Vickram Rajendran

Machine Learning Research Scientist

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Professional Experience

THE JOHNS HOPKINS UNIVERSITY APPLIED PHYSICS LABORATORY

Laurel, Maryland | Security Clearance: Top Secret

Assistant Section Supervisor, Machine Perception

Oct 2019 – Current

- Improved trust and enabled more sophisticated reasoning abilities in a large-scale deployed platform by developing and integrating novel, real-time uncertainty estimation methods for multiple different object detection architectures.
- Led teams of 3-6 to research and implement algorithms to understand, predict, and mitigate the effect of bias from known and unknown factors of variation.
- Saved client over $10M dollars in labeling costs by researching and developing targeted label analysis and label prioritization methods for object detection to significantly improve data efficacy for both training and testing.
- Invited to give talks to the Naval Postgraduate School, JHU Institute for Assured Autonomy, and as a keynote speaker at the 2020 APLAI Workshop. Represented APL in over 100 briefs to high level government executives.

AI Research Scientist

Sept 2018 – Current

- Proposed, won, and PI'ed a $10k internal seedling on uncertainty estimation. Championed this work to over $2M dollars of funding and a NeurIPS publication.
- Designed, developed, and deployed highly performant geospatial perception systems by creating object detection and hybrid AI-enabled tracking and data fusion algorithms and integrating into a larger system for production.

Publications and Conferences

TARGET DOMAIN DATA INDUCES NEGATIVE TRANSFER IN MULTI-SOURCE CLASSIFICATION UNDER CATEGORY SHIFT

Banatt, Eryk, and Vickram Rajendran

Preprint. Under Review.

- We show that adding training data from the target domain of disjoint classes than the source domain causes significant negative transfer in image classification.

SHAPE-BIASED DOMAIN GENERALIZATION VIA SHOCK GRAPH EMBEDDINGS

Narayanan, Maruthi, Vickram Rajendran, and Benjamin Kimia.

Proceedings of the IEEE/CVF International Conference on Computer Vision. 2021.

- We show that converting images to graphs and training a graph neural network can create an image classification method robust to various kinds of domain shift.

ACCURATE LAYERWISE INTERPRETABLE COMPETENCE ESTIMATION

Rajendran, Vickram, and William LeVine.

Advances in Neural Information Processing Systems 32 (2019): 13981-13991.

- We generalize uncertainty estimation to a notion of "competence estimation", and show real-time competency estimation for classical and deep image classification.

Honors and Awards

- Best Presentation in Session - APLAI Workshop 2021
- Bumblebee Award for Championing Revolutionary Capabilities - APL 2020
- Janney Explore Winner - APL 2019
- Highest Honors in Mathematics and Computer Science - Swarthmore 2018
- Top 500 - William Lowell Putnam Mathematical Competition 2017

Education

SWARTHMORE COLLEGE

B.A. in Computer Science

B.A. in Mathematics

Aug 2015 - May 2018 | Swarthmore, PA

Cum. GPA: 3.95 / 4.0

Skills

PROGRAMMING

Python • C++ • C • Bash

LIBRARIES/FRAMEWORKS

PyTorch • Keras/Tensorflow • scikit-learn • OpenCV • Pandas • React

MACHINE LEARNING

Image Classification • Object Detection • Multi-Target Tracking and Data Fusion • Uncertainty Estimation • Domain Adaptation and Generalization • Active Learning • Representation Learning • Q&A • Transformers • Semi-Supervised Learning

TOOLS/PLATFORMS

Git • Docker • Kubernetes • JIRA • Streamlit • LaTeX • Jupyter • Emacs • Linux • Slurm • CMake • vcpkg

Selected Courses

COMPUTER SCIENCE

Theory of Computation • Algorithms • Machine Learning • Artificial Intelligence • Computer Vision • Operating Systems • Computer Networks

MATHEMATICS

Topology • Riemannian Geometry • Elliptic Curves • Lie Groups/Lie Algebras • Complex Analysis • Modern Algebra II • Analysis on Manifolds