

# Sai Bhargav AVULA

## Computer Vision and Perception Engineer | Technology Innovation Institute



[github.com/bhargavab17](https://github.com/bhargavab17) | [bhargavk18@gmail.com](mailto:bhargavk18@gmail.com) | [linkedin.com/in/bhargavk18](https://www.linkedin.com/in/bhargavk18)  
[github.com/bhargavab17](https://github.com/bhargavab17)  
[scholar.google.com/bhargavk18](https://scholar.google.com/bhargavk18)

My goal is to design intelligent systems that build rich, multisensory models of the world, integrating vision and language. I am particularly interested in invertible world models that bridge real-world perception and action.

### EXPERIENCE

September 2022 Present	<b>Computer Vision and Perception Engineer, TECHNOLOGY INNOVATION INSTITUTE, Abu Dhabi, U.A.E.</b> <ul style="list-style-type: none"><li>&gt; Developing and Deploying perception algorithms for multiple R&amp;D projects.</li><li>&gt; Developed the perception stack for in-house autonomous platforms like Buggys, ATVs, and FJ Cruisers.</li><li>&gt; Solving multiple research problems in the context of segmentation and tracking in Thermal and RGB domains.</li><li>&gt; Core member of the TII's Infrared Tracking Challenge(<a href="#">[Project-Page]</a>)<ul style="list-style-type: none"><li>Created a novel dataset.</li><li>Developed evaluation framework.</li><li>Developed state -of-the-art baseline model.</li></ul></li></ul> <p><span>C++</span> <span>Python</span> <span>ROS</span> <span>PyTorch</span> <span>TensorFlow</span> <span>Docker</span> <span>CUDA</span> <span>TensorRT</span> <span>MATLAB</span> <span>GIT</span></p>
June 2022 September 2022	<b>Senior Machine Learning Engineer, QUALCOMM, Hyderabad, India</b> <ul style="list-style-type: none"><li>&gt; Worked on the SNPE framework to enable Qualcomm SOCs to infer various deep neural networks.</li></ul> <p><span>C++</span> <span>SNPE</span> <span>Python</span> <span>PyTorch</span> <span>TensorFlow</span> <span>GIT</span></p>
June 2020 April 2022	<b>Deep Learning Software Engineer, MATHWORKS, Hyderabad, India</b> <ul style="list-style-type: none"><li>&gt; Developed Deep Learning features for Automated Driving Toolbox, Computer Vision Toolbox, Lidar toolbox and Deep Learning Toolbox.</li><li>&gt; Developed deep learning layers for MATLAB.</li><li>&gt; Provided code generation support for both CPU and GPU targets to the functions developed.</li><li>&gt; Developed Deep Learning workflows as MATLAB Examples.</li></ul> <p><span>MATLAB</span> <span>C++</span> <span>Python</span> <span>PyTorch</span> <span>TensorFlow</span> <span>GIT</span></p>
June 2019 June 2020	<b>Engineer in EDG, MATHWORKS, Hyderabad, India</b> <ul style="list-style-type: none"><li>&gt; Developed domain adaptation workflows to address data scarcity and labeling problems of real-world data, majorly in the context of semantic segmentation.</li><li>&gt; Solved several customer workflow-related issues.</li></ul> <p><span>MATLAB</span> <span>C++</span> <span>Python</span> <span>PyTorch</span> <span>TensorFlow</span> <span>GIT</span></p>
October 2018 May 2019	<b>Motion Planning Intern, MATHWORKS, Hyderabad, India</b> <ul style="list-style-type: none"><li>&gt; Developed a Traffic simulator for testing MATLAB's Navigation and ADAS toolbox features. This project is the extension to my Master's thesis work for Multi Agent systems</li></ul> <p><span>MATLAB</span> <span>C++</span> <span>GIT</span></p>

### KEY SKILLS AND COMPETENCIES

C++, Python, MATLAB, Pytorch, Linux, GIT, Deep/Machine Learning, Computer Vision  
ROS (Robot Operating System), Docker, TensorFlow, Optimization, TensorRT  
BASH, CUDA, ROS2



## EDUCATION

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2016-2019	<b>MS by research in Robotics</b> , International Institute of Information Technology, Hyderabad, India	<b>GPA : 9.00/10.00</b>
2012-2016	<b>B.Tech in Electronics Design and Manufacturing</b> , Indian Institute of Information Technology, Design and Manufacturing	<b>GPA : 8.36/10.00</b>

## JOURNAL PUBLICATIONS

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<b>Reactive Navigation under Uncertainty through Hilbert Space Embedding of Probabilistic Velocity Obstacles</b>	RAL-ICRA 2020
Jyotish, Bharath Gopalakrishnan, <b>Bhargav</b> , Arun Kumar Singh, K.Madhava Krishna, Dinesh Manocha	<a href="#">[Project-Page]</a> <a href="#">[Video]</a>

