# Neehar Peri

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## Education

**Ph.D in Robotics, Carnegie Mellon University** — Aug 2021 - Present

**M.S in Robotics, Carnegie Mellon University** — Aug 2023

*Long-Tailed 3D Detection via Multi-Modal Fusion*

**B.S. in Computer Engineering, University of Maryland - College Park** — May 2021

*QUEST Honors Program*

## Journal Publications

- Data and Algorithms for End-to-End Thermal Spectrum Face Verification — TBIOM 2023
  *T Bourlai, J Rose, S Mokalla, A Zabin, L Hornak, CB Nalty, **N Peri**, J Gleason, CD Castillo, VM Patel, R Chellappa*

## Conference Publications

- Planning with an Ensemble of World Models — Under Review
  *AB Vasudevan, **N Peri**, D Ramanan*
- Better Call SAL: Towards Segmenting Anything in LiDAR — Under Review
  *A Osep, T Meinhardt, F Ferroni, **N Peri**, D Ramanan, L Leal-Taixe*
- 3D Video Object Detection — Under Review
  ***N Peri**, A Osep, L Leal-Taixe, D Ramanan*
- Revisiting Few-Shot Object Detection with Vision-Language Models — Under Review
  *A Madan, **N Peri**, S Kong, D Ramanan*
- Long-Tailed 3D Detection via 2D Late Fusion — Under Review
  *Y Ma*, **N Peri***, S Wei, D, Ramanan, W Hua$^\star$, Y Li $^\star$, S Kong$^\star$*
- ZeroFlow: Scaling Scene Flow via Distillation — ICLR 2024
  *K Vedder, **N Peri**, N Chodosh, I Khatri, E Eaton, D Jayaraman, Y Liu, D Ramanan, J Hays*
- Towards Long-Tailed 3D Detection — CoRL 2022
  ***N Peri**, A Dave, D Ramanan$^\star$, S Kong$^\star$*
- A Brief Survey of Person Recognition at a Distance — ASILOMAR 2022
  *C Nalty*, **N Peri***, J Gleason*, CD Castillo, S Hu, T Bourlai, R Chellappa*
- Forecasting from LiDAR via Future Object Detection — CVPR 2022
  ***N Peri**, J Luieten, M Li, A Osep, L Leal-Taixe, D Ramanan*
- Assessment of a Novel Virtual Environment for Examining Human Cognitive-Motor Performance during Execution of Action Sequences — HCII 2022
  *AA Shaver*, **N Peri***, R Mezebish, G Matthew, A Berson, C Gaskins, GP Davis, GE Katz, I Samuel, JA Reggia, J Purtilo, RJ Gentili*
- A Synthesis-Based Approach for Thermal-to-Visible Face Verification — FG 2021
  ***N Peri**, J Gleason, CD Castillo, T Bourlai, VM Patel, R Chellappa*
- PreferenceNet: Encoding Human Preferences in Auction Design with Deep Learning — NeurIPS 2021
  ***N Peri***, MJ Curry*, S Dooley, JP Dickerson*
- The Devil is in the Details: Self-Supervised Attention for Vehicle Re-ID — ECCV 2020
  *P Khorramshahi*, **N Peri***, JC Chen, R Chellappa*
- A Dual Path Model with Adaptive Attention for Vehicle Re-ID — ICCV 2019$^{\dagger\dagger}$
  *P Khorramshahi, A Kumar, **N Peri**, SS Rambhatla, JC Chen, R Chellappa*

## Workshop Publications

- An Empirical Analysis of Range for 3D Object Detection — ICCV 2023$^\dagger$
  ***N Peri**, M Li, B Wilson, YX Wang, J Hays, D Ramanan*
- ReBound: An Open-Source 3D Bounding Box Annotation Tool for Active Learning — CHI 2023$^\dagger$
  *W Chen*, A Edgley*, R Hota*, J Liu*, E Schwartz*, A Yizar*, **N Peri**$^\star$, J Purtilo$^\star$*
- Deep $k$-NN Defense Against Clean-label Data Poisoning Attacks — ECCV 2020$^\dagger$
  ***N Peri***, N Gupta*, WR Huang*, L Fowl, C Zhu, S Feizi, T Goldstein, JP Dickerson*
- Towards Real-Time Systems for Vehicle Re-ID, Multi-Camera Tracking, and Anomaly Detection — CVPR 2020$^\dagger$
  ***N Peri***, P Khorramshahi*, SS Rambhatla*, V Shenoy, S Rawat, JC Chen, R Chellappa*

- Attention Driven Vehicle Re-ID and Unsupervised Anomaly Detection for Traffic Understanding — CVPR 2019†
  *P Khorramshahi,* ***N Peri****, A Kumar, A Shah, R Chellappa*

*Equal Contribution
⋆Equal Supervision
†Selected for Spotlight Presentation
††Selected for Oral Presentation

## Patents

- End-to-End Systems and Methods for Streaming 3D Detection And Forecasting from LiDAR Point Clouds — 17/692,973
  ***N Peri****, D Ramanan*

## Academic Experience

**Carnegie Mellon University**, Pittsburgh, PA, *Robotics Institute* — *Apr 2020 – Present*

- Leading research on 3D object detection, multi-object tracking, motion forecasting, and multi-agent planning for embodied perception
- Advisor: Deva Ramanan

