Hemanth Sarabu

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Education

Georgia Institute of Technology, Atlanta **2016 - *2019***
MS Computational Science and Engineering (Candidate) **GPA: 4.0/4.0**
MS Mechanical Engineering **GPA: 4.0/4.0**
Skills Acquired: Multi-Disciplinary Optimization, Path Planning and Probabilistic techniques for Robotics, Signal Processing, Algorithm Design, Deep Learning for Computer Vision, Reinforcement Learning for Optimal Control, State Estimation, Filtering, Sensor Integration, Robot Perception, Localization and Mapping, Visual Odometry

The University of Manchester, UK **2012 – 2016**
BEng (Hons) Mechanical Engineering **First Class Honours (GPA: 4.0/4.0)**
Jack Allen Award 2016 for highest mark in the School of Mechanical, Aerospace and Civil Engineering
Stood 3rd in final year and 5th overall in the Mechanical Engineering cohort of 2016

Research Experience

Georgia Tech Research Institute (ATAS) **February 2018 - *Present***
Research Assistant
Research on collaborative arms that use surveying and servoing as canonical tasks to discover and harvest apples. Designed and implemented algorithms for full intelligence pipeline, from apple detection (custom YOLO), mapping and planning for robustness and scalability. Simulations in V-REP and experiments in real orchards using two UR5s and Realsense cameras. Leveraging and extending the idea of clear path detection (subspace planning) in contrast to expensive state of the art methods.

Robot Learning Lab **August 2018 - *Present***
Research Assistant
Teaching a deep model to generate optimal trajectories for GT Auto Rally cars to drive in rugged-terrain using policy gradient techniques. Currently integrating a Velodyne Puck lidar (vlp6) to existing rally car platform for obstacle detection and mapping.

Project Specter **July 2017 - *Present***
Researcher
Conceived and leading development of low-cost stereo vision guided autonomous quadrotor aircraft platform (funded by Dr. Byron Boots). Implemented state estimation using Georgia Tech Smoothing and Mapping (GT-SaM) and VINS-Mono algorithms. Current focus is on Bayesian learning for high-speed way-finding in unknown environments

FMRL, Georgia Institute of Technology **October 2016 – December 2017**
Research Assistant
Developed reduced order approximation algorithms inspired by classical machine learning techniques (PCA) tailored for turbulent flow analysis in active flow control systems. Formulated codes based on Empirical Mode Decomposition (EMD), Proper Orthogonal Decomposition and Dynamic Mode Decomposition. First authoring paper on using online EMD for turbulent flow analysis and control.

CFMS Group, Georgia Institute of Technology **September 2016 – May 2017**
Research Assistant
Analysis of flow field around moth antennae to understand dynamics of pheromone particle deposition and replicate effects in particle sensor design. Formulated and implemented search algorithms to characterize effects of antenna spacing and orientation, and grow geometry to maximize deposition.

Industrial Experience

Crescer Engineering, UK **August 2014 - *Present***

Founder & Managing Director

Founded and manage consultancy accepting component design, design optimization, system analysis, onsite development, structural, and CFD analyses jobs. Modelled and implemented lap time simulator and trajectory planning algorithms for Breitling Racing team for the RedBull Air Race. Optimised flow through propulsion system of high performance watercraft. Currently supporting development future members of product family and accessories.

NIO (NextEV), San Jose **May – August 2017**

Crash Safety Intern

Constructed vehicle level FE models and ran simulations for side crash modes for new car programme using LS-Dyna. Automated data extraction, plotting and calculation post-processing tasks using open source tools circumventing need for paid licensed software. Consulted and provided support for performance evaluation and optimization of non-crash related component and system level studies including the transmission system and novel door hinge mechanism.

McLaren Automotive, UK **July 2014 – July 2015**

Structural Analysis & Passive Safety Engineer

Performed structural analyses ranging from component level models to full car FE models concerning NVH, mass and, abuse case performance attributes across McLaren 570s, 675LT, and 720s. Led project on introduction of plastic fasteners to running and future McLaren projects. Estimated savings ~ £107k/year. Project entailed data analysis of existing Fasteners BOM, project planning, test planning and execution. Organised full vehicle builds and crash tests.

Mercedes-Benz, Hyderabad, India **September – October 2012**

Diagnostics Intern

Worked for the diagnostic department, conducting full diagnosis of cars using proprietary tools. Received training on powertrain, dynamics and safety systems in Mercedes-Benz cars.

