Nikhil Varma Keetha

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Education

Carnegie Mellon University — *Pittsburgh, PA*

PhD in Robotics — *2022 - Present*

Advisor: Prof. Sebastian Scherer

Cum. GPA: 4.08/4

Indian Institute of Technology (ISM) Dhanbad — *Dhanbad, India*

Bachelor of Technology (Distinction) in Engineering Physics — *2018 - 2022*

Cum. GPA: 8.94/10.0

Technical Skills

Programming Languages	Python, C/C++, Matlab, JavaScript, Octave, LaTeX
Libraries	PyTorch, TensorRT, JAX, Tensorflow, Numpy, Pandas, OpenCV, Matplotlib, Scipy, PCL, GradSLAM, Wandb
Environments/Tools	Linux, Git/Github, ROS/ROS2, AWS/GCP, UE 4, CARLA, Jupyter, MS Office, SLURM, Docker

Publications

Conference Papers

[1] **N. Keetha**, C. Wang, Y. Qiu, K. Xu, and S. Scherer, "Airobject: A temporally evolving graph embedding for object identification," in *Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR)*, 2022. arXiv: 2111.15150.

[2] K. M. Jatavallabhula *et al.*, "Conceptfusion: Open-set multimodal 3d mapping," in *Robotics: Science and Systems (RSS)*, 2023. arXiv: 2302.07241.

Journal Papers

[3] **N. Keetha***, A. Mishra*, J. Karhade*, *et al.*, "Anyloc: Towards universal visual place recognition," *IEEE Robotics and Automation Letters*, 2023. arXiv: 2308.00688.

[4] **N. Keetha**, M. Milford, and S. Garg, "A hierarchical dual model of environment- and place-specific utility for visual place recognition," *IEEE Robotics and Automation Letters*, vol. 6, no. 4, pp. 6969–6976, 2021. DOI: 10.1109/LRA.2021.3096751.

[5] **N. Keetha**, S. A. B. P, and C. S. R. Annavarapu, "U-det: A modified u-net architecture with bidirectional feature network for lung nodule segmentation," *MDPI Diagnostics*, 2020. arXiv: 2003.09293.

Preprint Articles

[6] **N Keetha**, J. Karhade, K. M. Jatavallabhula, *et al.*, "Splatam: Splat, track & map 3d gaussians for dense rgb-d slam," *arXiv*, 2023.

[7] Y. He*, I. Cisneros*, **N. Keetha**, *et al.*, "Foundloc: Vision-based onboard aerial localization in the wild," *arXiv preprint arXiv:2310.16299*, 2023.

Experience

AirLab, Carnegie Mellon University — *Pittsburgh, PA*

Graduate Research Assistant — *June 2022 - Present*

- Mentored by **Prof Sebastian Scherer** & **Prof Deva Ramanan**
- Exploring Temporal Perception, SLAM & Self-Supervised Learning in the context of Field Robotics
- Developing methods for universal localization [3] & reconstruction [6] in the Wild
- Contributed to Multi-Camera Detect and Avoid (DAA) system for vision-based collision avoidance
  - Multi-view 2D to 3D track fusion, Efficient inference, Pipeline design & implementation
- Developed Kalman-Filter-based Multi-modal Fusion system for Camera & Radar-based DAA
- Leading the AirLab Compute & Outreach Committee responsible for lab compute, demos, seminars, summer schools & workshops

Robotics Institute Summer Scholar (RISS) *April 2021 - May 2022*

- Mentored by **Dr. Chen Wang** and **Prof Sebastian Scherer**
- Explored Open-World Perception
- Developed a Graph Learning based Temporal Encoding method for Object Identification
- Paper [1] as first author accepted to **IEEE/CVF CVPR 2022** — **Poster** | **Paper** | **Blog** | **Code**
- Led the **RISS Working Papers Journal** team on logistics related to Peer Review and Journal Design
- Presented [1] at the **University of Minnesota REU 2021 Poster Symposium** — **Poster** | **Video**
- Presented RISS Summer Experience as a part of the **2021 RISS Community Seminar Series** — **Video**

