

CONTACT
INFORMATION

Website: arjunashokrao.me *Email:* raoarjun@colorado.edu
Google Scholar: Link

RESEARCH
INTERESTS

My research focuses on spatial representation learning methods for geographic applications, especially in biodiversity monitoring, climate change, and socio-economic modeling.

EDUCATION

University of Colorado Boulder **08/2024 – Present**
Ph.D Student, Computer Science

The Chinese University of Hong Kong (CUHK) **2018—07/2022**
Bachelor of Engineering in Financial Technology (Systems Engineering)
Minor in Computer Science
Dean's List 2018-2021

SELECTED
COURSEWORK

Machine Learning, Advanced Convex Optimization, Statistical Learning Theory, Stochastic Models, Optimization Theory, Numerical Analysis, Geospatial Machine Learning, Computer Vision.

PUBLICATIONS

[1] “**Measuring the Intrinsic Dimension of Earth Representations**”

Arjun Rao, Marc Rußwurm, Konstantin Klemmer, Esther Rolf

Under Review at ICLR 2026

[2] “**Using Multiple Input Modalities can Improve Data-Efficiency and O.O.D. Generalization for ML with Satellite Imagery**”

Arjun Rao, Esther Rolf

ICML TerraBytes Workshop, 2025 • **Spotlight** • **Best Poster Award**

[3] “**Counteracting Adversarial Attacks in Autonomous Driving**”

Qi Sun, **Arjun Ashok Rao**, Xufeng Yao, Bei Yu, Shiyuan Hu.

IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems (TCAD), 2022

[4] “**An Empirical Analysis on Compressed Decentralized Stochastic Gradient Algorithms with Overparameterized Models**”

Arjun Ashok Rao, Hoi-To Wai.

Asia-Pacific Signal and Information Processing Association Annual Summit and Conference (APSIPA), 2021

[5] “**Improving Imaging Spectrometer Methane Plume Detection with Large Eddy Simulations**”

Arjun Ashok Rao, Steffen Mauceri, Andrew K. Thorpe, Jake H. Lee, Brian D. Bue, Siraput Jongaramrungruang, and Riley M. Duren

American Geophysical Union, Fall Meeting 2021

[6] “**Methane Plume Detection with Future Orbital Imaging Spectrometers**”

Jake Lee, Steffen Mauceri, Sharmita Dey, **Arjun Ashok Rao**, Ryan Alimo, Andrew Thorpe, Siraput Jongaramrungruang

American Geophysical Union, Fall Meeting 2021

THESES

Understanding Generalization in Distributed Machine Learning

Arjun Ashok Rao and Hoi-To Wai.

Undergraduate Thesis, Bachelor of Engineering in Financial Technology, CUHK Faculty of Engineering 2021-22

RESEARCH
EXPERIENCE

Orbital Sidekick, San Francisco, CA

06/2022—08/2024

Machine Learning Science Group

- Machine Learning Scientist responsible for building OSK's on-orbit deep learning infrastructure. Worked on foundation Vision Transformers for climate-monitoring applications.
- Investigated model serving systems for high-throughput inference on remotely sensed data. Collaborated on a talk at **AWS re:Invent 2023**.

NASA Jet Propulsion Laboratory, Caltech, Pasadena, CA
Machine Learning and Instrument Autonomy Group

06/2021—09/2021

- Worked in collaboration with the Imaging Spectroscopy group at the Jet Propulsion Laboratory to improve robustness of deep learning models trained to detect methane emissions from hyperspectral imagery captured through NASA’s airborne and spaceborne imaging spectrometers.
- Proposed training algorithms with synthetic geospatial data generated through ‘Large Eddy Simulations’: a mathematical model built to simulate the distribution and structure of methane emissions. Presented poster at the American Geophysical Union Fall Meeting 2021.
- **Advisors:** Dr. Andrew Thorpe, Dr. Steffen Mauceri, Dr. Brian Bue.
- **Fellowship:** Caltech SURF Award.

The Chinese University of Hong Kong, Hong Kong
Network Science and Optimization Laboratory

09/2020—06/2022

- Worked on large-scale decentralized deep-learning algorithms that use a compressed gossip-based communication protocol over graphs.
- Empirically demonstrated that solutions found by compressed decentralized stochastic gradient algorithms are invariant to model size. Proposed an *inexact-consensus* decentralized learning algorithm. Initial paper published at APSIPA 2021, complete article under review.
- Advisor: Professor Hoi-To Wai

The Chinese University of Hong Kong, Hong Kong
Deep Vision Laboratory

05/2020—09/2020

- Exposed vulnerabilities in autonomous driving cars’ vision systems to ‘adversarial examples’: carefully crafted images aimed to misguide depth-detection algorithms.
- Developed *SmoothStereo*: An adversarial training algorithm that exploits implicit spatial relationships in a stereo-vision system.
- Advisor: Professor Bei Yu

PRESENTATIONS

- SGD: A Stability Perspective*, Network Science and Optimization Laboratory Group Meeting. (December 2021) [SLIDES]
- Improving Imaging Spectrometer Methane Plume Detection with Large Eddy Simulations*, Summer Undergraduate Research Fellowship at JPL Final Presentation. (September 2021) [SLIDES]
- Decentralized Deep Learning with Inexact Consensus*, Senior Thesis Presentation, CUHK. (December 2021) [SLIDES]

HONORS AND AWARDS

- NSF GRFP Honorable Mention **2025**
- Caltech Summer Undergraduate Research Fellowship (SURF) **2021**
- CUHK Admission Scholarship **2018 – 2022**
- Faculty of Engineering Admission Scholarship, CUHK **2018 – 2022**
- CUHK Outstanding Student Award **2020**

OUTREACH

Service is a major component of my non-research endeavours. I am passionate about **prison reform**. Since 2024, I have worked with the **Prison Mathematics Project** in the capacity of both a student instructor and an advocate during pre-clemency instructional sessions. I also volunteer at Boulder County Jail’s math circle as a volunteer tutor. Since 2021, I have been affiliated with the **414LIFE** program to end youth violence in Milwaukee, Wisconsin.