

# Sudharshan Suresh

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## PERSONAL

[www.cs.cmu.edu/~sudhars1](http://www.cs.cmu.edu/~sudhars1) / [suddhu@cmu.edu](mailto:suddhu@cmu.edu) / [LinkedIn](#) / [Scholar](#)

## EDUCATION

**Robotics Institute, Carnegie Mellon University**

2019 - present

Ph.D. in Robotics

Advisor: [Prof. Michael Kaess](#)

Interests: *Localization and mapping; Tactile perception; Computer vision*

**Robotics Institute, Carnegie Mellon University**

2017 - 2019

M.S. in Robotics

GPA: 4.09, Advisor: [Prof. Michael Kaess](#)

Thesis: [Localization and Active Exploration in Indoor Underwater Environments](#)

**National Institute of Technology, Tiruchirappalli, India**

2013 - 2017

B.Tech (Hons) in Instrumentation and Control Engineering

GPA: 9.45/10

## PUBLICATIONS

### PREPRINTS

- [1] [S. Suresh](#), Z. Si, J. Mangelson, W. Yuan, and M. Kaess, "Efficient shape mapping through dense touch and vision," In *Proc. IEEE Intl. Conf. on Robotics and Automation (ICRA)*, May 2022, submitted. \* ([arXiv](#) / [website](#))

### PEER-REVIEWED PUBLICATIONS

- [2] [S. Suresh](#), M. Bauza, K.-T. Yu, J. Mangelson, A. Rodriguez, and M. Kaess, "Tactile SLAM: Real-time inference of shape and pose from planar pushing," In *Proc. IEEE Intl. Conf. on Robotics and Automation (ICRA)*, Xi'an, China, May 2021, **Best paper award in service robotics finalist** \* ([pdf](#) / [website](#))
- [3] M. Hsiao, J.G. Mangelson, [S. Suresh](#), C. Debrunner, and M. Kaess, "ARAS: ambiguity-aware robust active SLAM based on multi-hypothesis state and map estimations," In *Proc. IEEE/RSJ Intl. Conf. on Intelligent Robots and Systems (IROS)*, Oct. 2020. ([pdf](#))
- [4] [S. Suresh](#), P. Sodhi, J. G. Mangelson, D. Wettergreen, and M. Kaess, "Active SLAM using 3D submap saliency for underwater volumetric exploration," In *Proc. IEEE Intl. Conf. on Robotics and Automation (ICRA)*, Paris, France, pp. 3132-3138, May 2020. ([pdf](#) / [presentation](#))

### JOURNAL PUBLICATIONS

- [5] [S. Suresh](#), E. Westman, and M. Kaess, "Through-water stereo SLAM with refraction correction for AUV localization," *IEEE Robotics and Automation Letters (RA-L)*, vol. 4, no. 2, pp. 2377-3766, presented at ICRA 2019, Apr. 2019. ([pdf](#) / [video](#))
- [6] R. K. Sarvadevabhatla, [S. Suresh](#), and R. Venkatesh Babu, "Object category understanding via eye fixations on freehand sketches," *IEEE Transactions on Image Processing*, vol. 26, no. 5, pp. 2508-2518, May 2017. ([pdf](#) / [website](#))

### WORKSHOPS/OTHER PUBLICATIONS

- [7] [S. Suresh](#), J. G. Mangelson, and M. Kaess, "Incremental shape and pose estimation from planar pushing using contact implicit surfaces," In *ICRA 2020 workshop - ViTac 2020: Closing the Perception-Action Loop with Vision and Tactile Sensing*, May 2020. \* ([pdf](#) / [presentation](#))
- [8] J. Hsiung, A. Tallaksen, L. Papincak, [S. Suresh](#), H. Jones, W. Whittaker, and M. Kaess, "Localized imaging and mapping for underwater fuel storage basins," In *Proceedings of the Symposium on Waste Management*, Phoenix, Arizona, Mar. 2018. ([pdf](#) / [presentation](#))
- [9] E. Fang, [S. Suresh](#) and W. Whittaker, "Camera-only kinematics for small lunar rovers," In *Annual Meeting of the Lunar Exploration Analysis Group*, Columbia, Maryland, Vol. 1960, Nov 2016. ([poster](#))

