

# Nikhil Varma Keetha

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## Education

### Carnegie Mellon University

PHD IN ROBOTICS

Advisors: Prof. Sebastian Scherer & Prof. Deva Ramanan

Pittsburgh, PA

2022 - Present

### Carnegie Mellon University

MS IN ROBOTICS

Advisor: Prof. Sebastian Scherer

CGPA: 4.12/4

Thesis: Splat, Track & Map 3D Gaussians for Dense RGB-D SLAM

Pittsburgh, PA

2022 - 2024

### Indian Institute of Technology (ISM) Dhanbad

BACHELOR OF TECHNOLOGY (DISTINCTION) IN ENGINEERING PHYSICS

CGPA: 8.94/10.0

Dhanbad, India

2018 - 2022

## 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**, J. Karhade, K. M. Jatavallabhula, G. Yang, S. Scherer, D. Ramanan, and J. Luiten, "Splatam: Splat track & map 3d gaussians for dense rgb-d slam," in *Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition*, 2024, pp. 21 357–21 366. arXiv: 2312.02126.
- [2] **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.
- [3] C. Ho\*, J. Zou\*, O. Alama\*, S. M. J. Kumar, B. Chiang, T. Gupta, C. Wang, **N. Keetha**, K. Sycara, and S. Scherer, "Map it anywhere (mia): Empowering bird's eye view mapping using large-scale public data," *Advances in Neural Information Processing Systems (NeurIPS)*, 2024. arXiv: 2407.08726.
- [4] K. M. Jatavallabhula *et al.*, "Conceptfusion: Open-set multimodal 3d mapping," in *Robotics: Science and Systems (RSS)*, 2023. arXiv: 2302.07241.

### JOURNAL PAPERS

- [5] **N. Keetha\***, A. Mishra\*, J. Karhade\*, K. M. Jatavallabhula, S. Scherer, M. Krishna, and S. Garg, "Anyloc: Towards universal visual place recognition," *IEEE Robotics and Automation Letters*, 2023. arXiv: 2308.00688.
- [6] **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.
- [7] **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

- [8] Y. He\*, I. Cisneros\*, **N. Keetha**, J. Patrikar, Z. Ye, I. Higgins, Y. Hu, P. Kapoor, and S. Scherer, "Foundloc: Vision-based onboard aerial localization in the wild," *arXiv*, 2023. arXiv: 2310.16299.
- [9] 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.
- [10] J. Patrikar, J. Dantas, B. Moon, M. Hamidi, S. Ghosh, **N. Keetha**, *et al.*, "Tartanaviation: Image, speech, and ads-b trajectory datasets for terminal airspace operations," *arXiv preprint arXiv:2403.03372*, 2024.

# Experience

## Meta Reality Labs

RESEARCH SCIENTIST INTERN

VISITING RESEARCHER

- Working on Generalizable 3D Reconstruction with the XR Maps team supervised by [Peter Kontschieder](#)

Zurich & Pittsburgh

May 2024 - Aug 2024

Aug 2024 - Present

## AirLab, Carnegie Mellon University

GRADUATE RESEARCH ASSISTANT

- Mentored by [Prof Sebastian Scherer](#) & [Prof Deva Ramanan](#)
- Exploring SLAM & Self-Supervised Learning in the context of Field Robotics
- Developing methods for Universal Localization [5] & Reconstruction [1] in the Wild
- Contributed to a Multi-Camera Detect and Avoid (DAA) system for vision-based collision avoidance
  - 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

Pittsburgh, PA

June 2022 - Present

[SpliTAM](#) | [AnyLoc](#)  
[Blog](#)

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 [2] as first author accepted to [IEEE/CVF CVPR 2022](#)
- Led the [RISS Working Papers Journal](#) team on logistics related to Peer Review and Journal Design
- Presented [2] at the [University of Minnesota REU 2021 Poster Symposium](#)
- Presented RISS Summer Experience as a part of the [2021 RISS Community Seminar Series](#)

[Poster](#) | [Paper](#) | [Blog](#) | [Code](#)

[Poster](#) | [Video](#)  
[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 [6] as first author accepted to [IEEE Robotics and Automation Letters \(RA-L\)](#)
- Presented Paper at [IEEE/RSJ International Conference on Intelligent Robots and Systems \(IROS\) 2021](#)

[Paper](#) | [Code](#)  
June 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)

PLACED 58/2,227 (TOP 3%) - SILVER MEDAL

May 2020 - June 2020

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

[GITHUB](#)

April 2020

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

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## RoboLaunch

Jan 2022 - July 2023

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 - May 2023

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

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

2021 - Present

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

Present