

AAYUSH MISHRA

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PUBLICATIONS / RESEARCH

 **Is In-Context Learning equivalent to Gradient Descent?**
[preprint] [under-review] September 2023


Scrutinized recent works which claim that transformers learn in-context using gradient descent, and show that real models like LLaMa-7B do not.

 **Unsupervised Domain Adaptation for 3D pose estimation**
[under review at ICLR 2024] September 2023


Showed that a novel piece-wise optimization method achieves adaptation and SOTA performance in unknown target domains which satisfy piece-wise support overlap between source/target data distributions.

 **SAFE: Stable Feature Extraction**
ICML (SCIS Workshop) [full paper under review] July 2023


Proposed conditions under which stable features can be identified in the data. Using selected stable features improves OOD [and worst-group] performance and calibration of prior learning algorithms.

 **Repeated Environment Inference for Invariant Learning**
ICML (SCIS Workshop) [link] July 2022

REIL achieves better OOD performance than EIL by utilizing increasingly biased reference models used for environment partition.

 **Novel usage of Model Coverage for Network Pruning, Optimization and Explanation**
Defensive Publication, Siemens May 2020

Introduced a novel method to quantitatively explain behavior of neurons in CNNs, and prune unimportant units/layers.

 **VStegNet: Video Steganography Network**
British Machine Vision Conference (BMVC) [link] September 2019

Devised a novel 3D-CNN based UNet to hide a secret video inside another cover video, improving the SOTA reconstruction quality.

 **Generating Masterprints**
Bachelor Thesis [link] May 2019

Used Self-Attention GAN to generate fake Fingerprints and Iris images, used CMA-ES to find biometric templates that could match with multiple subjects.

OTHER PROJECTS

 **Interpretable EEG data classification**
WAVi Co. February 2023 -

Designing robust and interpretable EEG data classifiers for early MCI detection.

 **CricScorer**
IRWA course project [report] May 2023

Live Cricket scorer to store and retrieve data/stats at the highest resolution.

 **Chain-of-Thought Prompting**
SSL course project [report] December 2022

Evaluated Chain-of-Thought prompting (GPT-3) with random labels to test its robustness against noisy labels.

 **Surgical Tool Segmentation**
DL course project [report] April 2022

Developed a novel data augmentation technique to improve tool segmentation performance.

 **Exoplanet Detection**
Inter-IIT Tech Meet project January 2018

Used an ensemble of Linear-SVC, Random Forest and LSTM based classifiers on time-series brightness data of stars to predict existence of exoplanets.

EDUCATION

Ph.D. in Computer Science

Johns Hopkins University

 January 2022 - Present [transcript]

B.Tech. in Computer Science & Engineering (with Minor in Management)

Indian Institute of Technology Mandi

 August 2015 - June 2019 [transcript]

WORK EXPERIENCE

Data Scientist

Microsoft

Bing Shopping

 August 2021 - January 2022

- **Product Ranking & Query Understanding:** Developed a novel relevance metric to improve ranking of sale offers, and query ↔ product class mapping (~18k classes) to capture fine-grained intent.

Research Professional

Siemens

Verification and Validation of Intelligent Systems

 July 2019 - August 2021 [Full-Time]

- **Neural Network Optimization and Explanation:** Novel method to explain behavior of CNNs and help compress them for deployment on edge devices.
- **Sythetic Data Generation for testing NNs:** Used ProGAN to generate realistic traffic scenes. Devised a language to describe and generate novel scenes via GAN-Dissection.
- **Simulation testing of Self-Driving Agents:** Trained an RL model to quickly find edge-case scenarios where self-driving agents violate safety properties.

 Winter 2017, Summer 2018 [Intern]

- **Source Code Analytics:** Recommend code reuse via semantic search.
- **Siemens Social Network Post Classification**

TECHNICAL SKILLS

Python

C++

Machine Learning toolkits

Data Engineering

Software Engineering

