Vaibhav Sahu

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Education

University of Pennsylvania — Philadelphia, PA
Master of Science in Scientific Computing - GPA: 3.76/4 — *Aug. 2022 – May 2024*

Indian Institute of Science — Bangalore, India
Bachelor of Science in Physics - GPA: 8.2/10 — *Aug. 2016 – June 2020*

Experience

Graduate Research Assistant — May 2023 – Present
Prof. Talid Sinno, University of Pennsylvania — *Philadelphia, PA*

- Measured the Performance of Neural Network Potentials at predicting the Energy Landscape of Materials
- Trained Symmetry Preserving Neural Network Potentials on the DeePMD framework for Copper systems
- Ran 1000s of Molecular Dynamics simulations on LAMMPS using high capacity H100 and A100 GPUs on the cloud for analyzing the Performance of Neural Network Potentials

Research Engineer — April 2021 – July 2022
Simyog Technology Pvt. Ltd. — *Bangalore, India*

- Achieved a 22% speedup by optimizing the Matrix-Vector Product (detected bottleneck) by parallelizing it to speed up computational solvers to perform EMI/EMC simulations of IC boards
- Implemented experiments on achieving the best way to custom parallelize 1000s of Matrix-Vector operations in the solver
- Implemented a concurrent GMRES algorithm for the computational solver, resulting in a 40% speed improvement using contiguous memory operations
- Single-handedly established a pipeline for simulating Black-box measurement-based Integrated Circuit models using Neural Networks within TensorFlow, which also resulted in a publication

Projects

Playing Hangman with Transformers | *PyTorch, Hugging Face, NumPy*

- Devised a pre-training task in the form of a multiclass classification for the transformer to learn guessing letters in hangman
- Pre-trained Google CANINE on a corpus of 200k words to achieve optimal performance of 45% game winning accuracy
- Devised a Reinforcement Learning based fine-tuning task for better performance
- Fine-tuned the model to achieve 57% winning accuracy within 6 wrong guesses and 83% accuracy within 10 wrong guesses

Extracting Lexical Stylistic Notions From Words Using LLMs | *PyTorch, Hugging Face, NumPy, Scikit-learn*

- Performed Literature Review on Extracting Directions attributing to features, such as Complexity and Formality of Text
- Improved the Performance of LLM-based Contextual Word Embeddings on extracting lexical features and using them to classify phrases using cluster-based Anisotropy removing - accuracy improved from 64% to 83%
- Fine-tuned LLMs to do document-level classification for these features
- Used ML models to make new similarity measures that performed better than cosine similarity

Synthetic Data Classification with GPT | *Python, OpenAI-API, Pandas*

- Synthetic Data is a neat way to avoid privacy issues and cheap to generate
- Generated data by prompting GPT to generate queries by tuning the temperature setting
- Engineered prompts to classify these disputes into 3 categories
- Used Few-shot In-context learning to achieve ≈ 95 % accuracy

Masked Face identification using One-Shot Learning | *Python, PyTorch, NumPy, OpenCV*

- Applied transfer learning on Inception-ResnetV1 deployed as a Siamese Network for one-shot face identification to achieve 91% accuracy of the LFW Dataset
- Generated database of masked faces using LFW Dataset and Image Editing using OpenCV
- Retrained the models to achieve 82% accuracy on masked faces

Technical Skills

Languages: Python, C/C++, MATLAB
ML Frameworks: PyTorch, Tensorflow, SQL, Spark, PyTorch, Scikit-learn, Hugging Face, OpenAI-API
Other Frameworks: pandas, NumPy, Matplotlib, Seaborn, OpenMP, AWS, Azure
Courses: Deep Learning, Computer Vision, Big Data Analytics, Applied Machine Learning, Natural Language Processing
Conceptual Skills: Machine Learning, Large Language Models, Natural Language Processing, Parallel Computing, Data Science

Certifications

Generative AI with Large Language Models — Certificate
Introduction to Machine Learning in Production — Certificate
DeepLearning.AI: Deep Learning Specialisation — Certificate
Fundamentals of Parallelism on Intel Architecture — Certificate