

# Rupa Kurinchi-Vendhan

## Computer Vision Researcher for Sustainability and Conservation

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## Education

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### Bachelor of Science

#### The California Institute of Technology

📅 September 2020 – Present

- Major: Computer Science
- Awarded study abroad opportunity at the University of Cambridge, St. Catharine's College for Michaelmas Term 2022-23
- Relevant Courses: Learning Systems, Machine Learning & Data Mining, Decidability & Tractability, Algorithms, Algorithms and Society, Data Science, Vision and Large Language Models, Advanced Topics in Machine Learning
- GPA: 4.2/4.3

## Work Experience

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### Coral Gardeners – Benthic Classification for Coral Restoration

#### Computer Vision Researcher

📅 March 2023 – Present

- Developed 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.
- The drone-to-map methodology will be used to inform restoration efforts by providing actionable, specific evidence of unhealthy reefs where corals should be planted.
- Collaborated with the Coral Gardeners to host hands-on restoration workshops for 34 local students in French Polynesia to hear about coral reefs, robotics, and citizen science data collection initiatives.
- Paper under review at ICLR 2024.

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### Computational Vision Laboratory – Species Distribution Modeling

#### Undergraduate Researcher

📅 December 2021 – Present

Advisor: Pietro Perona

- Using the GeoCLEF Life 2020 dataset, created a land cover classification model which identifies landscapes such as open ocean and deciduous forests from satellite imagery with 95% accuracy.
- Currently extending this work for species distribution modeling. 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.

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### Apple – Atlas Packing for Volumetric Rendering

#### Technology Investigation Intern

📅 June 2022 – September 2022

- Within the Technology Development Group (TDG), designed and implemented a novel algorithm for texture/bin packing which improves computational and power demands by reducing image atlas size by 20%. This will improve the efficiency of the scene and video rendering pipeline for the recently-released Apple Vision Pro.
- Selected from internship cohort to present work to Head of TDG and member of Apple's advisory board, Mike Rockwell.

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### 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 (DOEE) and a team of geospatial researchers to create Solar Potential Maps to inform solar panel installations for neighboring communities outside of DC.

- Independently developed a vision-based model for estimating roof tilt from LiDAR-derived digital surface models and satellite images for predict average annual solar potential at a 1-ft resolution.
- Using GIS tools for data visualization, processing, and analysis, we demonstrated that the median potential per building in the study area is 14.7 MW each year.
- Our software packages and code library will be made available to the DOE to reproduce our results and provide further insights to their solar energy planning.
- As the Impact Lead for this project, led discussions with the DOE to ensure our investigation targeted their specific research questions.
- Presented to leadership of NASA's Earth Science Division at the DEVELOP National Symposium.

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## 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.
- Accepted at NeurIPS CCAI Tackling Climate Change with Machine Learning 2021 Workshop.

## Publications and Reports

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- Kurinchi-Vendhan, R., Gray, D., Cole, E., & Perona, E. (2023). BenthIQ: a Transformer-Based Benthic Classification Model for Coral Restoration. *In review*.
- 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.

## Presentations

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- Kurinchi-Vendhan, R. BenthIQ: a Transformer-Based Benthic Classification Model for Reef Restoration. Berkeley AI Research (BAIR) Climate Initiative, University of Berkeley. November 2023.
- Kurinchi-Vendhan, R. Mapping Corals: Reef Restoration and Citizen Science in French Polynesia. California Institute of Technology International Education Week. November 2023.
- Kurinchi-Vendhan, R. BenthIQ: a Transformer-Based Benthic Classification Model for Reef Restoration. California Institute of Technology Doris S. Perpall Speaking Competition. October 2023.
- Kurinchi-Vendhan, R. WiREDiff: a Wind Resolution-Enhancing Diffusion Model. Advanced Machine Learning Project Showcase. June 2023.
- Kurinchi-Vendhan, R. WiSoSuper: Benchmarking Super-Resolution Methods on Wind and Solar Data. NeurIPS CCAI Tackling Climate Change with Machine Learning 2021 Workshop. December 2021.
- Cronin, E., Fernando, A., James, J., Kurinchi-Vendhan, R. 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

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### Data, Algorithms, and Society

#### Teaching Assistant

📅 September 2023 – Present

Professors: Claire Ralph and Hillary Mushkin

Department of Computing and Mathematical Sciences, California Institute of Technology

- Taught lectures for 22 students on algorithmic design that avoids bias.
- Organized and assisted team projects in AI for social good, from refugee monitoring to disaster response planning.
- Led discussions with teaching staff on student experience and course organization and content.

## Learning Systems I & II

### Teaching Assistant & Head Teaching Assistant

📅 March 2023 – Present

*Professor: Yaser Abu-Mostafa*

*Department of Computing and Mathematical Sciences, California Institute of Technology*

- Hosted review sessions for 154 students on fundamental topics in machine learning and artificial intelligence.
- Assist teams to achieve multi-label classification that identify pathologies in chest radiographs. Generated and formatted the radiograph dataset, and created leaderboard for project competition amongst students.
- Led weekly TA meetings to discuss student progress and plan/organize coursework and assignments.

## Awards

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- Doris S. Perpall Speaking Competition Outstanding Speaker Award | October 2023
- 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

## Leadership & Service

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### Caltech Y

#### President of Student Executive Committee

📅 September 2022 – Present

- Coordinated community service events: produced and donated crocheted blankets for Project Linus, and hosted professional development workshops, science talks, and lab tours for black students in Southern California through Young Legends.
- Participated in and organized trips to local nature reserves and the LA River for environmental cleanups and to D.C. for a Science Policy Symposium with AI policy writers and government leaders at NOAA.
- As a member of the Board of Directors, made executive decisions regarding funding and mission of the non-profit.

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### Advocacy Committee

#### Diversity Representative & Senior Advocate

📅 January 2023 – Present

- Voiced student concerns related to issues in diversity, equity, and inclusion. Advocated for administration to remove dead names in official campus communications and provide work-study support for students with demonstrated financial in research positions.
- Advocated for Title IX support for students and hosted yearly awareness and confidence workshops for young female researchers in male-dominated fields.
- Served as a campus resource for mental health support and hosted monthly decompression events for students.

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### Reading Partners

#### Volunteer

📅 September 2021 – Present

Through the California-based children's literacy non-profit, volunteered 5 hours a week at the local elementary school in Pasadena to read to first-grade students struggling with phonetic reading skills.

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### Rise Program

#### Volunteer

📅 September 2020 – Present

Mentored and worked with underprivileged students in Pasadena Unified School District struggling with topics in math and science. Volunteered at Girls who Code summer online workshop for 17 middle school-level students from Southern California.