

Nupoor Bibawe

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EXPERIENCE

Robotics Software Engineer

November 2024 - Present

Rainier Labs

USA

- Developed a COLMAP-based **3D reconstruction** pipeline with a Vision-Language Model (VLM), enabling a mobile robot to monitor and analyze dynamic environmental changes for enhanced decision-making and situational awareness.
- Engineered advanced image segmentation algorithms and built **Gaussian splatting** models to enhance object identification accuracy, allowing the robot to interpret complex environments with greater precision and responsiveness.
- Integrated multimodal **vision-language** data using **CLIP** and **NLP** frameworks, improving the robot's contextual analysis, understanding of environmental cues, and user interactions through more accurate visual and language-based insights.
- Leveraged the OpenAI API to generate natural language summaries of visual changes, enabling the robot to report environmental shifts and communicate complex visual data in real-world scenarios.

Programmer Analyst – Full Stack Engineer

February 2021 - April 2022

Cognizant Technology Solutions

India

- Developed robust back-end features throughout the **software development lifecycle** for mobile app using **Java** and **JavaScript**, employing **Agile** methodologies to ensure alignment with industry standards and project timelines.
- Utilized **Spring Boot** and **Node.js** to develop and maintain 12 microservices, ensuring efficient communication between front-end and back-end systems through the integration of REST APIs and using **CI/CD** pipelines for streamlined deployment.
- Identified and implemented code optimizations, delivering 30% performance boost and minimized database retrievals.
- Collaborated with **cross-functional teams** to architect, develop, and deploy end-to-end solutions on **Azure** cloud infrastructure, ensuring adherence to best practices and architectural principles focused on reliability, scalability, and security.
- Conducted **root cause analysis** of system failures using advanced log analysis tools such as the ELK stack, identifying critical issues and reducing incidents through proactive monitoring and the implementation of automated alert systems.

Software Team Lead

July 2017 - June 2019

MIT Robotics

India

- Led team of 7 programmers in design, and development of advanced **legged** and **wheeled autonomous robotic systems**. Implemented three distinct autonomous gait patterns to achieve quadruped robot motion using inverse kinematics.
- Programmed remote-controlled 3- and 4-wheeled holonomic drives using **PID** and Odometry for precise motion and positioning, leveraging **C++** with 32-bit Arduino boards, resulting in a 50% reduction in robot travel time.
- Automated the locomotion of robots by integrating **machine vision** and image processing techniques in Python with OpenCV. Interfaced **Linux** with Arduino for fast, real-time video processing, improving system responsiveness and performance.
- Integrated a variety of sensors, including **LiDAR**, **cameras**, and **IMU**, using communication protocols such as I2C and SPI, conducting thorough comparisons and analyses to drive improvements in system performance.

EDUCATION

Master of Science in Robotics - Artificial Intelligence

August 2022 - May 2024

Arizona State University

3.87/4.00

Bachelor of Engineering in Computer Engineering

August 2016 - November 2020

Savitribai Phule Pune University, India

3.64/4.00

ACADEMIC PROJECTS

Real-time Monocular Depth Perception

January 2023 - May 2023

- Engineered a real-time image processing pipeline with object detection for monocular depth estimation, developing algorithms for geometric depth calculation and achieving $\pm 3\%$ precision in distance measurements.
- Analyzed **RESNET**, **YOLO**, and **MobileNet** models on a custom dataset, optimizing precision and accuracy.

Path Planning and Reinforcement Learning

January 2023 - May 2023

- Implemented Q-learning for reinforcement learning using Gazebo and **ROS** in two distinct robotic environments, enabling the system to optimize its decision-making processes and maximize cumulative rewards in 500 episodes.
- Optimized various search algorithms, including Greedy Breadth-First Search and A-star with a custom heuristic, to execute high-level search-based path planning with customized low-level actions for TurtleBot simulation.

TECHNICAL SKILLS

Programming Languages: C, C++, Python, Java, JavaScript, TypeScript, MATLAB, SQL, NoSQL

Frameworks: TensorFlow, Pandas, NumPy, Keras, OpenCV, PyTorch, FastAPI, Spring, Angular, Node, React, Optuna

Tools: Simulink, Arduino, ROS, ROS2, Git, Gazebo, RViz, Azure, Docker, Kubernetes, AWS, SolidWorks, Kubeflow, MLFlow

AI: Reinforcement Learning, Natural Language Processing (NLP), Neural Networks (CNN, RNN, LSTM), GANs