Avinash Prabhu Puppala

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Education

MS in Computer Science (Specialization in Machine Learning), Georgia Tech Aug. 2022 - May 2024

BTech in ECE (Honors in Computer Vision), IIIT-Hyderabad Jul. 2018 - Jun. 2022
GPA: 8.74/10

Experience

Research Assistant | *Computer Vision, Robotics*
Robotics Research Center, IIIT-Hyderabad Sept. 2019 - Jul. 2022

- Developed a novel **CNN** architecture to 3D reconstruct scenes from a single image using **Python** and **Pytorch**.
- Developed a domain-randomized synthetic data generation pipeline using **C#**, **Unity** and **Blender**. *Publication*.

Research Assistant | *AI for Social Computing*
Precog Lab, IIIT-Hyderabad Jan. 2021 - Jul. 2022

- Using an interpretable ML model (**XGB Classifier** with **SHAP values**), analysed *restored users* on Twitter for the **first-time**. *Publication*.
- Developed novel features to capture and detect insidious interaction patterns between Twitter users. Using **SMOTE** for data rebalancing, and ML models such as **RFC**, **LGBM**, **DNN**, etc, achieved an F1 score of 93%. *Publication*.
- Analysed inequities in India's COVID-19 vaccination drive using statistical tools such as **Pearson Correlation**, **Spatial Regression** and **Regression Discontinuity in Time**. *Technical Report*.
- Collected 100,000 and 4 million datapoints from **Parler** & **Twitter** respectively and contrasted the trending content during the Capitol Riots using **Python**. Work was reported in **USATODAY**. *Technical Report*.

Computer Vision Intern | *Computer Vision*
Research & Technologies Center, Robert Bosch May 2021 - Aug. 2021

- Enhanced real-world LiDAR datasets using synthetic models, consequently improving performance of 3D object detection networks (such as **PointPillars**) on difficult to obtain real-world data.

Projects

COVID-19 Detection from XRay images | *Computer Vision, Pytorch, Python*

- Designed a custom classifier on top of the pre-trained feature extractor from **VGG16** to detect XRays having COVID-19.
- Concatenated the **meta-data** of patients to the flattened feature extractor output and improved the F1 score by 10%.

Classical Computer Vision algorithms | *Computer Vision, Python*

- **Grabcut for image segmentation** - Implemented the GMM, energy model and minimization algorithms from scratch.
- **Viola Jones for face detection** - Implemented the Haar features, integral image and the adaboost algorithm from scratch.
- **Seam Carving for image resizing** - Calculated the energy map and used dynamic programming to remove the seam with lowest energy.

Robotic Path Planning algorithms | *Robotics, Path Planning*

- Implemented the Rapidly exploring Random Tree (**RRT**), Model Predictive Control (**MPC**) and the Velocity Obstacle formulation (**VO**) algorithms for goal reaching with obstacle avoidance.

Stereo Reconstruction & Non-Linear Optimization | *Robotics, 3D reconstruction, Pose estimation*

- Given stereo pairs, generated **disparity maps**. Using camera parameters, generated **dense 3D point clouds**.
- Synthesized a new image taken by a virtual monocular camera fixed at any arbitrary pose in the point cloud. Recovered this pose by implementing the **Perspective-from-n-Points (PnP)** algorithm.

Linux Shell | *Bash, C*

- Implemented a Linux bash shell, a command line interpreter from scratch in C. Supports all basic commands along with redirection and piping.

Multi-threaded Web Server | *Operating Systems, Web Sockets, C*

- Implemented a multi-threaded web server in C. Wrote a custom **Ruby** script to make multiple HTTP requests to the server. Handled the requests using the **socket** library.
- Studied the effect of **scheduling algorithms** and **number of threads** used on the turnaround & response time of the server.

Programming languages & Coursework

Languages: C++, C, Python, C#, Matlab, SQL, Bash, HTML, CSS, Javascript
Tools: Pytorch, Keras, Numpy, Pandas, Matplotlib, ROS, Git, Arduino, Blender, Unity, Linux, Latex
Computer Science: Data Structures and Algorithms, Networks, OS, Compilers, Processor Architecture
AI: AI, Computer Vision, Image Processing, Mobile Robotics, Robotics: Path Planning
Mathematics: Applied Optimization, Probability and Random Processes, Real Analysis, Linear Algebra

Publications

Monocular Multi-Layer Layout Estimation for Warehouse Racks	Computer Vision	ICVGIP 2021
Efficient Rep. of Interaction Patterns with HypHC for Classification of Users on Twitter	AI, Social Media	WI-IAT 2021
"I'll be back": Examining Restored Accounts On Twitter	AI, Social Media	WI-IAT 2021