Nikhil Varma Keetha

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Education

Carnegie Mellon University   *Pittsburgh, PA*
PHD IN ROBOTICS   *2022 - Present*
Advisor: Prof. Sebastian Scherer
Cum. GPA: 4.11/4

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. arXiv: 2312.02126.

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

[8] Y. Hu*, Q. Xie*, V. Jain*, J. Francis, J. Patrikar, **N. Keetha**, *et al.*, "Toward general-purpose robots via foundation models: A survey and meta-analysis," 2023. arXiv: 2312.08782.

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   **Blog**
  - Multi-view 2D to 3D track fusion, Efficient inference, Pipeline design & implementation
  - 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*