\* Current representative publications

- [10] S. Suresh, E. Fang and W. Whittaker, "Optical kinematic state estimation of planetary rovers using downward-facing monocular fisheye camera," *RISS Working Papers Journal*, Nov 2016. ([pdf](#) / [video](#))

SERVICE	<p><b>Reviewer:</b> IROS '20, '21   ICRA '21, '22   RA-L '20   T-RO '21</p> <p><b>Organizing committee:</b> 2021 <a href="#">Debates on the Future of Robotics Research</a> (ICRA Virtual Workshop)</p> <p><b>Admissions committee:</b> CMU RI Summer Scholars program (2018-2020)</p> <p><b>Mentorship:</b> CMU AI undergraduate mentorship program (2019), NIT Trichy Jiteshraj Scholarship (2018)</p>
AWARDS AND HONORS	<p>Best paper award in service robotics finalist, ICRA 2021 [1]</p> <p><a href="#">Hima and Jive Fellowship</a> in Computer Science for International Students, 2020</p> <p>RECAL Alumni Award and Sri. Avinash Memorial Award, 2017 (<i>gold-medalist in undergraduate major</i>)</p> <p><a href="#">OPJEMS Scholar</a>, 2017 (<i>100 undergraduates across India</i>)</p> <p><a href="#">Cargill Global Scholar</a>, 2015 - 2017 (<i>10 undergraduate sophomores across India</i>)</p>
TEACHING	<p>Teaching Assistant, <a href="#">16-833: Robot Localization and Mapping</a> Fall 2019, Spring 2020</p> <p>Project mentoring, office hours, grading, presented lectures on occupancy mapping<sup>†</sup> and sparse visual SLAM techniques.</p>
EXPERIENCE	<p>Graduate Research Assistant, Carnegie Mellon University 2017 - present</p> <p>Ph.D. research in the <a href="#">Robot Perception Lab</a>, focusing on tactile and visual perception for robot manipulation. Previously developed algorithms for active exploration and stereo visual SLAM for autonomous underwater vehicles.</p> <p>Undergraduate Research Scholar, Carnegie Mellon University Summer 2016</p> <p>RI summer scholar working with Red Whittaker on visual state-estimation via self-perception for planetary rovers.</p> <p>Undergraduate Research Scholar, Indian Institute of Science Summer 2015</p> <p>Work with R. Venkatesh Babu and R. K. Sarvadevabhatla on freehand sketch understanding through eye-gaze fixations.</p>
SELECT COURSEWORK	<p><b>Graduate:</b> Convex optimization (10-725), kinematics, dynamics and control (16-711), geometry-based methods in vision (16-822), planning and decision-making in robotics (16-782), robot localization and mapping (16-833), introduction to machine learning (10-701), computer vision (16-720), mathematical fundamentals for robotics (16-811)</p> <p><b>Undergraduate:</b> Data structures and algorithms, computer networks, neural networks and fuzzy logic, image processing, basics of programming, control systems, robotics, signals and systems, circuit theory, embedded systems, linear integrated circuits, sensors and transducers, material science, numerical methods</p>
INDEPENDENT PROJECTS	<p>DeepGeo: Photo localization with deep neural network (<a href="#">10-701</a>) (<a href="#">arXiv</a> / <a href="#">github</a>)</p> <p>A deep network that beats humans at <a href="#">GeoGuessr</a>—trained on our <i>50States10K</i> dataset.</p> <p>Task and motion planning for robotic food preparation (<a href="#">16-782</a>) (<a href="#">pdf</a>)</p> <p>Hierarchical task and motion planning for a 6-DOF robot arm—to prepare yogurt parfaits!</p> <p>Thin structure reconstruction via 3D lines and points (<a href="#">16-822</a>) (<a href="#">poster</a>)</p> <p>We combine edge data and sparse features in the SfM pipeline to recover thin objects in a scene.</p> <p>Factor graph optimization for dynamic parameter estimation (<a href="#">16-711</a>) (<a href="#">pdf</a>)</p> <p>We implement a method for estimation of MAV poses and dynamic parameters during flight.</p>