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PROFILE

Data Scientist with **4.5 years** of experience in **Data Science, Machine Learning, Neural Network, MLOps, System Identification, Computer Vision, Smart Manufacturing &IIoT.**

SKILLS & INTERESTS

- **Skills:** MLOps, Python, TensorFlow, Pytorch, C++, SQL, Matlab & Simulink, OpenCV, Flask, Git, Cloud Function, RESTful API, Computer Vision, HTML, Docker,, OOPS, Functional API
- **Techniques:** Time Series Modeling, Forecasting, ML libraries & algorithms, SVM, Neural Network, CNN ,RNN, Clustering, Dimensionality reduction, Natural Language Processing, Large Language Models, System Identification, SHAP, PDP ,Hypothesis Testing, Process Analytical technology, Decision Tree, Plotly, Dash, Signal Processing Techniques.
- **Interests:** Cricket, Reading, Animation

WORK EXPERIENCE

STL **Jul'19 – Present**
MIT's Device Realization Lab, Director MIT Nano, Prof. Brian Anthony *Pune, Maharashtra*
Data Driven Modeling of system dynamics and control design

- Collaborated with Prof. Brian Anthony at MIT, developed a model of the complex optical fiber drawing process using a deep LSTM Neural Network and modeled the existing controllers using statistical time-series system identification methods.
- Developed closed-loop simulation as a design tool for controller improvements.
- Fine-tuned the controller gains, resulting in the fiber diameter decreasing from 125 ± 0.7 μm to 125 ± 0.3 μm (with annual savings of approximately $3 million).
- Developed a POC in collaboration with **MIT** on Model free tracking control of an optical fiber drawing process using **Deep Reinforcement Learning**.

Data Driven Adaptive Control of Fibre Coating Process

- RCA was conducted in python to find process parameters contributing to the coating defects.
- Processed large amounts of IoT data, applied noise reduction, tapering and other pre-processing techniques.
- Learned the relation between process parameters using transfer function model (system identification methods in control theory) in Matlab and modified the lookup table. Reduced the coating scrap by **25%**

Defect Detection System using Computer Vision

- Designed and developed a Computer Vision platform **(Edge Detection)** in Google Cloud to improve the Mfg. Process quality and productivity.
- It involved deploying a python job on Google App Engine that can fetch the images from GCS Bucket and apply edge detection algorithms and save geometrical and spatial information of edges in the BigQuery table.
- Saved approx **100 Man hours/month.**

Deployed tree based model for scrap reduction

- Deployed end to end Bend Insensitive Fiber Scrap Reduction ML model, starting from data collection from different data sources to model deployment to Google Cloud using App Engine and managing data pipelines with CronJob. Impact was an annual savings of **$1M.**
- Wrote a python script to extract machine analytical information from the 4 different data sources from Big query and created and deployed a dashboard to GCP using App Engine for the better monitoring of the business process.

Optimization of glass making process - MIT's Device Realization Lab

- Successfully conducted in depth analysis of mapping IoT data to quality test parameters. This involved techniques like noise reduction, dimensionality reduction, clustering to visualize the patterns in IoT data.
- Developed and deployed advanced models to map input parameters to quality outcomes, optimizing business processes.

Other Experience

- Experienced in K-means Clustering, Gaussian Mixtures Models, First Principle Modeling
- Have worked on time series forecasting, different ML algorithms eg. Random Forest, XGBoost, CatBoost, Logistic Regression, Support Vector Machines, different regularization techniques.
- Experienced in Process Analytical Technology to identify process signatures.
- Experienced in statistical analysis e.g. Analysis of Variance, T test.
- Experienced in dockerize the application, docker networking, Rest APIs and deployment on Google Cloud.

RESEARCH INTERNSHIPS/ PROJECTS

NeoAero, Controller Designer*,* VTOL autonomous drones for last mile logistics **Apr'19 – Jun'19**
Simulation and position control of VTOL drone NeoAero, London, UK

- Designed position control for Food delivery quadcopter using PID, LQR and state-feedback in Matlab & Simulink/Simscape-multibody.
- Linearized the models about the operating point and generated the State Space model and tuned the PID.
- Simulated the model with varying trajectories.

Taiwan Tech, Taipei, Distinguished Prof. Chyi-Yeu Jerry Lin **Apr'18 – Aug'18**
Control and synchronization of motor driven 7 bar mechanism NTUST, Taiwan

- Implemented PID algorithm for motor driven mechanism that can mimic the motion of jogger face on treadmill.
- Taking the feedback of the jogger face from the camera sensor with serial communication, treated this as a setpoint. Fetched response from Faulhaber motor driver, feed this setpoint and response difference to tuned PID to get optimal voltage required to drive the motor (7 Bar Mechanism is driven by this motor and Jogger can attach his/her iPad or tablet to it).

ROLES & RESPONSIBILITIES

- Collaborate cross-functionally with leadership, process experts, IT, data engineering teams to set up the end to end scope, business benefits and expectations from the projects.
- Sharing findings with the management and stakeholders to improve the model and identify additional data/ feature generation based on domain knowledge.
- Leading, mentoring monitoring the performance of team members to ensure efficiency in process.
- Key person from company to manage the collaboration with MIT, USA

EDUCATION

Indian Institute of Technology Kharagpur, West Bengal
Jul'15 - Apr'19
B.Tech, CGPA 8.01/10, Mechanical Engineering
Relevant Coursework – MIT'x Machine Learning with Python: from Linear Models to Deep Learning, Statistical Modeling and Computation in Applications, Probability - The Science of Uncertainty and Data, Fundamental of Statistics, Deep Learning Specialization, Introduction to Artificial Intelligence with Python, Reinforcement Learning, Statistical Method, Data Analysis and Algorithm, Advanced Image Processing, Digital Signal Processing, MLOps Fundamental, Docker Mastery, Optimal control, Robotics, Soft Computing, System and Control.