Harshit Joshi

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Education

Indian Institute of Technology, Delhi – M.Sc. in Mathematics 2023-(···)
Hans Raj College, University of Delhi – B.Sc. in Mathematics 2020-2023

Experience

Intern, Swachh.io – New Delhi May 2024 - July 2024

- Architected a Vehicle Emission Detection model for Indian vehicles using a YOLOv8 model trained on a custom dataset compiled from various internet sources. Integrated Automatic Number Plate Recognition (ANPR) to identify polluting vehicles. Achieved 89.5% precision, 80.7% recall, 88.4% mAP50, and 62.7% mAP50-95 across all classes.
- Developed a Python script using BeautifulSoup to scrape number of classrooms from approximately 8,500 schools across clusters in Tumkur, Chitradurga, and Ballari districts, Karnataka.
- Designed and implemented statistical methods to assess product filtration efficiency with subsequent data analysis.

Projects

Stauffer Grimson Background Subtraction GitHub

- Implemented Stauffer Grimson Background Subtraction Algorithm from scratch using OpenCV to segment out background and foreground frames generating respective video files.
- Used Gaussian Models to filter out the outlying pixel values across time at fixed spatial positions.

FisherFaces and EigenFaces GitHub

- Implemented PCA for dimensionality reduction and FLD for class separability to improve facial recognition.
- Evaluated performance differentials on Yale Face Dataset B using EigenFaces (50% accuracy) and FisherFaces (90% accuracy) under varied lighting conditions.

Scale-Invariant Feature Transform GitHub

- Developed the Scale-Invariant Feature Transform (SIFT) algorithm in Python from scratch using custom implementations of Gaussian pyramids, Difference of Gaussians (DoG), keypoint detection, orientation assignment, and descriptor generation.
- Implemented feature matching using BFMatcher with L1 distance and visually represented all the key stages.

Axelrod's Tournament GitHub

- Built a Python simulation of the Prisoner's Dilemma, featuring multiple strategies such as Tit-for-Tat, Random, Friedman, Joss, and Harrington with flexibility for users to customize and add their own strategies
- Implemented a tournament framework to evaluate the effectiveness of strategies, using cumulative payoff tracking and graphical result representation

Music Recommendation System GitHub

- Engineered a music recommendation system by calculating similarity scores between user input and a library of 114,000 songs using Cosine Similarity algorithms.

Master's Thesis

- Conducting a Master's Project under Dr. Aparna Mehra (HOD, Mathematics IITD) on the topic "Non-Convex Data Envelopment Analysis"
- Drawing on methodologies from the papers "Efficiency Analysis Trees" and "Measuring Dynamic Inefficiency" to explore innovative DEA techniques.

Skills

Programming: Python, C, C++, R, SQL, Git/GitHub
Tools/Libraries: Numpy, Pandas, OpenCV, PyTorch, TensorFlow, Keras, BeautifulSoup, Selenium, HuggingFace, Gurobi
Data Visualization: MatPlotLib, Seaborn, Tableau, ggplot, Excel

Extra Curricular Activities

Co-Author: In Search of the Perfect Story (Quill Club Writers, 2018)
Volunteer: Mathematics Society, IITD (2023-2024)
Certifications: Machine Learning in Production, OpenCV Bootcamp, Google Data Analytics

Academic Achievements

- **IIT-JAM (MA) 2023:** AIR-141
- **Senior School Certificate Examination (12th):** 95.33%
- **CAT 2022:** 98.11 percentile
- **Secondary School Examination (10th):** 96.20%