Rupa Kurinchi-Vendhan

AI Researcher for Scientific Discovery and Biodiversity Monitoring

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Education

Doctorate of Philosophy in Electrical Engineering and Computer Science

The Massachusetts Institute of Technology

📅 September 2024 – Present

Advisor: Sara Beery

Bachelor of Science in Computer Science

The California Institute of Technology

📅 September 2020 – June 2024

Awarded study abroad opportunity at the University of Cambridge, St. Catharine's College for Michaelmas Term 2022-23

Work Experience

Coral Gardeners – Benthic Classification for Coral Restoration

Computer Vision Researcher

📅 March 2023 – January 2024

- Developed an aerial benthic composition mapping dataset and a transformer-based benthic classification architecture, which takes processed aerial drone imagery as input and identifies pixels as coral cover, rocks, rubble, sand, algae, etc. Model achieves up to 93% accuracy, and is deployed to inform and monitor restoration efforts.

Computational Vision Laboratory – Species Distribution Modeling

Undergraduate Researcher

📅 December 2021 – June 2023

Advisor: Pietro Perona

- Created a land cover classification model which identifies landscapes such as open ocean and deciduous forests from satellite imagery with 95% accuracy using the GeoCLEF Life 2020 dataset.
- Independently extended this work to explore using high-resolution satellite imagery and citizen science species observation data to infer the joint distribution of species as a function of their geographic location.

Apple – Atlas Packing for Volumetric Rendering

Technology Investigation Intern

📅 June 2022 – September 2022

- Designed a novel algorithm for texture/bin packing which improves computational and power demands by 20%. This will improve the efficiency of the scene and video rendering pipeline for the Apple Vision Pro.
- Selected from internship cohort to present work to member of Apple's advisory board, Mike Rockwell.

NASA – Estimating Solar Potential for Washington, D.C.

DEVELOP National Program Intern

📅 September 2021 – November 2021

- Partnered with the Washington DC Department of Energy & Environment and a team of geospatial researchers to create solar potential maps to inform solar panel installations for communities outside of DC at a 1-ft resolution.
- Independently developed a vision-based model for estimating roof tilt from LiDAR-derived digital surface models and satellite images to provide more accurate urban solar potential estimates.

Netlab – WiSoSuper: Benchmarking Super-Resolution Models for Wind and Solar Data
Research Fellow

📅 June 2021 – September 2021

Advisors: Steven Low and Dava Newman

- Modified and identified novel deep learning-based super-resolution models, and applied them to satellite data to achieve 5x super-resolution of wind speeds and solar irradiance fields for informing short-term, local energy planning.
- Published datasets and modules for benchmarking assessment and spatial analysis for wind and solar data fields.

Publications

- Kurinchi-Vendhan, R., Gray, D., & Cole, E. (2024). BenthIQ: a Transformer-Based Benthic Classification Model for Coral Restoration. *arXiv pre-print arXiv:2311.13661*.
- Kurinchi-Vendhan, R., Lütjens, B., Gupta, R., Werner, L., & Newman, D. (2021). WiSoSuper: Benchmarking Super-Resolution Methods on Wind and Solar Data. *NeurIPS CCAI Tackling Climate Change with Machine Learning 2021 Workshop*.
- Cronin, E.*, Fernando, A.*, James, J.*, & Kurinchi-Vendhan, R.*, (2021). Washington, D.C. & Maryland Energy: Estimating Solar Potential Using NASA POWER Data to Inform Renewable Energy Policy. *NASA Technical Reports*.

Talks

- Mapping Corals: Monitoring Reefs with Aerial Drones. *MIT Ocean Engineering Seminar*. April 2025.
- BenthIQ: Benthic Classification Reef Restoration. *Berkeley AI Research Climate Initiative*. November 2023.
- Mapping Corals: Reef Restoration and Citizen Science. *Caltech International Education Week*. November 2023.
- WiSoSuper: Benchmarking Super-Resolution Methods on Wind and Solar Data. *NeurIPS CCAI Tackling Climate Change with Machine Learning 2021 Workshop Poster Session*. December 2021.
- Estimating Solar Potential Using NASA POWER Data to Inform Renewable Energy Policy for Washington, D.C. *NASA Earth Science DEVELOP National Symposium*. November 2021.

Teaching Experience

Deep Learning for Ecology
Visiting Lecturer

📅 December 2024

African Institute of Mathematical Science, Cape Town, South Africa

Organized week-long lectures and coding sessions for 10 students on fundamentals of computer vision and its applications in ecology. Assisted students on an object detection-based African Penguin activity heat-mapping pipeline in collaboration with the Two Oceans Aquarium in Cape Town.

Data, Algorithms, and Society
Teaching Assistant

📅 September 2023 – March 2024

Department of Computing and Mathematical Sciences, California Institute of Technology

Learning Systems I & II
Teaching Assistant & Head Teaching Assistant

📅 March 2023 – June 2024

Department of Computing and Mathematical Sciences, California Institute of Technology

Awards

- **NSF Graduate Research Fellowship** | April 2025
- **Mabel Beckman Leadership Award** | *June 2024*
- **Doris S. Perpall Speaking Competition, 3rd Place Finalist** | *February 2024*
- **Samuel P. and Frances Krown Fellowship** | *June 2023*
- **Advocating Change Together (ACT) Award** | *May 2023*
- **Rise Teaching Award** | *May 2023*
- **Mari Peterson Ligocki Memorial Award for Community Service, Semi-Finalist** | *April 2023*
- **Jack E. Froehlich Memorial Award for Academic Excellence, Semi-Finalist** | *April 2023*