Vishal Gattani

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EDUCATION

University of Maryland College Park, MD	Aug 2021 - May 2023
Master of Science, Systems Engineering	3.762 CGPA
International Institute of Information Technology, Bangalore (IIIT-B)	Aug 2015 – Sept 2020
Integrated Master of Technology, Electronics and Communication Engineering	3.54 CGPA

WORK EXPERIENCE

Robotics Software Engineer - Simulation, Process, Tools, Infrastructure — Jul 2023 – Present
Simulation-based System Design Lab (SBSDL), UMD — College Park, MD

- Spearheaded the Agile process development of a full-stack Python UI tool-chain to improve developer workflows and simulation execution, resulting in 83% decrease in manual intervention for data collection, and metrics generation.
- Deployed an AWS cloud simulation validation framework with REST APIs for scalable containerized deployment on EC2 with data loggers, and S3 data extraction and retrieval; increasing testing execution efficiency by 90.8%.
- Developed reporting tools' process instructions with SysML to decompose user requirements to system requirements and architecture; automated test scripts with Pytest framework, boosting tool's test coverage to 80%.
- Streamlined data throughput with **Apache Kafka**, establishing ETL pipeline to automate data-driven decisions.

Graduate Research Assistant - 3D Scenario/World Creation, Unity — Nov 2021 – May 2023
Simulation-based System Design Lab (SBSDL), UMD — College Park, MD

- Created and validated synthetic test scenario datasets leveraging Scenic with CI/CD pipelines, which streamlined the development processes of 5 research teams to generate robot performance requirements for cluttered scenarios.
- Generated Unity simulation assets, participated in code reviews and integrated time-of-day and ray-cast features; resulting in a 300% boost in simulation validation and test case diversity within a range of operational conditions.

Research Associate - Lab Operations, Motion Capture — Oct 2020 – Jul 2021
Surgical and Assistive Robotics Lab (SARL), IIIT-B — Bangalore, India

- Enabled full digital twin development of a teleoperation data interface for sensor data visualization, actuator PID control of a 3D-printed robotic arm in real-time serially through Motion Capture with 0.1°precision using Blender.
- Conducted a detailed analysis of Microsoft Kinect V2 and Azure Kinect depth cameras to compare and contrast accuracy, and latency in capturing human motion to remotely interact and control Reachy, 8-DoF robotic arm.

PUBLICATIONS

V. Gattani and M. Rao, "An integrated system design interface for operating 8-DoF robotic arm", 2021 ICCAS, Korea.

ACADEMIC PROJECTS

Robotics - Motion Planning, Computer Vision & Perception

- Implemented **Dijkstra**, $\mathbf{A}^*$, **3D Probabilistic road-maps** and **RRT** for holonomic and non-holonic robots.
- **ASL Detection** - Designed a gesture recognition system using **Google's Mediapipe** and **LSTM** networks to train and detect real-time sign language gestures with 98.25% accuracy.
- **Stereo Disparity** - Estimated pixel-wise depth by computing Disparity Map using sliding-window approach.

Simulation & Game Development

- **Traffic System**: Used Unity engine to simulate the movement of vehicles and pedestrians to transition between Animation states and Blend Tress and to model complex traffic flow patterns, such as loops and forks.
- **AutoValet**: Implemented a simulation incorporating a **Hybrid A*** path-finding algorithm, combined with a PID controller, using Voronoi Field and Euclidean distance as heuristics for a self-driving car.
- **PyBBN**: Designed offline Bayesian Network simulation test sets to model assurance cases, predict claim likelihoods under uncertainty, and optimize experimental designs via DoE, to build confidence in system performance.
- **Self-replicating robotic system**: Led the evaluation process of 6 swarm robotic configurations using Finite State Machines to analyze trade-offs for 10 missions; enhanced system reliability by computing availability, MTBF, MTTR.

TECHNICAL SKILLS

Programming Languages: Python, C++, C#, Shell, SQL
Software: Blender, Unity3D, Gazebo, MATLAB, LTSpice, MultiSIM, Arduino, Cameo Systems Modeler, Tableau
Developer Tools: ROS, ROS2, Git, Jira, VS Code, AWS, Docker, Flask, pytest, OpenCV, Kafka, Pandas, NumPy
Deep Learning Architectures: LSTM, CNN.