Saikiran Komatineni

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Education

University of California San Diego

M.S. Electrical Engineering Mar 2022
Depth: Intelligent Systems and Robotic Control
GPA: 3.90

B.S. Electrical Engineering Jun 2020
Depth: Machine Learning and Controls
GPA: 3.62

Research Experience

Graduate Researcher - Advanced Robotics and Controls (ARC) Lab @UCSD Feb 2021 - Present

Advisor: Michael Yip

- Designed and Developed an extension to Fastron, a kernel-perceptron based proxy collision checking algorithm. The previous method randomly sampled around support vectors to predict their new locations. We developed an equation to relate obstacle motion to support vector translation using inverse kinematics of a subsection of the robot arm. With the new heuristic, collision accuracy increased by 20%.
- Developed an Unscented Kalman Filter based tracking algorithm to track obstacles. To accommodate for the noise in observation and tracking, I modified the original Fastron training algorithm by formulating support vectors as random variables. I derived a method to relay the uncertainty in the workspace to randomness in C-space. (Technical report available on my website)

Undergraduate Researcher - Wireless Communications & Networking (WCSNG) Lab @ UCSD Mar 2020 - Jun 2020

Advisor: Dinesh Bharadia

- Used gaussian mixture model analysis, k-means, spectral clustering and other ML algorithms to categorize Bluetooth signals by transmitter-receiver distance. We started with simple linear classifiers on raw Bluetooth RSSI data and progressed towards more complex ones as more data became available.
- This work resulted in a publication to ACM Sensys. As part of this project, we developed a social distancing app and it was innovative because it was the first to use crowdsourced dats to train and iteratively improve the classifier.

Undergraduate Researcher - Video Processing Lab (VPL) @ UCSD Jun 2019 -Sep 2020

Advisor: Truong Nguyen

- Worked on a 3D reconstruction project where my innovation was specifically on developing a more accurate camera calibration technique. I used a 3D rotating box with ChArUco board imprinted on the surface to simultaneously calibrate multiple depth cameras. I demonstrated an improvement in feature detection performance. Additionally, I also implemented the point-cloud synchronization and rendering algorithms in C++ for applications in 3D real-time human reconstruction.

Publications

Aditya Arun, Agrim Gupta, Shivani Bhakta, **Saikiran Komatineni**, Dinesh Bharadia. "BluBLE, Space-time social distancing to monitor the spread of COVID-19." ACM SenSys 2020

Patents

[Pending] Physical Balance Training System Using Foot Sensors, Real-Time Feedback, Artificial Intelligence, and Optionally Other Body Sensors

Work Experience

Machine Learning R&D Intern - Qualcomm Jun 2021 - Sep 2021

- I worked with Facebook's GLOW compiler framework which optimizes ML model inferences by partitioning neural networks for processing in multiple cores. I developed two algorithms: i) computes the cost (in terms of clock cycle counts) of partitioning the NN graph at various points, ii) analyzes the tradeoff between various configuration parameters to determine the optimal partition configuration. I implemented this algorithm in C++.
- I studied debug logs of model inferences for may deep learning models including RESNET and BERT and tracked optimization steps from C++ implementation to Assembly code to learn about each optimization layer. The problem is challenging as the algorithm needs to simulate optimization layers to estimate the cost multiple layers deep.

Machine Learning R&D Intern - Qualcomm Aug 2020 - Dec 2020

- Predicted and corrected frequency drift in on-chip crystal oscillators caused by temperature variation. I first analyzed time-series data (millions of rows), which was obtained by processing logs from test equipment, using Pandas and Matplotlib to eliminate anomalies and engineered new features. I researched, developed, and, implemented ML algorithms including Neural networks (RNN, CNN, FCN), Classical ML (DT, boosting), and Statistical Forecasting (ARIMA, ETS) and reduced error rate from 40% to 18%

Co-Founder - Stasis (IOT/Healthcare Startup) Mar 2019 - Jun 2021

- The product is smart shoe insole to help patients suffering from Parkinson's disease walk better and reduce their risk of falling. I worked on the design and build of a custom pressure sensor using piezoelectric material (patent pending). We collected data with this sensor and an IMU and used smoothing techniques to preprocess it. We identified anomalies in the user's gait and used tactile feedback to correct it.
- We graduated from 5 incubators at UCSD and I interviewed over 50 people as part of customer discovery. Our initial prototype won the popularity prize at the UCSD Design competition.

