Sai Varun Aduru**, Manan Pathak, Richard D. Braatz, Venkat.R. Subramanian," Real-time Nonlinear Model Predictive Control (NMPC) Strategies using Physics-Based Models for Advanced Lithium-ion Battery Management Systems (BMS)", *Journal of Electrochemical Society*, **167 063505-063505-13**, 2020
2. **Sai Varun Aduru**, Manan Pathak, Suryanarayana Kolluri, Richard D. Braatz, Venkat.R. Subramanian," Nonlinear Model Predictive Control Strategies for Optimal Charging of a Lithium-Ion Battery", *ECS Meeting Abstract*, **106-106**, 2019
3. **A. Sai Varun** and R. Padma Sree, " Tuning of PID Controller for First order stable/unstable Time Delay Systems with a Zero", *IJCTA*, **8**, 3, 2015

## Academic Projects

Machine Learning models for predicting molecular properties
*Beck Research Lab, University of Washington, Seattle* **Dec 2017**

- Performed normalization, feature selection (PCA), and built machine learning models on QSAR/QSPR datasets
- Developed classification and regression models from datasets comprising chemical descriptors for assessing caco-2 cell monolayer permeability of compounds in ADME profiling (classification) and for predicting general melting points of compounds(regression)

Data Intensive Research Enabling Clean Technologies (DIRECT) program
*University of Washington, Seattle* **Jan 2017 - July 2017**

- Studied the correlation between the nanoscale chemical structure and electrical properties in perovskite films for optimizing performance of solar cells using hyperspectral image data
- Developed a Python package, *Energy by Location in America (ELA)*, to visualize the energy generation and storage facilities across US.