DIVYANSHU SINGH CHAUHAN

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EDUCATION

University of Michigan, Ann Arbor Michigan, USA
MSE - Aerospace Engineering; (Subdomain: Autonomous Systems and Control) *Aug 2024 - May 2026*

Indian Institute of Technology (IIT) Guwahati Guwahati, India
B.Tech - Mechanical Engineering *July 2017 - July 2021*

Relevant Coursework: Linear Feedback Control Systems (ECE 565) & Flight and Trajectory Optimization (AEROSP 575), ROB 550: Robotic Systems Laboratory, Guidance Navigation and Control (AEROSP 584), Inference Estimation and Learning (AEROSP 567), Online Learning and Control (AEROSP 740), Aerospace Information Systems (AEROSP 552)

EXPERIENCE

Graduate Research Assistant, Standard Chartered Bank Aug 2021 - Jul 2024

- Developed automated **python** workflows for three years for threat detection and response using **splunk phantom**, improving threat response time by **40 percent** and reducing the human resource usage for the specific tasks by **30 percent**.
- Executed the development of python-driven solutions for process automation via **FastAPI** and **RESTful APIs**, leveraging **Git** for version control and **Jira** for agile task management.
- Collaborated with the data science team to develop a **supervised** phishing detection model with an accuracy of **83%**.

Python Developer, Standard Chartered Bank Aug 2021 - Jul 2024

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Deep Learning Summer Intern, HyperVerge Inc. GitHub

- Developed **U-Net** based architectures and **GAN-assisted autoencoders** for image tampering localization, achieving a **91% and 50%** detection rate for authentic and tampered data respectively.
- Designed a custom **Conv2D** layer that improved image manipulation detection, increasing precision rates from **75%** to **90%**, and allowing for more accurate insights in data-driven decision-making processes.

PROJECTS

Robust Trajectory Optimization in Orbital Mechanics under Uncertainty - Research Assistant. Research Asst.
Prof. Alex Gorodetsky, University of Michigan

- Developed an end to end **three phase** trajectory pipeline for autonomous docking spacecraft on a **deterministic** target location under the actual constraints as per NASA's Docking standards using **CasADI** framework and **IPOPT** numerical solver.
- Formulating terminal constraints using uncertainty-aware cost functions, incorporating statistical bounds via **Monte Carlo sampling and covariance-based quaternion perturbations**.
- Next steps include integrating **Kalman Filter** (KF) variants for state belief propagation and feedback estimation during re-planning, enhancing robustness against process noise and sensor error.
- **Skills**: Python, NumPy, CasADi, State Estimation, Trajectory Optimization

Communication-Aware, Physics-Based and Photo-Realistic simulator for multi-robot systems Research Asst.
Prof. Vasileios Tzoumas, University of Michigan

- Developed multi-robot simulations for semantic mapping using **ROS2** for middleware in **C++** language in **Unity** Environment.
- Working on migration of the project from **ROS1** to **ROS2** with the implementation of **SlideSLAM**.
- Familiarizing with active spatial perception and map reconstruction algorithm.

Botlab and Armlab Robotics Laboratory

- **BotLab**: Implemented **A* search** and **particle filter-based SLAM** on mBot; modeled the robot's configuration space and performed probabilistic localization using onboard IMU and LiDAR sensors.

- Integrated **IMU** and **LiDAR** modules for robust localization and mapping, leveraging **C++** and **PID** controller for efficient computing and control.
- **ArmLab**: Programmed precise control for a **5-DOF ArmBot** by developing **forward** and **inverse** kinematics algorithms.
- Enhanced operational capabilities by integrating vision-based control using a **realsense camera** in python environment.

Lunar Anomaly Search Project

- Developed an end to end **keras/tensorflow** pipeline with a team of researchers to find anomalies on the lunar surface using **variational autoencoder models**.
- Utilized **terabytes** of real-time data from NASA's LRO camera to train the deep learning model on google cloud.

TECHNICAL SKILLS

- **Languages**: Python, C++, MATLAB
- **Robotics Control Tools**: ROS1, ROS2, Simulink, CasADi, PID control, SLAM, Kalman Filter (ExKF, UKF), Particle Filter
- **Planning Estimation Algorithms:**: A*, MPC, Probabilistic Inference, Trajectory Optimization
- **Machine Learning:**: TensorFlow, Keras, GANs, Autoencoders, KNN, SVM, Computer Vision
- **Other Tools**: Git, Linux, FastAPI, Splunk Phantom

PUBLICATIONS

"**Deep learning via LSTM models for COVID-19 infection forecasting in India**" Link
Accepted in PLOS One Journal

"**Neural Anomaly Search on Lunar Reconnaissance Orbiter Camera Images**" Link
Accepted for presentation in Astrobiology Science Conference (AbSciCon 2022)