**University of Maryland**, College Park, MD, *UMIACS* — *May 2018 – May 2021*

- Conducted research in unsupervised traffic anomaly detection and discriminative representation learning for vehicle re-id
- Led research in defending against clean-label adversarial poisoning attacks
- Established novel method for encoding human preferences in revenue maximizing auction design
- Advisors: Rama Chellappa & John P. Dickerson

## Industry Experience

**NVIDIA**, Remote, *Research Scientist Intern* — *January 2024 – Current*

- Leading research on multi-modal 3D object detection

**MUKH Technologies**, College Park, MD, *Research Engineer* — *Aug 2020 – May 2023*

- Led research on improving thermal-to-visible face synthesis for zero-shot identification
- Built robust face verification pipelines for multi-spectral data streams

**Argo AI**, Pittsburgh, PA, *Research Scientist Intern* — *May 2021 – Oct 2022*

- Developed end-to-end 3D object detection and forecasting pipeline from LiDAR point clouds
- Implemented novel metrics that jointly evaluate detection and forecasting accuracy

**Bank of America**, Charlotte, NC, *Conversational Commerce Technology Intern* — *Jun 2019 – Aug 2019*

- Developed novel deep learning pipeline to validate quality of utterance-intent pairs in chatbot conversations using PyTorch, AllenNLP, and NLTK
- Deployed RESTful Active Learning API to introduce targeted learning feedback loop and improve intent classification model performance

## Teaching Experience

**16-720**, Carnegie Mellon University, Robotics Institute, *Head Teaching Assistant* — *Spring 2022, Fall 2022*

- Managed team of teaching assistants to effectively coordinate course responsibilities
- Updated course projects, held office hours, answered student questions and graded course projects

**ENEE 244**, University of Maryland, ECE Department, *Undergraduate Teaching Fellow* — *Spring 2019*

- Led Introduction to Digital Logic recitation for a discussion section of 15 students

## Invited Talks

- Long-Tailed 3D Object Detection via Multi-Modal Fusion — Jan 2024
  *Invited Talk: Carnegie Mellon University (R-PAD Lab)*
- Argoverse 2 End-to-End Forecasting Challenge — Jun 2023
  *Invited Talk: CVPR 2023, Workshop on Autonomous Driving*
- 3D Object Detection for Autonomous Vehicles — Mar 2023
  *Guest Lecture: 16-825, Learning for 3D Vision*
- Image Processing and Convolutions — Sep 2022
  *Guest Lecture: 16-720, Computer Vision*
- How do Autonomous Vehicles See the World? — Aug 2022
  *Invited Talk: Carnegie Mellon University (RoboLaunch)*
- Transformers for Vision — Apr 2022
  *Guest Lecture: 16-720, Computer Vision*
- Training Convolutional Neural Networks — Apr 2022
  *Guest Lecture: 16-720, Computer Vision*
- Metrics and Methods for Detection and Forecasting in Autonomous Vehicles — Apr 2022
  *Invited Talk: National Autonomous Vehicle Conference*

## Service

**Conference Reviewer**: NeurIPS 20{21,22,23}, CVPR 20{22,23,24}, AAAI 20{23,24}, ICCV 2023, ICLR 2024, ECCV 2024
**Journal Reviewer**: IJCV 2021, TPAMI 2023
**Mentorship**: CMU AI Mentoring Program (20{21, 22}), QUEST Mentoring Program (2022), CMU AI for Social Good Summit (2022)
**Organizer:** Visual Perception and Learning in an Open World (CVPR 20{22, 23, 24}), Computer Vision Reading Group (20{23, 24})
**Other:** TRINITY Cluster Management 20{22,23,24}, AUTOBOT Cluster Management 20{22,23,24}

## Mentorship

| Name | Institution | Year(s) | Project |
|---|---|---|---|
| Zihan Wang | CMU | 2024 – | Benchmarking dynamic reconstruction with RGBD videos |
| Mehar Khurana | IIITD | 2023 – | Shelf-supervised 3D object detection |
| Anish Madan | CMU | 2022 – | Few-shot multi-modal 2D detection with vision-language models |
| Andrew Shen | CMU | 2022 – 2023 | Benchmarking modular 3D perception stack for autonomous vehicles |
| Xindi Wu | CMU | 2022 | Self-supervised multi-modal representation learning for point clouds |
| Aminah Yizar, Andrew Edgley, Ezra Schwartz, Joshua Liu, Raunak Hota, Royce He, Wesley Chen | UMD | 2022 | Project champion for CMSC435 software engineering capstone to build an active learning framework to allow human-in-the-loop 3D object annotation |
| Christopher Nalty | MUKH | 2021-2022 | Synthetic data augmentation for thermal-to-visible face verification |
| Aastha Senjalia, Andrew Vetter, Benjamin Namovicz, Cheyenne Montgomery, Ferzam Mohammad, Matthew Weinberg, Nicholas Revill | UMD | 2021 | Project champion for CMSC435 software engineering capstone to build a visualization platform for autonomous vehicle data. Project won People's Choice Award. |

## Awards

| Name | Institution | Distinction | Year |
|---|---|---|---|
| NSF Graduate Research Fellowship | CMU | National | 2023 |
| Maryland Undergraduate Researcher of the Year | UMD | University | 2021 |
| Sujan Guha Memorial Best Senior Thesis Award | UMD | Department | 2021 |
| CRA Outstanding Undergraduate Researcher (Honorable Mention) | UMD | National | 2021 |
| Yurie & Jeong H. Kim Scholarship | UMD | Department | 20{18,19,20} |