## CONFERENCE PUBLICATIONS

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<b>Semantic Segmentation based on Multiple Granularity Learning</b>	IROS 2023
Kebin Wu, Ameera Bawazir, Xiaofei Xiao, <b>Sai Bhargav Avula</b> , Ebtesam Almazrouei, Eloy Roura, Merouane Debbah	<a href="#">[Project-Page]</a>
<b>Remote ID for separation provision and multi-agent navigation</b>	DASC 2023
Evgenii Vinogradov, <b>A.V.S. Sai Bhargav Kumar</b> , Franco Minucci, Sofie Pollin, Enrico Natalizio	<a href="#">[Project-Page]</a>
<b>SROM : Simple Real-time Odometry and Mapping using LiDAR data for Autonomous Vehicles</b>	IV 2020
Nivedita Rufus, Unni Krishnan R. Nair, <b>A. V. S. Sai Bhargav Kumar</b> , Vashist Madiraju, K. Madhava Krishna	<a href="#">[Project-Page]</a>
<b>PIVO : Probabilistic Inverse Velocity Obstacle for Navigation under Uncertainty</b>	ROMAN 2019
Jyotish, Yash Goel, <b>A. V. S. Sai Bhargav Kumar</b> , K. Madhava Krishna	<a href="#">[Project-Page]</a>
<b>IVO : Inverse Velocity Obstacles for Real Time Navigation</b>	AIR 2019
Jyotish, Yash Goel, <b>A. V. S. Sai Bhargav Kumar</b> , K. Madhava Krishna	<a href="#">[Project-Page]</a>
<b>Gradient Aware - Shrinking Domain based Control Design for Reactive Planning Frameworks used in Autonomous Vehicles</b>	AIR 2019
Adarsh Modh, Siddharth Singh, <b>A. V. S. Sai Bhargav Kumar</b> , Sriram N. N., K. Madhava Krishna	<a href="#">[Project-Page]</a>
<b>Motion Planning Framework for Autonomous Vehicles : A Time Scaled Collision Cone Interleaved Model Predictive Control Approach</b>	IV 2019
Raghu Ram Theerthala, <b>A.V.S. Sai Bhargav Kumar</b> , Mithun Babu, K. Madhava Krishna	<a href="#">[Project-Page]</a>
<b>Novel Lane Merging Framework with Probabilistic Risk based Lane Selection using Time Scaled Collision Cone</b>	IV 2018
<b>A. V. S. Sai Bhargav Kumar</b> , Adarsh Modh, Mithun Babu, Bharath Gopalakrishnan, K. Madhava Krishna	<a href="#">[Project-Page]</a>

## PROFESSIONAL SERVICES

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2020 :	Reviewer, IV(IEEE Intelligent Vehicles Symposium).
2019 :	Program Committee, ROBIO(International Conference on Robotics and Biomimetics)
2019 :	Reviewer, CASE(International Conference on Automation Science and Engineering)

## HONORS AND AWARDS

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2016-2019	<b>IIIT Hyderabad research fellowship</b> , Awarded a fellowship to cover tuition and living expenses during my Masters, Total value (approx.) : INR 350000.
2012-2016	<b>Merit Cum Means Scholarship</b> , Awarded a scholarship to cover tuition during my Bachelors, Total value (approx.) : INR 200000.

## PROJECTS

### SELF DRIVING CAR - MAHINDRA RISE CHALLENGE

2016 - 2019

 [tinyurl.com/selfdriveMRC](https://tinyurl.com/selfdriveMRC)  [tinyurl.com/selfdriveMRC2](https://tinyurl.com/selfdriveMRC2)

- > Developed the Motion Planning and Localization pipeline.
- > Implemented and Integrated the Sensor Fusion stack.
- > Developed the cross-sensor calibration package for Camera and LiDAR.
- > Integrated the other pipelines and deployed the code base.
- > Led to publications in IV (Intelligent Vehicle Symposium-18) and AIR (Advances in Robotics-19)

C++ Python ROS PyTorch MATLAB

### INVESTIGATION OF NON-PARAMETRIC UNCERTAINTY IN MOTION PLANNING

2019-2020

 [tinyurl.com/nonparam](https://tinyurl.com/nonparam)

- > Developed efficient algorithm for solving a class of chance-constrained op- optimization by representing the non-parametric uncertainty as functions in Reproducing Kernel Hilbert Space(RKHS).
- > Developed computationally efficient implementation of the proposed idea in C++ and its deployment on Bebop drone to conduct real-time experiments.
- > The efforts for this work got published in RA-L with ICRA 2020.

C++ Python ROS MATLAB

### MULTI AGENT SYSTEMS

2017 - 2019

 [tinyurl.com/IVOCC](https://tinyurl.com/IVOCC)

- > Developed both deterministic and stochastic variants of the egocentric version of the famous velocity obstacle(VO).
- > Reformulated the velocity obstacle to adapt to an egocentric framework and deployed the real-time experiments on the Bebop drone.
- > Led to publications in AIR (Advances in Robotics-19) and ROMAN(International Conference on Robot and Human Interactive Communication 2019).

C++ ROS MATLAB

### RISK AWARE MERGING

2017 - 2018

 [tinyurl.com/RiskAwareMerge](https://tinyurl.com/RiskAwareMerge)

- > Developed a risk-aware merging behavior, for a traffic-like scenario.
- > Developed a framework that has a two-layer structure that ensures generating a collision-free merge maneuvers even in a dense traffic scenarios
- > The efforts for this work got published in IV(Intelligent Vehicle Symposium-18,19).

C++ ROS MATLAB

### LOCALISATION AND NAVIGATION IN GPS DENIED ENVIRONMENT.

2016 - 2017

 [tinyurl.com/GPSDenied](https://tinyurl.com/GPSDenied)

- > Developed an algorithm that fuses the sensor data from a visual sensor and an IMU to estimate the robot's current location and navigate the robot to its destination with obstacle avoidance in GPS denied environment.
- > The planning stack was implemented using the RRT planner from the MRPT toolkit in Tory Parameter (TP) space, was deployed on Clearpath A200 mobile robot, and tested for its efficacy.

C++ ROS Python