Hardik Gupta

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https://hardik.page/

Education

University of Minnesota, Twin Cities Sept 2023 - May 2025
Master of Science (M.Sc.) in Robotics

Birla Institute of Technology and Science, Pilani Aug 2018 - Jun 2023
Bachelor of Engineering (B.E.) in Mechanical Engineering
Master of Science (M.Sc.) in Biological Sciences

Skills

Languages Python, C++, Java, C, JavaScript, R, HTML, CSS, MATLAB
Databases MySQL, MongoDB
Libraries and Frameworks TensorFlow, Keras, Scikit-learn, Tableau, OpenCV, ReactJS, Express.js, Node.js, Django, Flask
Others Git, Amazon Web Services, GitHub, Bash Scripting, CUDA, Metal, LaTeX

Experience

Graduate Research Assistant, University of Minnesota, Twin Cities June 2024 - Present
Large Language Models, Mathematical Modeling, Generative Pre-Trained Transformer

- Collaborated on the development of a mathematical model to analyze consumer decision-making under uncertainty using Bayesian inference and LLMs for optimal product attribute evaluation and utility maximization.
- Conducted in-depth research on Transformer architecture, including tokenization processes and the implementation of attention mechanisms, to enhance our understanding of Generative AI's impact on consumer information acquisition.

Financial Analyst Intern, Union Bank of Switzerland Feb 2023 - Jun 2023
Python, Pandas, Numpy, Beautiful Soup, Excel Macros, VBA

- Automated the analysis of Pension IPV, streamlining the preparation of CPV graphs for clients, which increased efficiency and reduced analysis time by 40%.
- Utilized Python libraries, along with UBS reporting tools, Totem, and Bloomberg, to analyze and report on key financial figures, improving data analysis.
- Assisted in a training sessions on automation in Finance for 18 team members, contributing to discussions on the use of python and Power BI in finance.

Selected Projects

End-to-End Machine Learning Model, Titanic Survival Prediction API May 2024
Python, Flask, Scikit-learn, Pandas, Docker, GitHub Actions, AWS EC2 GitHub

- Developed a Logistic Regression model achieving 94% accuracy to predict passenger survival on the Titanic, encompassing comprehensive data preprocessing and model training.
- Serialized the trained model and deployed it as a RESTful API using Flask, enabling real-time predictions based on user-provided input features.
- Containerized the application with Docker and implemented CI/CD pipelines using GitHub Actions to automate testing, building, and deployment on AWS EC2, ensuring consistent deployment environments and enhancing scalability and deployment reliability.

RentFree, Short-term Property Listing and Management Web Application Jun 2024
React, Node.js, Express, MongoDB, AWS S3, Tailwind CSS Live Project

- Developed a full-stack web application enabling users to list, search, and manage rental properties, integrating property-listing and booking features for seamless user experience.
- Implemented secure user authentication and authorization with real-time updates on property availability and inquiries, ensuring data integrity and user trust.
- Designed and deployed a profile management system with a responsive interface, adapting to various screen sizes and enhancing user accessibility and experience.

Apple Detection and Counting in Orchards Dec 2023
Python, YOLOv8, 3D Reconstrution, Filtering

- Implemented a robust apple detection pipeline using YOLOv8, achieving detection with 85.2% accuracy.
- Developed a 3D reconstruction pipeline using COLMAP to create detailed point clouds from overlapping 2D images and applied DBSCAN for clustering detected apple points in 3D space, improving the precision.
- Utilized RANSAC for ground and tree trunk plane detection to filter out irrelevant apples, ensuring accurate yield estimation to increase by 16%.

Optimised Trajectory and Collision Avoidance using Nonlinear Model Predictive Control Dec 2022
Python, Non-Linear Control and Optimization, Path Planning

- Programmed the Nonlinear Model Predictive Control of the single robotic system for collision avoidance in a dynamic obstacle environment.
- Simulated the problem of MAV reactive collision avoidance by employing a model-based controller and scaled the system to a two-robot system

Published Work

The Phylogenetic Study of the CRISPR-Cas System in Enterobacteriaceae Apr 2023
Clustering Algorithms, BLAST, Data Analysis PMID: 37118221
Systematically investigate the evolutionary framework of the CRISPR-Cas system in six *Enterobacteriaceae* species and its evolutionary association with housekeeping genes as determined by the gyrB phenogram. These results advance our understanding of the dynamics of the CRISPR-Cas system.