Robotics and Embodied AI Lab (REAL), Mila *Montreal, Canada*

Winter 2021 Research Intern *Jan 2021 - July 2021*

- Mentored by **Krishna Murthy Jatavallabhula** and **Prof Liam Paull**
- Competed with 50 undergraduate and graduate students worldwide for a **Winter 2021 Research Internship** at REAL, Mila
- Explored multi-view consistent representation learning for 2D tasks such as depth estimation and semantic segmentation leveraging **GradSLAM**
- Worked on material property recovery & expanding NeRF-based representations using Continual Learning

QUT Centre for Robotics *Brisbane, Australia*

Undergraduate Research Intern *Aug 2020 - Feb 2021*

- Mentored by **Dr. Sourav Garg** and **Prof Michael Milford**
- Explored Semantics in Robotic Localization and Mapping, especially, Visual Place Recognition (VPR)
- Developed a Hierarchical Dual Model of 'Environment- and Place-Specific Utility' for Visual Place Recognition in challenging conditions such as drastic viewpoint shift and environmental changes. — **Paper** | **Code**
- Paper [4] as first author accepted to **IEEE Robotics and Automation Letters (RA-L)** — *June 2021*
- Presented Paper at **IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS) 2021** — **Video**

IIT (ISM) Dhanbad *Dhanbad, India*

Undergraduate Research Intern *Nov 2019 – Aug 2020*

- Advised by **Prof ACS Rao** (Department of Computer Science IIT(ISM) Dhanbad).
- Conducted research on the Application of Deep Learning to Bio-Medical Imaging and Agricultural Robotics.
- Developed a modified U-Net architecture with a Bi-FPN feature network for lung nodule segmentation. — **Paper** | **Code**

PURE EV ™ *Hyderabad, India*

R& D Data Analyst *May 2020 - Aug 2020*

- Worked on establishing frameworks for Range Prediction algorithms under the guidance of **Prof Nishanth Dongari, IITH**.
- Applied Statistical and ML Techniques to interpret key points from IoT sensor data and Battery data to drive production decisions.
- Studied Dynamic Models of Electric Vehicles for battery range analysis.

Projects

Multi-Camera Object Track Fusion for Visual Detect and Avoid (DAA) *November 2022*

Presentation Slide *CMU 16-811: RoboMath*

GradSLAM-RGB-D-Completion *December 2020*

Github *Framework: Pytorch*

- Leveraged Multi-view gradients from GradSLAM to optimize RGB-D Images
- Presented insights on the potential of the gradslam framework for differentiable rendering and representation learning

COVID-19 Twitter Sentiment Analysis India (IBM Hackathon 2020) *June 2020 – July 2020*

Github | **Demo** | **Presentation** *Framework: TF 2.0*

- Developed a Visualization Dashboard for COVID-19 Twitter Sentiment Analysis & Extraction using a modified Roberta & Roberta-CNN model

Twitter Sentiment Extraction (Kaggle Competition) *May 2020 - June 2020*

Placed 58/2,227 (Top 3%) - Silver Medal *Framework: Pytorch & TF 2.0*

- Developed a modified Roberta base model with CNN head for Twitter Sentiment Extraction
- Implemented Teacher Student learning and Ensembling for improvement of Model Performance

Reddit Flair Predictor *April 2020*

Github *Framework: TF 2.0 (Keras)*

- Developed an XLNet language model based on Transfer Learning & a Web App based on Flask API for Reddit Flair Classification

Leadership & Outreach

RoboLaunch *Jan 2022 - Present*

Organizer ***Webpage***

- Organized a robotics outreach initiative aimed at broadening participation & making robotics more accessible
- Led logistics involving speaker invitations, communications, scheduling, publicity & streaming
- Reached an audience of over 13,000 students & viewers worldwide — **Blog** | **Media Coverage**

Tartan Planning Series *March 2023 - Present*

Organizer ***Spring***

- Organized an interactive series of talks, tutorials, and learning on planning for robotics with world-renowned pioneers

Tartan SLAM Series *April 2021 - December 2021*

Organizer ***Summer*** | ***Fall***

- Organized an interactive series of talks, tutorials, and learning on SLAM with world-renowned pioneers

Service & Mentoring

Reviewer: **ICRA, IROS, RA-L, ECCV, ICCV, CVPR** *2021 - Present*

Mentor: **CMU Undergraduate AI Mentoring Program, SCS Mentorship Program** *Present*