Academic Projects

Level-k Thinking Strategies for Pacman Players **January 2017 - *Present***

Game-theory oriented project seeking to answer if a level-k thinking player (from Cognitive Hierarchy Theory) is strategically superior to opponents of all lower levels and develop online player level estimation methods to allow dynamic modification of strategy in a game. Using deep Q learning to recursively train higher level players (bootstrapping). This is being studied in a Pacman environment.

Project Ghost – Hyper Range Autonomous Glider **July 2017 - *Present***

Conceived and leading development of fully autonomous glider capable of extended flight ranges using imaging and meteorological data to track and leverage thermal drafts to gain altitude. Leveraging deep reinforcement learning and computer vision algorithms that use data from low-cost sensor and aquisition system.

Visual Cues and Planning Strategies during Indoor Navigation **May 2018 - July 2018**

Modelled cognitive mechanisms driving human navigation and learning in unfamiliar indoor spaces after teasing out supporting data using experiments in a virtual world, interviews and on-location experiments. Built cognitive engine with capability of making memories, localization, feeling confusion, attributing saliency to visual cues and learning from reinforcement to better navigate unknown spaces.

Segmentation of Fan-Bones in Images **August 2017 – *December 2017***

Used object (YOLO) and keypoint detection alongside Artificial Color Contrasting to detect and localize fan-bone segments in images of chicken meat.

Sailing Race Path Planning **August 2016 – December 2016**

The underlying physics that govern the optimal path of a sailboat for a given set of conditions are highly coupled and dynamic, rendering the course very unintuitive to determine. Developed two different approaches; for minimal trajectory complexity (Single Tack Method) and minimal lap time (Continuous VMG Maximization).

Undergraduate Final Year Dissertation: **September 2014 – May 2016**

Analyzed flow through design variations of *delta-style* motorsport muffler using numerical methods. Gained expertise on CFD, turbulence modelling and appreciation of effects of turbulent structures on flow.

Formula Student Manchester Core member:

Developed air intake system for Formula Student Manchester cars of 2014 and 2016 to achieve Helmholtz resonance targets. Designed lighter, faster and more effective clutch actuation system for the Formula Student Manchester Car of 2015. Initiated, modeled and implemented effective *Development Process Optimization Framework* based on Knowledge Transfer in the interest of Formula Student Manchester.

Awards and Achievements

2016 Received the Jack Allen Award 2016 from the University of Manchester for achieving the highest mark in the School of Mechanical, Aerospace and Civil Engineering.

2012 *Designed and built* one-off economical Hydrogen-powered supplementary fuel system for four-stroke engines. *Presented to former* ***President*** of India, DR. APJ Abdul Kalam after persistent research, emissions and dyno testing.

2011 *National Balashree Honour:* Awarded the National Balashree Honour by H.E Pratibha Patil, the then President of India, for *"Creative Scientific Innovation"*. 11 selected out of the 200,000 nationwide participants in this category.

Leadership

Volunteer, The Orange Leaf, Hyderabad **January 2011 – May 2012**

Lead growing NGO to maximize reach of old age homes and orphanages. Devised and implemented plans to reach wider demographics at low costs utilizing student networking.

Volunteer, Butterfly Fields, Hyderabad **May 2008 – May 2011**

Responsible for product research, improvement and development. Products involved ranged from model planes to underactuated robots. Responsible for leading multiple projects to design inexpensive engineering solutions for the unprivileged - portable coolers and water purifiers.

Skills

Engineering Tools	ROS, VREP, Gazebo, OpenCV, TensorFlow, Solidworks, LS-Dyna and various simulation packages.
Programming Languages	C++, Python, MATLAB/Octave
IoT & Mechatronics	Raspberry Pi and Arduino enthusiast exploring numerous home automation and cloud server projects.
Psychology	Diploma holder in Psychology; zealot interested in mechanisms of decision making, abatement of bias in decisions and relevance to product design.
Autonomous Vehicles	UAV (multirotor and glider) enthusiast, built sailplanes and quadcopters
Languages	Fluent in Hindi and Telugu. Basic conversational Tamil and French
Photography	Ardent travel photography enthusiast with advanced equipment and experience.
Sailing	Royal Yachting Association (RYA) Level 2 certified sailor