RUDRA PANCH

SOFTWARE DEVELOPER AND MACHINE LEARNING ENGINEER

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EDUCATION

IIT MADRAS (Nov 2021 - May 2025)
BACHELORS IN TECHNOLOGY
Major in Mechanical Engineering
Minor in AI and ML
GPA - 8.9/10

VIDYA MANDIR (Jul 2020 - May 2021)
CLASS XII PCMC stream
Grade - 99.33%

M.E.S.K.K. (Jul 2018 - May 2019)
CLASS X
Grade - 98.72%

ACHIEVEMENTS

JEE ADVANCED
Secured AIR 2080 among 2.5L candidates

JEE MAINS
Secured AIR 3940 among 10L candidates

KARNATAKA-CET
Secured State Eank 37 among 2L candidates

CODEFORCES
Reached a peak rating of 1500 (Specialist)

CLUB EXPERIENCE

AVISHKAR HYPERLOOP
PROJECT MEMBER (2022-2023)
- Designed a magnetically levitating system with 3 degrees of freedom
- Placed Global Top 4 in the European Hyperloop Week July'23 at Edinburgh

DEPARTMENT LEGISLATOR
MECHANICAL DEPT (2024-2025)
- Elected by over 1,000 students of the Mechanical Engineering Department
- Part of the SLC, a 75-member team involved in formulating rules and approving budgets

SKILLS

FRAMEWORKS/LANGUAGES
Linux, GitHub, C/C++, Python, OOPS, VS Code

PARALLEL PROGRAMMING
CUDA, SYCL, OpenMP, MPI and OpenACC

WEB DEVELOPMENT
Node.js, Express.js, React.js, MongoDB, API

MACHINE LEARNING
NumPy, PyTorch, TensorFlow, PopSQL, Pandas

PROFESSIONAL EXPERIENCE

PARALLEL COMPUTING INTERN GITHUB
Dr. Phani Motamarri — May 2024 - Present
MATRIX Lab, IISc Bangalore
- Implemented DFT-FE on Intel GPUs, translating 100k+ lines of code to SYCL, to conduct detailed performance analysis and comparisons with CUDA on custom GPU nodes
- Understood various parallel architectures and BLAS libraries, contributing to the lab's success as the first to successfully execute the DFT-FE code on SYCL and Intel GPUs

UNDERGRADUATE RESEARCH WORK GITHUB
Dr. Rupesh Nasre — Jul 2024 - Present
PACE Lab, IIT Madras
- Currently optimizing the NP-Hard Vehicle Routing algorithm using MSTs and parallelizing the code, to lower the 2nd order time complexity and improve the existing 85% accuracy
- Working on achieving up to 10x speedup in the Vehicle Routing algorithm, building on a previous 5x improvement, by advancing GPU parallelization techniques

PROJECT WORK HISTORY

MACHINE LEARNING

MEDICAL CHATBOT (LLM- Large Language Models) GITHUB
- Created a medical chatbot using Langchain and Pinecone for vector search and HuggingFace embeddings for query processing.
- Implemented PDF loading, text splitting, and document search on trusted medical encyclopedias for an interactive chatbot that answers all medical related queries

TEXT TRANSLATOR (ENCODER-DECODER) GITHUB
- Developed an encoder-decoder model using Gated Recurrent Units for accurate language translation using the Bahdanau Attention method
- Implemented teacher-forcing to further enhance the translation accuracy by focusing only on relevant parts of the sentence

ALGORITHMS FROM SCRATCH (REGRESSION, CLASSIFICATION) GITHUB
- Developed ML algorithms from scratch, including Stochastic Gradient Descent, K-means, Principal Component Analysis & logistic regression without libraries.
- Executed models like Gaussian mixture model, Support Vector Machines and Naive Bayes classifier on public datasets reporting 98% accuracy

PARALLEL PROGRAMMING

PARALLELIZATION OF THE LATTICE BOLTZMANN METHOD GITHUB
- Analyzed the efficiency of parallel programming in the use of LBM for transient unsteady heat conduction problems on various frameworks
- Explored OpenMP, MPI, and hybrid parallelization techniques to achieve 3x speedups on small grid sizes and further developed CUDA and SYCL implementations

PARALLELIZATION OF THE CYCLIC REDUCTION METHOD GITHUB
- Developed the Cyclic Reduction Algorithm for tri-diagonal systems, incorporating Forward Elimination, Recursive Doubling, and Back-Substitution
- Optimized GPU programming, achieving a 3x speedup over serial code and a 2x improvement compared to NVIDIA's existing implementation.

PARALLELIZATION OF THE V-SCHEME MULTIGRID METHOD GITHUB
- Explored parallel optimizations for the V-cycle scheme in multigrid methods using 5 major parallelization frameworks enhancing computational scalability
- Implemented the code in OpenMP, MPI, OpenACC, CUDA and SYCL, reducing execution time by more than 75% of the serial runtime for large-scale linear systems