Bharat Yalavarthi

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EDUCATION

- **University at Buffalo, The State University of New York** **August 2022 - May 2024**
  M.S. (Thesis) in Computer Science (Spec. in A.I.) ***(GPA: 3.9/4.0)***
- **VIT University** **July 2016 - June 2020**
  Bachelor of Technology in Computer Science & Engineering ***(GPA: 8.7/10.0)***

EXPERIENCE

ML Research Assistant **January 2023 - Present**
SUNY Research Foundation *Buffalo, NY*

- ***Efficient Deep Learning:*** Decreased the inference latency of standard CNNs like **ResNet, EfficientNet** by 104% using integral image.
- Applied **quantization, low-precision inference, pruning, and knowledge distillation** to reduce the inference time of deep networks.
- ***Secure Deep Learning:*** Researched on encrypted inference of deep networks like **ViTs, CNNs,** and MLPs, using Fully Homomorphic Encryption **(FHE)**, tackling issues like high latency, limited multiplicative depth and constraints on supported operations in FHE.
- Devised an FFT based Convolutional layer, a fully connected layer, and pooling layers, leveraging SIMD operations in FHE for secure detection of sleep apnea from encrypted ECG signals, achieving an **accuracy of 99.3% and setting a new benchmark**.
- ***Face Analytics:*** Enhanced the capabilities of a humanoid robot (Pepper) by integrating SOTA models for face and emotion recognition, facilitating contextually aware responses during human interactions.
- Discovered the inadvertent leakage of private information such as age, gender, and ethnicity in leading face template protection techniques employed by face recognition systems. Formulated an FHE-based solution that reduces the privacy leakage by an average of **35% compared to SOTA methods**.

Software Engineer **October 2020 - July 2022**
Harman International (A Samsung Company) *Bangalore, India*

- Developed various features for the ADAS and route guidance components, including traffic sign recognition, intelligent speed and access restriction assistance, and routing capabilities incorporating diverse route modes and vehicle profiles using C++.
- Added traffic sign recognition ability to ADAS module using R-CNN and vision techniques image yielding a remarkable **90% decrease in errors**. Coordinated among multiple internal teams and the client to redesign the truck navigation system to coaches.

PUBLICATIONS

- **Improving Template Protection in Face Analytics**
  Bharat Yalavarthi*, et al. - 18th IEEE International Conference on Automatic Face and Gesture Recognition* ***(IEEE FG 2024)***
- **Confidential and Protected Disease Classifier using Fully Homomorphic Encryption**
  Aditya Malik, Nalini Ratha, ***Bharat Yalavarthi****, et al. - 2024 IEEE Conference on Artificial Intelligence* ***(IEEE CAI 2024)***

ACADEMIC/RESEARCH PROJECTS

- **Explainable Face Recognition (MS Thesis)**: Leveraged textual descriptions of facial features alongside vision language models **(VLM's)**, such as **CLIP**, to align face images with descriptions. This approach facilitates novel explanations of decisions made by face recognition systems while preserving the state-of-the-art performance.
- **Active Learning on Medical Data using Reinforcement Learning**: Used RL to actively train a CNN classifier for detecting diseases in the colon while maximizing the performance and minimizing the number of labeled samples required. The devised **active learning** framework was able to achieve similar performance to the baseline with only **41.8% of training data.**
- **Ovarian Cancer Subtype Classification**: Implemented Multiple Instance Learning **(MIL) on pre-trained transformers** for the classification of histopathology images. Conducted **fine-tuning** and comprehensive analysis of different combinations of transformer architectures (CTransPath, TransPath, and MoCo v3), MIL methodologies, and interventional training techniques.
- **Traffic Flow Optimization using Reinforcement Learning**: Developed a **Multi-Agent RL** solution to optimize traffic flow, achieving a noteworthy **50%** reduction in average vehicle waiting time compared to baseline at each traffic signal. This solution was tested over 5 real-world city maps having diverse traffic conditions and road layouts through simulation.

SKILLS

- **Languages and Software Technologies**: Python, C++, Java, Go, SQL, MySQL, Neo4j, RESTful API, Scala Play, FastAPI, Flask, AWS, Sage Maker, ElasticSearch, Docker, Kubernetes, JIRA, Agile, Concurrency, Git, Linux, Windows
- **AI Technologies**: PyTorch, PyTorch Lightning, TensorFlow, Hugging Face, CNNs, Vision language models (VLMs), Vision Transformers (ViT), Explainable AI, Secure AI (FHE), OpenCV, Numpy, Tensorboard, OpenAI Gym, Cloud Computing, ROS.