Neeresh Kumar Perla

Machine Learning PhD Student

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EDUCATION

- **University of Massachusetts Dartmouth** — Dartmouth, MA
  Ph.D. Student in Computer and Information Science (Full Scholarship) — *Jan. 2024 - present*
- **University of Massachusetts Dartmouth** — Dartmouth, MA
  MSc. in Data Science — *Jan. 2023 - Dec. 2023*

RESEARCH INTEREST

• Machine Learning • Computer Vision • Time-Series Analysis • Adversarial Learning • Continual Learning • Classification • Transfer Learning

Experience

University of Massachusetts Dartmouth, Dartmouth MA Jan. 2023 - present

- **Research Assistant** *(2023 – present)*
  Advisor: Prof. Ming Shao
  - Analyzing advanced machine learning techniques for real-time analysis of Organ-on-a-Chip (OOC) tissue models using microscopy-based image data
  - Enhancing transfer learning for time series analysis by developing and applying transformer-based models to boost model performance and prediction accuracy
  - Investigated vulnerabilities in exemplar-based Class-Incremental Learning models by developing a novel black-box attack framework, revealing significant weaknesses to poisoning-based attacks
- **Research Assistant** *(2023)*
  Advisor: Prof. Collin D. Capano
  - Utilized Apple Silicon for gravitational wave data analysis and collaborated with Collin Capano on developing an Apple Silicon cluster for gravitational wave astronomy
  - Conducted rigorous benchmarking and performance tuning to achieve superior results in signal detection and data processing, enhancing the precision and efficiency of research in gravitational wave astronomy

Cognizant, Hyderabad, India

- **Programmer Analyst** Mar. 2021 - Dec. 2022
  - Performed data validation and developed tailored SQL scripts, significantly decreasing query execution time
  - Engineered automation scripts to verify accuracy between insurance costs and system-calculated values
- **Data Engineer Intern** Feb. 2020 - Sep. 2020
  - Gathered and processed a substantial dataset comprising movie-related information, encompassing user ratings, movie details, and user profiles, to support comprehensive analysis and research
  - Utilized Apache Spark's MLlib library to implement the ALS algorithm and engineered the data pipeline to transform and preprocess the dataset, ensuring data quality and compatibility with the ALS model

WingfoTech Pvt. Ltd, Hyderabad, India May. 2019 - Jul. 2019

- **Artificial Intelligence Intern**
  - Self-learned and developed a strong understanding of various machine learning algorithms, including decision trees, random forests, support vector machines, and neural networks.
  - Developed data preprocessing pipelines to improve dataset quality and optimized model performance through feature engineering, dimensionality reduction, and hyperparameter tuning

ACADEMIC & PERSONAL PROJECTS

- **Early Sepsis Prediction with Transformers - *PyTorch, Transformers, Transfer Learning***
  - Utilized state-of-the-art transformer architectures to diagnose sepsis up to 6 hours before clinical onset
  - Improved model performance by employing domain adaptation techniques to better generalize across patient data between different hospitals
- **Vulnerabilities of Exemplar-Based Class Incremental Learning Models - *PyTorch, CNNs***
  - Developed and implemented a novel black-box attack framework targeting the exemplar set of CIL models under conditions where only hard-label predictions were available
  - Conducted extensive experimental evaluations across various exemplar-based incremental learning algorithms, revealing significant vulnerabilities to poisoning-based attacks using a zero-overlapping dataset
- **3D Images Classification - *TensorFlow, Video Vision Transformers***
  - Implemented a Multi-View Transformer with cross-view attention and MLP fusion from scratch for video recognition to classify abdominal CT scans
- **Image Captioning - *TensorFlow, Text Transformer, Vision Transformer***
  - Developed an Custom Image Captioning model with a pre-trained Vision Transformer for feature extraction and a custom Transformer for generating captions, and built a UI that accepts images and displays the generated captions
- **Patch Attack - *PyTorch, CNNs***
  - Developed a custom patch algorithm to test the robustness of deep learning models by perturbing critical patches by using mutual information and input diversity techniques
  - Evaluated model vulnerability by generating and analyzing adversarial examples, reconstructing perturbed images to assess weaknesses in image classification tasks

SKILLS

Python, PyTorch, TensorFlow, R, C, SQL, GitHub, LaTeX

PUBLICATIONS

Under Review

[1] **NK. Perla**, MI. Hossain, A. Sajeeda and M. Shao. Are Exemplar-Based Class Incremental Learning Models Victim of Black-box Poison Attacks? in Winter Conference on Applications of Computer Vision (WACV 2025)

[2] MI. Hossain, **NK. Perla**, A. Sajeeda and M. Shao. Robust Defense Strategies for Multimodal Contrastive Learning: Efficient Fine-tuning Against Backdoor Attacks in Winter Conference on Applications of Computer Vision (WACV 2025)