Rahul Venkatesh

Education

September 2021-present	PhD Computer Science, **Stanford University**, Stanford, CA Advisor: Prof. Daniel Yamins
August 2019-December 2020	Masters of Science Computer Vision, Advisors: Prof. Laszlo Jeni and Prof. Zico Kolter **Carnegie Mellon University**, Pittsburgh, PA
August 2014-August 2018	Bachelor of Engineering Computer Science and Engineering, **R. V. College of Engineering (RVCE)**, Bangalore, India

Work Experience

July 2021-Present	Research Assistant at NeuroAILab, Stanford University, USA Visual World Modeling, Intuitive physics, Neuroscience-inspired AI
Jan 2021-July 2021	Research Intern at Verisk Analytics, New Jersey, USA Developed implicit 3D representations for representing complex object topologies.
Jan 2018-July 2019	Research Assistant at Video Analytics Lab, Indian Institute of Science (IISc, Bangalore) Object and human pose estimation, Domain Adaptation, Semantic Segmentation.

Research Interests

Visual World Modeling, Human-centered AI, Segmentation, Optical Flow, 3D scene understanding, Intuitive physics, Adversarial robustness.

Publications

World Modeling:

- **Rahul Venkatesh*** and Kotar, Klemen* and Chen, Lilian Naing* and Kim, Seungwoo and Wheeler, Luca Thomas and Watrous, Jared and Ancone, Gia and Lee, Wanhee and Chen, Honglin and Bear, Daniel and Stojanov, Stefan and Yamins, Daniel LK, *Physical Object Understanding with a Physically Controllable World Model*, IEEE/CVF Conference on Computer Vision and Pattern Recognition, 2026
- Wanhee Lee* and Kotar, Klemen* and **Rahul Venkatesh*** and Watrous, Jared and Yamins, Daniel LK, *Perceptual 3D Simulation With Physical World Modeling*, IEEE/CVF Conference on Computer Vision and Pattern Recognition, 2026
- Wanhee Lee* and Klemen Kotar* and **Rahul Venkatesh*** and Jared Watrous* and Honglin Chen* and Khai Loong Aw and Daniel LK Yamins, *Unified 3D Scene Understanding Through Physical World Modeling*, International Conference

on Learning Representations, 2026

- Klemen Kotar* and Wanhee Lee* and **Rahul Venkatesh*** and Chen, Honglin* and Bear, Daniel and Watrous, Jared and Kim, Simon and Aw, Khai Loong and Chen, Lilian Naing and Stojanov, Stefan and Feigelis, Kevin and Thobani, Imran and Durango, Alex and Jedoui, Khaled and Kazemian, Atlas and Yamins, Daniel LK, *World Modeling with Probabilistic Structure Integration*, arXiv:2509.09737, 2025
- **Rahul Venkatesh*** and Chen, Honglin and Feigelis, Kevin and Bear, Daniel M and Jedoui, Khaled and Kotar, Klemen and Binder, Felix and Lee, Wanhee and Liu, Sherry and Smith, Kevin A and and Yamins, Daniel LK, *Understanding physical dynamics with counterfactual world modeling*, European Conference on Computer Vision, 2024

Optical-flow extraction from world models:

- Stojanov, Stefan* and Wendt, David* and Kim, Seungwoo* and **Rahul Venkatesh*** and Feigelis, Kevin and Wu, Jiajun and Yamins, Daniel LK, *Self-Supervised Learning of Motion Concepts by Optimizing Counterfactuals*, NeurIPS, 2025

Segmentation:

- **Rahul Venkatesh*** and Kotar, Klemen* and Chen, Lilian Naing* and Kim, Seungwoo and Wheeler, Luca Thomas and Watrous, Jared and Ancone, Gia and Lee, Wanhee and Chen, Honglin and Bear, Daniel and Stojanov, Stefan and Yamins, Daniel LK, *Discovering and Using Spelke Segments*, arXiv:2507.16038, 2026
- Chen, Honglin and, **Rahul Venkatesh** and, Friedman, Yoni and Wu, Jiajun and Tenenbaum, Joshua B and Yamins, Daniel LK and Bear, Daniel M, *Unsupervised segmentation in real-world images via spelke object inference*, European Conference on Computer Vision, 2022

Intuitive-physics understanding in humans and machines:

- Wang, Haoliang and Jedoui, Khaled and, **Rahul Venkatesh**, and Binder, Felix Jedidja and Tenenbaum, Josh and Fan, Judith E and Yamins, Daniel and Smith, Kevin A, *Probabilistic simulation supports generalizable intuitive physics*, Proceedings of the Annual Meeting of the Cognitive Science Society, 2024
- Binder, Felix Jedidja and **Rahul Venkatesh**, and Yamins, Daniel LK and Fan, Judith E, *Lessons learned in the study of representational alignment in physical reasoning*, ICLR 2024 Workshop on Representational Alignment, 2024

