Sumanth Kandala

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OBJECTIVE

Incoming graduate student at the **University of California Berkeley** enrolled in the **Master of Engineering program** offered by **Mechanical Engineering** department, with a specialization in **Control of Robotic and Autonomous Systems**

EDUCATION

BACHELOR OF TECHNOLOGY | INDIAN INSTITUTE OF TECHNOLOGY BOMBAY
Jul '16 - May '20

Department of Mechanical Engineering — GPA - 8.77/10.0

Bachelor's degree majoring in **Mechanical Engineering** with **honors** and a **minor degree** in **Computer Science**

WORK EXPERIENCE

GRADUATE SOFTWARE ENGINEER | JAGUAR LAND ROVER, INDIA
Sep '20 - Present

Android Open Source Project & Autonomous Driving Teams — Full-time Employee

- Created a **persistent split-screen** based user interface for Android Automotive OS by modifying the Android Framework
- Modified the android audio-HAL to configure **multi-zone audio** on Qualcomm SA8195 Automotive Development Platform
- Designing a custom **power-state machine** for Android Automotive OS at the Vehicle Hardware Abstraction Layer level
- Developing an **LSTM-based maneuver-aware vehicle trajectory prediction** model as a part of the R&D Initiative at JLR

MICROROBOTICS LABORATORY | UNIVERSITY OF TORONTO, CANADA
May '19 - Jul '19

Dr. Eric Diller — Mitacs Globalink Research Intern

- Worked on an **automated calibration setup** to measure and characterize the magnetic field strength in a workspace
- Accounted for the deviations due to the stray fields to improve the wireless control of magnetic **micro-surgical tools**
- Designed 3D Models of linear stages, mounts for the setup and an insulating enclosure for the electronics in **SolidWorks**
- Fabricated the supports and mounts for a gantry stage capable of 3-DOF motion using a **Laser Cutter** and **3D Printer**
- Developed a script to control **stepper motors** on **lead-screw** based stages to adjust the position of gaussmeter probe
- Implemented an algorithm in C++ to store the magnetic field strength values using a **USB DAQ** by National Instruments

RESEARCH EXPERIENCE

PRIORITY PATROLLING USING MULTIPLE AGENTS | MULTI-AGENT SYSTEMS
Jul '18 - Apr '19

Mallya D., Kandala S., Vachhani L. and Sinha A., titled ***"Priority Patrolling Using Multiple Agents"*** *published in* ***IEEE ICRA 2021***

- Developed a novel multi-agent patrolling algorithm for a given environment with nodes of interest of **varying priorities**
- Designed a **reward function** based on the idleness of the nodes and the paths of the agents to assign optimal targets
- Established a **guarantee** for the minimum number of agents required to perform **area** and **perimeter patrolling** tasks
- Validated and tested the implementation of the algorithm on a realistic traffic simulator designed using **SUMO** and **TraCI**

KEY PROJECTS

SELF DRIVING CAR, TEAM SEDRICA | AUTONOMOUS VEHICLES
Sep '17 - May '20

Dr. Amit Sethi — Student Technical Team

Currently SeDriCa is one of the **11 finalists** among 256 teams of the Mahindra RISE Driverless Car Challenge (ongoing)

- Leading the Motion Planning subsystem of SeDriCa, a fully **autonomous** car (Mahindra E2O), tuned for the Indian roads
- Parallelized the Road and RANSAC based Lane detection modules using **CUDA** and **OpenMP** improving speeds **tenfold**
- Optimized the route of the vehicle by integrating GPS targets obtained by Google Maps data in the **Hybrid A*** algorithm
- Designed a **lane preference** system, created virtual lanes and accommodated the overtaking mechanism of the vehicle
- Implemented a decision making algorithm to modify the path of the vehicle to account for the **traffic signs and signals**
- Developed the **velocity planning** and PID-based **control** algorithms for the vehicle and integrated it as a **ROS** package

