

Vikram Shree



CONTACT INFORMATION

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RESEARCH INTERESTS

Robot perception, Computer vision, Machine learning, Localization and Mapping

EDUCATION

PhD, **Cornell University, USA**

Aug' 17 - Jul' 22

Major: Mechanical Engineering, **GPA:** 4/4

Minor1: Computer Science (AI), **Minor2:** Entrepreneurship

B.Tech., **Indian Institute of Technology Kanpur, India**

Jul' 13 - May' 17

Major: Aerospace Engineering, **Minor:** Electrical Engineering (Controls), **GPA:** 9.3/10

PUBLICATIONS

- V Shree, S Allen, B Asfora, J Banfi, and M Campbell, “**Multi-modal Perception for Cooperative Escape Planning in Hazardous Environments.**” in *IROS, 2022*. [\[arXiv\]](#)
- V Shree*, B Asfora*, R Zheng, S. Hong, J Banfi, and M Campbell, “**Exploiting Natural Language for Efficient Risk-Aware Multi-robot SaR Planning.**” in *ICRA and RA-L, 2021*. [\[arXiv\]](#)
- A Bhaskar*, S Rangarajan*, V Shree*, M Campbell, F Parise, “**Accelerated consensus in multi-agent networks via memory of local averages.**” in *CDC, 2021*. [\[arXiv\]](#)
- J Banfi, V Shree, and M Campbell, “**Planning High-Level Paths in Hostile, Dynamic, and Uncertain Environments.**” in *JAIR, 2020*. [\[DOI\]](#)
- V Shree, WL Chao, and M Campbell, “**Interactive Natural Language-based Person Search.**” in *ICRA and RA-L, 2020*. [\[arXiv\]](#)
- V Shree, WL Chao, and M Campbell, “**An Empirical Study of Person Re-Identification with Attributes.**” in *RO-MAN, 2019*. [\[arXiv\]](#)
- S Agarwal, V Shree, and S Chakravorty, “**RFM-SLAM: Exploiting Relative Feature Measurements to Separate Orientation and Position Estimation in SLAM.**” in *ICRA, 2017*. [\[arXiv\]](#)

PATENTS

- V Shree, LA Jiang, and P Swierczynski, “**Stereo vision system and method for small-object detection and tracking in real time.**” U.S. Patent No. 12125215, 2024.
- V Shree, P Swierczynski, and LA Jiang, “**Real-time confidence-based image hole-filling for depth maps.**” U.S. Patent No. 12094144, 2024.

TECHNICAL SKILLS

- **Programming Languages:** Python, C++, C, Matlab, Java.
- **Software:** PyTorch, TensorFlow, ONNX, OpenCV, ROS, AutoCAD, SolidWorks, Git, ANSYS.
- **Sensing modalities:** RGB cameras, stereo vision, LiDAR, UWB Radar, IMU, natural language.
- **Compute Platforms:** Nvidia Jetson, CUDA.

INDUSTRY EXPERIENCE

Senior Perception Engineer

SiLC, Monrovia CA

Manager: Patrick Nercessian

Aug '25 - Present

- Developing advanced perception algorithms for a line-scanning FMCW lidar system, covering extrinsic calibration, geometric object characterization, and automated tire tread-depth evaluation.
- Created a robust calibration routine for 2D lidar to support high-fidelity 3D reconstruction of objects on a rotary stage, validated with a 2.5 mm size-estimation error on cuboidal boxes.

Senior Perception Engineer

NODAR, Boston MA

Manager: Dr. Piotr Swierczynski

Mar '24 - Jun '25

- Developed 3D object detection benchmarking pipeline to evaluate key performance metrics like signal-to-noise ratio, false positives (FP), and false negatives (FN). Conducted extensive analysis

with different sensor configurations, including baseline and resolution, on real-world data covering various driving conditions like low-speed, high-speed, rain, and night-time.

- Co-developed system architecture for NODAR's GuardView product and implemented algorithmic enhancements to meet key customer requirements like detecting a 10 cm tall object, at 50 m range.
- Evaluated SOTA learning-based stereo matching models to improve the Figure-Of-Merit (FOM) of depth maps. Introduced left-right consistency check and confidence prediction to reduce hallucinations, resulting in more reliable and accurate depth estimation.

Perception Engineer

Manager: Dr. Piotr Swierczynski

NODAR, Boston MA

Sep '22 - Feb '24

- Developed core algorithm for object detection and tracking in 3D at long range (>150 meters) that operates on dense stereo-camera pointcloud (>1 million points per frame).
- Leveraged CUDA libraries to deliver a production-grade system capable of real-time operation on Jetson AGX Orin, culminating in launch of NODAR's GridDetect product.
- Integrated probabilistic model into stereo-disparity estimation to capture key sources of uncertainty: pixel-locking and disparity resolution, enabling robust vehicle tracking up to 500 meters.

Research Intern

Supervisor: Dr. Yuming Zhu

Samsung Research America, Plano TX

Jun '21 - Aug '21

- Enhanced cell phone position estimation in indoor environments by addressing the limitations of UWB-based Indoor Positioning Systems (IPS), which often experience accuracy issues due to communication loss. Developed a fusion architecture that integrates IPS position estimates into the ORB-SLAM framework, resulting in improved localization and mapping accuracy.

