

Ayush Goel

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EDUCATION

- **University of Pennsylvania** Philadelphia, PA
Master of Science in Robotics Engineering | GPA: 3.9
May 2024
Coursework: Deep Learning, Machine Learning, Geometric Computer Vision, Advanced Robotics, Learning in Robotics
Position: Teaching Assistant for Data Structures and Algorithms
- **Thapar Institute of Engineering and Technology** Punjab, India
Bachelor of Engineering - Mechatronics Engineering | GPA: 3.89
June 2018
Relevant Coursework: Advanced Control Systems, Robotics Engineering, Kinematics & Dynamics of Machine, Signals & System
Awards: Certificate of Merit for 3 consecutive years | Achievements: 3RD rank in Undergrad, Merit-based Scholarships for all 4 years

SKILLS SUMMARY AND COURSES

- **Programming:** C++, Python, JAVA, Bash, Shell Scripting, JavaScript, SQL, MATLAB, HTML5, CSS, NodeJS
- **Tools:** Git/GitHub, Docker, Latex, IntelliJ, Jenkins, Android Studio, MySQL, Maven, MongoDB, Postman
- **AI/ML/Robotics:** ROS, OpenCV, PyTorch, scikit-learn, pandas, TensorFlow, Gazebo, Sensor Fusion, CARLA
- **Technologies:** AWS, Spring Boot, REST APIs, Microservices, Apache Tomcat, Elasticsearch
- **Others:** Linux, macOS, Windows, Data Structures, Algorithms

RESEARCH EXPERIENCE

- **Programme in Autonomous Robotics** | ROS, Computer Vision, Pattern Recognition Delhi, India
Research Intern, IIT Delhi Jan 2017 - July 2017
 - Designed & developed **Semi-Autonomous Mobile Robot** from **scratch** capable of moving autonomously or teleoperated, with **live video surveillance & face recognition** for security using **Haar cascades**.
 - Improved odometry with calibration, controllers and IMU & encoder infused data using **Kalman filter**.
 - Implemented ROS Navigation Stack to map surroundings & Pattern Recognition to identify medical equipments.

WORK EXPERIENCE

- **Unicommerce eSolutions Pvt. Ltd.** Gurugram, India
Senior Software Development Engineer Aug 2019 - July 2022
 - Responsible and decision-maker of **critical deliverables for high & low-level design changes** and ensuring **robust end-to-end architecture** of the platform.
 - Served as **Team Lead and mentored & managed team of Software Engineers** & ensured shipping of **high-quality products; fulfilling 80% more business requirements per sprint**.
 - **Reduced cost of infrastructure by 25%** by redesigning integrations for **optimal bandwidth utilization** and implementing **load distribution, IP-rotation, and fallback**.
 - Implemented **MLOps** processes to streamline deployment & monitoring of machine learning models in production environments; boosting revenue by **30%**.
 - **Tech stack:** Spring Boot, Java, Mongo, SQL, Zookeeper, ActiveMQ, Elastic Search, AWS, CI/CD pipelines(Jenkins)

PERCEPTION AND DEEP LEARNING PROJECTS

- **Stereo Visual Odometry** | Geometric Computer Vision, C++, Ceres, KITTI, SLAM
 - Extracted features from stereo images using **GFTT** and performed **triangulation** for 3D point location.
 - Implemented **Direct Method** and **Optical Flow** for pose and feature estimation during feature tracking.
 - Performed **Bundle Adjustment** for backend optimization.
- **Dynamic Obstacle avoidance for Self-Driving Car** | DeepLearning, LSTM, PINN, CARLA
 - Implemented **Social LSTM, OLSTM** and **GRU** for predicting pedestrians' trajectory.
 - Used **Physics informed Neural Nets** to model the nonlinear dynamics of **MPC** for planning car's motion.
- **Bird's Eye View using Egocentric RGB images** | ImageSegmentation, LaneDetection, YOLOP
 - Performed **Instance Segmentation** with **72% IOU score** for detecting social agents using **Mask RCNN, Resnet50** and performed **YOLOP** on the masks for Drivable Area Identification.
 - Evaluated Optical flow using the bounding boxes and measured **time to collision**.
- **Localization and Estimation** | Unscented Kalman Filter, Sensor Fusion, State Estimation
 - **Orientation tracking with inertial data:** Implemented a Quaternion based Unscented Kalman Filter(UKF) to track 3D orientation from Gyroscope and Accelerometer data
- **Vision-based SLAM**
 - Implemented **2-view** and **multi-view stereo** algorithms to convert 2D viewpoints into 3D reconstruction
 - Implemented **Bundle Adjustment** using **Ceres** on BAL dataset (C++)
 - Used **Tracking** and **Pose Estimation** to place several virtual object models in real world by estimating camera poses using **Perspective-N-Point**; and **Persepective-three-point & Procrustes problem**.

LEADERSHIP EXPERIENCE

- **Unicommerce eSolutions Pvt. Ltd.** Gurugram, India
Team Lead Dec 2021 - July 2022
 - Reviewed the works of my team members, set up best software engineering practices and held tech sessions with team members for each assigned tasks. Also, mentored the members of the team for the various tasks.

SELF-LEARNED COURSES

Autonomous Mobile Robots, Robotics Specialization, ROS, Machine Learning, Image Processing and Deep Learning