Curriculum Vitae/Resume **Arjun Ashok Rao**

CONTACT INFORMATION

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Google Scholar: Link

RESEARCH INTERESTS

I am interested in building robust and interpretable machine learning (ML) systems that can reliably be used for novel science applications. More recently, my research involves building statistical methods with geospatial data that are robust and resource-efficient enough to operate in low-SNR, hardware-constrained environments.

EDUCATION

University of Colorado Boulder **Starting 08/2024**
Ph.D Student, Computer Science, Advised by Esther Rolf

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, Remote Sensing, Statistical Learning Theory, Stochastic Models, Optimization Theory, Numerical Analysis, Data Structures, Human-Computer Interaction

RESEARCH EXPERIENCE

Orbital Sidekick, San Francisco, CA **06/2022—Present**
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 **06/2021—09/2021**
Machine Learning and Instrument Autonomy Group

- Worked in collaboration with the Imaging Spectroscopy 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 **09/2020—06/2022**
Network Science and Optimization Laboratory

- 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 **05/2020—09/2020**
Deep Vision Laboratory

- 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**

Publications

[1] **"Counteracting Adversarial Attacks in Autonomous Driving"**
Qi Sun, **Arjun Ashok Rao**, Xufeng Yao, Bei Yu, Shiyan Hu.
IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems (**TCAD**), 2022

[2] **"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

[3] **"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

[4] **"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

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

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**
Cyberport Creative Micro-Fund Scholarship **2020**
Microsoft Learn Student Ambassador **2019**

Outreach

ICCV Student Volunteer Award **2021**

Flux Payments: A RL-powered financial planner to help ease bill payment during COVID-19 (100,000 HKD funding through CCMF Program, Hong Kong) ..... **2020 – 2022**

International Student Association at CUHK ..... **2019 – 2020**

Volunteer Educator, Sri Ramana Maharishi School for the Blind - Spent two years as a volunteer part-time computer science instructor for visually disabled students in Bangalore, India. Helped teach concepts in data structures, algorithms, and basic computing. ..... **2017 – 2019**