Teaching Experience

Reader - Digital Image Processing Sep 2021 - Jun 2021

- Answered students' questions, during OH and online, on a variety of topics related to the course material

Teaching Assistant - The Art of Product Engineering Jan 2021 - Jun 2021

- Designed and Developed homework assignments on topics including Website development, Python programming, full-stack engineering (to remotely control a quadcopter)

Tutor - Introduction to Autonomous Vehicles Jan 2019 - Jun 2020

- Helped students build an autonomous RC car from scratch. Helped develop class curriculum in the fields of computer vision, machine learning, robotics system integration and odometry.

Tutor - Hands-On Engineering Mar 2018 - Jan 2019

- I helped students in various aspects of their independent projects including designing and debugging.I also managed the lab space and helped students with 3D printers, laser cutter and soldering machines.

Projects

Simultaneous Localization & Mapping (SLAM) Jan 2021 - Mar 2021

- Particle Filter SLAM - used 2-D LiDAR and stereo camera sensor measurements from a real autonomous car dataset to localize the robot and build a 2-D occupancy grid map of the environment
- Visual-Inertial SLAM - performed feature detection, with stereo images, and mapped them with the Extended Kalman Filter update using IMU data

Small-Group Reinforcement Learning Jan 2021 - Mar 2021

- Developed a new multi-agent reinforcement learning (MARL) by integrating the Small-Group Learning framework with the REINFORCE algorithm. This reduced learning time by allowing multiple agents to learn simultaneously while sharing knowledge. Demonstrated performance improvement on various Gym environments.

Guided Policy Search for Multi-Agent Reinforcement Learning Sep 2021 - Dec 2021

- Develop a modification to the Guided Policy Search algorithm for applications in multi-agent reinforcement learning. In summary, a sample from the policy distribution of each agent is used as a guiding sample to guide policy search of all other agents.

Multi-Agent MultiPath Mar 2020 - Jun 2020

- Developed an improvement to Google's Multipath (trajectory prediction algorithm) to account for multiple agents in the scene. I Implemented our neural network on a custom dataset with Pytorch.

Depth Mapping Dec 2017 - May 2019

- Built a 3D cube that mirrors the environment in three dimensions. The environment was captured using a Kinect Depth camera and some objects that were detected by our deep learning object detection model were reconstructed. This 3D object was scaled and mapped to the cube in real-time.
- I was the team lead for this project and it was selected to be taught as part of an upper division hands-on engineering course

IEEE Line Following Robot Oct 2017 - Jun 2018

- Built an autonomous RC car from scratch (including the circuitry) using only a line-scan camera. Developed a filtering algorithm to process data from a line-scan camera and used a PID controller to enable the robot to follow a line.

Honors & Fellowships

- Provost Honors
- Eta Kappa Nu (HKN)
- Startup Fundamentals: FORM+FUND Fellow

Leadership & Achievements

- IEEE UC San Diego Officer (autonomous vehicles chair)
  - Lead a team of 40 students to build a line following robot and compete in an inter-university robotics competition
- UC San Diego Robofest organizer
  - Lead the planning and execution of UCSD's first inter university robotics competition
- Project In A Box UC San Diego Officer (Internal Director)
  - Managed the student's organization's leadership activities
- UC San Diego Design competition - popularity prize winner
- UC San Diego Innovation Expo2021 - third place
- Independent Depth Perception / ML project
  - The project that I proposed, led, and developed, got accepted to be taught in an ECE upper-division class
- IEEE Best Team Lead Award

Volunteer & Mentorship

- Mentor for middle school students competing at Science Olympiad
- Mentor for first-year ECE students
- Volunteered at IEEE UCSD and Project In A Box outreach events
  - Events were for students with economical disparities
  - We guided them in building simple engineering projects and introduced STEM education
- Mentor for incoming freshmen to John Muir college