Ved Mitra Verma

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EDUCATION

Indian Institute of Technology, Jodhpur **Aug 2024 – Present**
Bachelor's Degree - Computer Science and Engineering - **CGPA - 8.96** Jodhpur, Rajasthan

TECHNICAL SKILLS

Languages: C, C++, Python, JavaScript, Kotlin, CUDA, Solidity
Web Technologies: HTML, CSS, ReactJS, Node.js, Express.js
Libraries/Frameworks: OpenCV, NumPy, Pandas, Scikit-Learn
Tools & Databases: Git, GitHub, Linux, Google Colab, Firebase Authentication
Hardware: Arduino, ESP32

EXPERIENCE

Undergraduate Student Researcher **Jan 2026 – Apr 2026**
Indian Institute of Technology, Jodhpur | Supervisor: Dr. Dip Sankar Banerjee IIT Jodhpur

* Architected an **Out-of-Memory (OOM)** dynamic graph processing framework using **C++ and CUDA**, bypassing strict GPU VRAM limits to successfully compute complex topologies on massive-scale datasets up to **120GB** (MOLIERE) and **56GB** (com-Friendster).
* Accelerated External Memory Maximal Independent Set (MIS) updates across dynamic edge insertion batches (10^{-5} and 10^{-6} ratios), achieving highly optimized GPU execution times (averaging under **600ms** per batch on sets with over **36 million active MIS nodes**).
* Mitigated severe **PCIe bandwidth bottlenecks** by engineering an **active subgraph extraction** strategy, effectively **eliminating Unified Virtual Memory (UVM) page-fault thrashing** and ensuring rapid structural convergence across both dense and sparse networks.

PROJECTS

C++ Autograd Engine & CNN from Scratch | GitHub | **C++, CUDA, CMake, Git** **May 2026 – Jun 2026**

* Architecting a PyTorch-style **reverse-mode automatic differentiation engine** and custom N-dimensional Tensor library from the ground up using C++ smart pointers.
* Implementing a **dynamic computation graph** that records mathematical operations, utilizing topological sorting to automatically calculate gradients via the Chain Rule during the backward pass.
* Engineered foundational neural network modules, including Convolutional, Fully Connected, and Max Pooling layers, alongside an end-to-end training pipeline utilizing Stochastic Gradient Descent (SGD) and Cross-Entropy Loss.
* Validated the custom engine's forward and backward passes by training models from scratch on multiple benchmark datasets, successfully achieving **87.7% accuracy on MNIST** and **77% accuracy on Fashion-MNIST.**

MiniOS Design | GitHub | **C, Python, Git** **Jan 2026 – Apr 2026**

* Extended the xv6 (x86) operating system in C by engineering a **Copy-On-Write (COW)** fork mechanism, reducing physical memory allocation overhead by **76.6%** across concurrent processes.
* Developed an idle-state **garbage collector** ensuring **0% active CPU overhead**, and implemented **dynamic memory compaction** that eliminated **100% of external fragmentation** to enable contiguous 48KB+ block allocations.
* Managed iterative Agile development for a 4-person team to deliver core kernel logic and user-space utilities (shell commands, terminal calculator, hybrid log keeper) while strictly tracking velocity and schedule variance.

Social Network Intelligence Engine (SNIE) | GitHub | **C++, Python, CMake** **Oct 2025 – Nov 2025**

* Designed a highly scalable graph analytics framework in **C++** to model social networks, efficiently processing real-world datasets with over **4,000 nodes** and **88,000 edges**.
* Implemented optimized graph algorithms, including Brandes' Algorithm **O(V × E)** for betweenness centrality and Weighted Dijkstra **O((V + E) log V)**, to compute localized node recommendations.
* Engineered a cross-community bridge recommendation system that identified optimal global connections, successfully reducing the simulated network information spread cost by over **8%**.

COURSEWORK

- Data Structures and Algorithms
- Software Engineering
- Discrete Mathematics
- Pattern Recognition & Machine Learning
- Probability and Statistics

ACHIEVEMENTS

- Ranked among **top 25 students** in the CSE Department at IIT Jodhpur.
- **National Finalist** in AlgoUniversity Fellowship Scholarship Test.
- **Leetcode** max rating - **1652**.
- Among **Top 12** teams in SBI Finnovation Hackathon 2026 (ongoing).