3D scene understanding:

- Chen, Honglin and Lee, Wanhee and Yu, Hong-Xing and **Rahul Venkatesh**, and Tenenbaum, Joshua and Bear, Daniel and Wu, Jiajun and Yamins, Daniel, *Unsupervised 3D scene representation learning via movable object inference*, Transactions on machine learning research, 2024
- **Rahul Venkatesh**, and Karmali, Tejan and Sharma, Sarthak and Ghosh, Aurobrata and Babu, R Venkatesh and Jeni, Laszlo A and Singh, Maneesh, *Deep implicit surface point prediction networks*, Proceedings of the IEEE/CVF international conference on computer vision, 2021
- **Rahul Venkatesh**, and Sharma, Sarthak and Ghosh, Aurobrata and Jeni, Laszlo and Singh, Maneesh, *Dude: Deep unsigned distance embeddings for hi-fidelity representation of complex 3d surfaces*, arXiv preprint arXiv:2011.02570, 2020

Adversarial robustness:

- **Rahul Venkatesh**, and Wong, Eric and Kolter, Zico, *Adversarial robustness in discontinuous spaces via alternating sampling & descent*, Proceedings of the IEEE/CVF Winter Conference on Applications of Computer Vision, 2023

Domain adaptation:

- Kundu, Jogendra Nath* and, **Rahul Venkatesh***, and Venkat, Naveen and Revanur, Ambareesh and Babu, R V, *Class-Incremental Domain Adaptation*, European Conference on Computer Vision, 2020
- Kundu, Jogendra Nath and Venkat, Naveen and, **Rahul Venkatesh**, and Babu, R V, *Universal Source-Free Domain Adaptation*, Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition, 2020
- Kundu, Jogendra Nath and Venkat, Naveen and Revanur, Ambareesh and, **Rahul Venkatesh**, and Babu, R V, *Towards Inheritable Models for Open-Set Domain Adaptation*, Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition, 2020

Object pose estimation:

- Kundu, Jogendra Nath* and, **Rahul Venkatesh***, and Ganeshan, Aditya and Babu, R V, *Object pose estimation from monocular image using multi-view keypoint correspondence*, European Conference on Computer Vision, 2018
- **Rahul Venkatesh***, Jogendra Nath Kundu*, R Venkatesh Babu, *iSPA-net: Iterative Semantic Pose Alignment Network*, ACM Conference on Multimedia, ACMMM 2018

Reconstructing 3D humans from images:

- Kundu, Jogendra Nath and Rakesh, Mugalodi and Jampani, Varun and, **Rahul Venkatesh**, and Babu, R V, *Appearance Consensus Driven Self-Supervised Human Mesh Recovery*, European Conference on Computer Vision, 2020
- Kundu, Jogendra Nath and Revanur, Ambareesh and Waghmare, Govind Vitthal and, **Rahul Venkatesh**, and Babu, R V, *Unsupervised Cross-Modal Alignment for Multi-Person 3D Pose Estimation*, European Conference on Computer Vision, 2020

  * = equal contribution

Patents

- **Rahul Venkatesh**, Sarthak Sharma, Aurobrata Ghosh, Maneesh Kumar Singh, Laszlo Attila Jeni, *Computer Vision Systems and Methods for High-Fidelity Representation of Complex 3D Surfaces Using Deep Unsigned Distance Embeddings* , (US Patent App. 17/534,849)
- Sneha M, Shobha G, Shakti Kumar, and **Rahul Venkatesh**, *Method, System and Apparatus for Providing Efficient and Secured Authentication Using Biometric Credentials*, India Patent Application No. 201841036854, published 3 Apr. 2020.

Awards and Achievements

- Best Team from India: Semantic Segmentation Challenge at Autonomous Navigation in Unconstrained Environments Workshop (AutoNUE), (Poster at ECCV 2018 and Winner of Intel Travel Grant)

- Best project award for State Level, in Engineering Students' Innovation challenge, organized by International Society for Scientific Research and Development (ISSRD 2017), for project titled 'Water Quality Prediction in Rural India'

Software Skills

- Programming Languages: Python, MATLAB, R, Java, C, C++, C#, CUDA
- Machine Learning Frameworks: PyTorch, TensorFlow.
- Graphics API: Blender, OpenGL
- Miscellaneous: SLURM, Docker

References

Daniel Yamins, Associate Professor at Stanford University | yamins@stanford.edu
Jiajun Wu, Assistant Professor at Stanford University | jiajunwu@stanford.edu
Zico Kolter, Associate Professor at Carnegie Mellon University | zkolter@cs.cmu.edu
Laszlo Jeni, Assistant Professor at Carnegie Mellon University | laszlojeni@cmu.edu
R Venkatesh Babu, Professor at IISc, Bangalore | venky@iisc.ac.in