RESEARCH EXPERIENCE

Dense 3D Point cloud Segmentation

Graduate Research Assistant, Advisor: Prof. Mark Campbell

Cornell University, Ithaca NY

Feb '22 - Jul '22

- Assumed known semantic labels for sparse but accurate lidar pointcloud and generated dense pseudo-lidar data labels by learning a 3D connectivity matrix and applying label-diffusion.

Scene Danger Estimation from Language Descriptions

Graduate Research Assistant, Advisor: Prof. Mark Campbell

Cornell University, Ithaca NY

Feb '20 - Dec '20

- Developed a danger assessment pipeline that estimates scene danger by aggregating the similarity scores between images and descriptions provided by an expert human user. Results revealed that the estimates closely match human ground truth. Used danger estimates for planning risk-aware paths for a team of robots in a search and rescue mission that ensures victim safety.

Person Search with Appearance Attributes and Language

Graduate Research Assistant, Advisor: Prof. Mark Campbell

Cornell University, Ithaca NY

Mar '19 - Dec '19

- Conducted human-subject study to identify distinct visual attributes of a person that are consistently reported by users. Used those distinct attributes for training and testing representative zero-shot learning methods. Extended the work to language-driven person search task by adapting visual question answering (VQA) models. Conducted real world experiment where the robot asks questions to the user till it reaches a confidence threshold.

Multisensor Decentralized Pedestrian Tracking

Graduate Research Assistant, Advisor: Prof. Mark Campbell

Cornell University, Ithaca NY

Aug '18 - Feb '18

- Developed a compact feature representation for person images that takes advantage of person's orientation, retaining crucial details of appearance. This avoids the problem of linear feature growth needed for data association in the tracking problem. The compact gallery of features was then shared with connected agents to facilitate multi-sensor tracking.

Simultaneous Localization and Mapping

Research Intern, Advisor: Prof. Suman Chakravorty

Texas A&M University, College Station TX

Jun '16 - Jul '16

- Studied role of orientation uncertainty in localization and mapping algorithms through simula-

tions. Suggested using a global heading sensor like compass to avoid deterioration in orientation estimate. Performed comparative analysis of a novel SLAM approach with standard GTSAM.

Suboptimal Path Planning Under Uncertainty

Undergraduate Research Fellow, Advisor: Prof. Mangal Kothari

IIT Kanpur, Kanpur UP

May '15 - Jul '15

- Performed path planning for UAV with RRT algorithm, while including probabilistic collision-avoidance constraints. Evaluated throughput rate via simulation in crowded environments.

**SELECTED
PROJECTS**

Accelerating Consensus in Multi-agent Networks [arXiv]

Aug '20 - Dec '21

- Introduced a model for network evolution where agents use the weighted linear combination of current and past states, to update their current state. We proved that our model guarantees faster convergence than existing linear models and established the rate of convergence.

Social Navigation for Tour-guide Robot [report]

Jan '20 - May '20

- Proposed a modification to the classic social force model for a tour-guide robot that takes into account the field of view of the user. Developed a virtual experimental platform with ROS to assess impact on constructs such as: follow-ability, perceived safety, and perceived intelligence.

Vehicle Orientation Estimation from Monocular Images [report]

Aug '18 - Dec '18

- Proposed a two staged CNN framework for vehicle orientation estimation from monocular images. Compared performance of SOTA models for estimating orientation on widely used KITTI dataset.

Multiple Robot SLAM with Particle-Filtering [report]

Jan '16 - Apr '16

- Simulated Fast-SLAM for two ground robots and created occupancy grid map of surrounding. Obtained relative pose of robots and fused the individual maps to estimate the global map.

Design of Autonomous Underwater Vehicle (AUV) [report]

May '14 - Jun '14

- Designed and built the hull for university's AUV team and equipped it with 4 self-made thrusters. Designed and fabricated a miniaturized torpedo with passive, pneumatic-based propulsion system.

**ADVANCED
COURSEWORK**

- **Robotics and Control:** Autonomous Mobile Robots, Human-Robot Interaction, Multivariable Control Theory, Robot Motion Planning, Convex Optimization, Network Systems and Games.
- **Machine Learning:** ML for Intelligent Systems, Computer Vision, Advanced ML.
- **Statistics:** Engineering Probability & Statistics, Bayesian Estimation, Information Theory.
- **Business (Management Certificate):** Managing & Leading in Organizations, Managing Operations, Marketing Management, Designing New Ventures.

TEACHING AND

ACADEMIC SERVICE

- **MAE3780 (Mechatronics):** Led discussions, created assignments, and held office hours.

- **MAE3260 (System Dynamics):** Developed content for group work sessions, designed virtual lab experiments, and held office hours.

- **Mentoring (Cornell University):** Advised 10 undergraduate and masters students in developing projects that involved implementation of sophisticated algorithms on miniature robots.

- **Reviewer:** Peer-reviewed articles submitted in international journals and conferences like RA-L, IROS, CDC, Trans. on Neural Networks and Learning Sys, Journal of Supercomputing, AAMAS.

**ORGANIZATIONAL
ACTIVITIES**

- Volunteer for international robotics conference ICRA 2019.

- VP of Robotics Graduate Student Organization (Spring 2019).

- Board Member and VP, Cornell India Association (Aug 2018 - Jul 22).