VISUAL QUESTION ANSWERING | DEEP LEARNING
Jul '18 - Nov '18

Dr. P. Balamurugan — Course Project

- Developed a software that generates probabilities of the top 3000 answers when fed with an input image and a question
- Designed an encoder for a image and a question using a **Convolutional Neural Network** (ResNet-152) and a **Bi-LSTM**
- Implemented a **soft attention** mechanism to compute multiple glimpses of image features based on the state of LSTM
- Achieved an **accuracy** of **57.22%** trained on the **VQA v2.0 dataset** consisting of 10 ground truth answers per question

CHATTER IDENTIFICATION | IMAGE PROCESSING
Jul '18 - Nov '18

Dr. Ramesh Singh, Dr. S.S Pande — Course Project

- Automated the chatter identification process in machining operation using a non-contact process reducing human effort
- Analyzed the **Grey Level Co-Occurrence Matrix** to estimate second-order probability distribution of intensity of pixels
- Predicted the **surface roughness** of a given work-piece using the grayscale images enhanced using a **Laplacian filter**

ORNITHOPTER | ROBOTICS
Jan '19 - Apr '19

Dr. Abhishek Gupta — Course Project

- Designed a flapping wing mechanism using a **planetary gear mechanism** to imitate the motion of a bird when in flight
- Fabricated and assembled the wings, body and the gears of the Ornithopter while achieving a weight of less than 400 g

GENDER RECOGNITION | MACHINE LEARNING
Jul '18 - Nov '18

Dr. Sunita Sarawagi — Course Project

- Extracted speech parameters from a .mp3 file using **specan** in R to identify the gender of the main speaker in a recording
- Achieved a validation **accuracy** of **94%** using Adam Optimizer and Cross Entropy Loss trained on a self-created dataset

MULTI-CLIENT SERVER | COMPUTER NETWORKS
Jul '17 - Nov '17

Dr. Mythili Vutukuru — Course Project

- Designed a Transmission Control Protocol (TCP) server to handle multiple clients simultaneously using **event-driven I/O**
- Implemented a common database storing the **key-value pairs** which can be viewed and edited by the connected clients

LASER HOCKEY | INSTITUTE TECHNICAL SUMMER PROJECT
May '17 - Jul '17

Electronics and Robotics Club — Summer Project

- Revamped Air Hockey with a puck formed from diffused laser and a model with servos to control the motion of the laser
- Implemented **Accelerometer** and **Gyroscope** modules to bounce the incident puck off the mallet detected using LDRs
- Integrated RF modules to **wirelessly** transmit the data from the mallets to the Arduino UNO controlling the servo motors

TALKS AND LECTURES

- Delivered a **lecture** series on path planning algorithms and Robot Operating System (ROS) to the freshmen of IIT Bombay
- Invited to deliver a speech on autonomous vehicles and SeDriCa at the Milennovation **TED Talks** event, organized by **JPMorgan Chase & Co. India**, that was attended by over **2000 employees** and broadcast at JPMC offices **nationwide**

AWARDS AND ACHIEVEMENTS

- **Institute Technical Citation**, the 2^{nd} highest award for excellence amongst the graduating batch of IIT Bombay '20
- **Institute Technical Color**, for the outstanding contribution to the technical activities in IIT Bombay '19
- Hostel **Organizational Special Mention**, for conducting various hostel events and activities '19
- **Institute Technical Special Mention**, for the contribution to Team SeDriCa, IIT Bombay '18
- Secured an **All India Rank 901** in JEE Advanced and **99.8 Percentile** in JEE Mains out of 1.2 million candidates '16
- Achieved an **All India Rank 563** and a scholarship in the prestigious **KVPY fellowship** by the Govt. of India '15

MENTORSHIP

INSTITUTE STUDENT MENTOR | SMP, IIT BOMBAY
Mar '19 - May '20

- Served as the first point of contact for **12 freshmen** from various departments to help them transition into campus life
- Among **108 mentors** selected out of a total of **300 applicants** based on peer reviews and a rigorous interview process

DEPARTMENT ACADEMIC MENTOR | D-AMP, IIT BOMBAY
Mar '18 - May '20

- Mentored and guided **16 sophomores** over a duration of two years to help them improve their academic performance
- Personally structured the course plan and timeline for one sophomore in the **Academic Rehabilitation Program** (ARP)

POSITIONS OF RESPONSIBILITY

FINANCE & MARKETING HEAD, TEAM SEDRICA | INNOVATION CELL, IIT BOMBAY — Sep '17 - May '20

- Showcased the technology of SeDriCa at **TechConnect** '17, organized by **Techfest**, IIT Bombay with a footfall of 1,00,000
- Organized the recruitment orientation and selection for Team SeDriCa for over **250** undergraduates and postgraduates
- Showcased the autonomous drones and robots of Innovation Cell at the **Tech and R&D Expo** conducted at IIT Bombay

SYSTEM ADMINISTRATOR | HOSTEL 8, IIT BOMBAY — Sep '17 - May '19

- Designed websites, portals and a Chrome extension for Hostel 8 students with a provision for **secure login (OAuth 2.0)**
- Digitized the schedule of cultural, sports and technical events and addressed issues regarding LAN and WiFi in the hostel

WEB COORDINATOR | MOOD INDIGO, IIT BOMBAY — May '17 - Dec '17

- Developed websites for Mood Indigo that received over **6.5 million** visits using tools like HTML, SASS, CSS & Angular JS
- Managed a team of 6 organizers to conduct and execute events for Mood Indigo, Asia's Largest College Cultural Festival

EVENTS COORDINATOR | TECHFEST, IIT BOMBAY — May '17 - Dec '17

- Designed and developed a webpage for **Nirbhaya**, an initiative by Techfest to **empower women** through self-defence
- Ideated and conducted **Op-Rahat** - a national level Remote Controlled (RC) drone development and flight competition
- Led a team of 5 organizers to conduct events for Techfest, Asia's Largest College Technical Fest with a footfall of 1,55,000

TECHNICAL SKILLS

Programming Languages	Python, C/C++, MATLAB/Octave, Java, R, Bash
Programming Libraries	PyTorch, TensorFlow, OpenCV, SUMO, TraCI
Software/Platforms	ROS, CUDA, OpenMP, AutoCAD, SolidWorks, Arduino IDE, Git, NS-3, LaTeX
Web Development Tools	HTML5, CSS3, SASS, Bootstrap, Javascript, Angular JS, MySQL

KEY COURSES UNDERTAKEN

Mechanical Engineering	Robotics, Microprocessors & Automatic Control, Machine Design, Solid Mechanics, Kinematics and Dynamics of Machines, Thermodynamics, Fluid Mechanics
Computer Science	Deep Learning, Machine Learning, Data Structures and Algorithms, Computer Networks, Computer Programming and Utilization, Computer Network Security and Cryptography
Operations Research	Service and Infrastructure Systems, System Dynamics Modeling & Analysis, Operations Analysis
Mathematics & Statistics	Data Analysis and Interpretation, Numerical Analysis, Linear Algebra, Calculus

EXTRACURRICULAR ACTIVITIES

- **Mentored 3 teams** in the ideation and execution phase of the Institute Technical Summer Project (ITSP) '17
- Secured **4th position** in the annual **Main Dramatics General Championship** (MDGC), IIT Bombay '17
- Coordinated the **Cyclothon Initiative**, IIT Bombay to spread awareness about the risk of heart diseases '17
- Professionally trained in badminton as a part of the **National Sports Organization** (NSO), India '16
- Organized free **diabetes check-up camps** under the Techfest CURED initiative, a **PAN India** campaign '16
- Vocally trained in **Indian Classical Music** and capable of playing the same on a keyboard or a piano '14

REFERENCES

Prof. Eric Diller
Associate Professor
University of Toronto, Canada

Prof. Leena Vachhani
Associate Professor
IIT Bombay, India

Prof. Shashikanth Suryanarayanan
Associate Professor
IIT Bombay, India

Prof. Amit Sethi
Associate Professor
IIT Bombay, India

Prof. Arpita Sinha
Associate Professor
IIT Bombay, India