Utkarsh Khandelwal

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Education

New York University - Courant Institute of Mathematical Sciences — New York, USA
Master of Science in Scientific Computing — Sep 2021 – May 2023

Indian Institute of Technology (BHU) Varanasi — Varanasi, India
Bachelor of Technology in Mechanical Engineering — July 2014 – May 2018

Work Experience

Dassault Systèmes — Waltham, MA

Software Engineering Manager – 3DExperience SOLIDWORKS Drafting & MBD — Aug 2024 – Current
- Developing a full-stack web application for technical drawings and 3D annotations of CAD models, enabling engineers to transition from traditional 2D blueprints to digital design workflows.
- Building a highly interactive UI with an Angular frontend, integrating it with a high-performance C++ backend, and utilizing WebGL for real-time 3D rendering.

Software Engineering Manager – SIMULIA R&D — June 2023 – July 2024
- Designed and optimized geometric computation algorithms for large-scale multi-physics simulations, enhancing fluid dynamics performance.
- Reduced processing time by 75% through multithreading-based parallelization techniques and algorithm optimizations.
- Developed native simulation software features for Linux and Windows using C++ (backend) and Qt (frontend).

ALTAIR — Bangalore, India

Software Engineer – HyperWorks — Aug 2018 – Jul 2021
- Built high-performance geometry processing algorithms for 3D modeling and mesh generation in C++ , used in engineering simulations and analysis.
- Developed automated 3D shape comparison algorithms to validate CAD designs during regression testing.

Projects

Redis Server Implementation — Nov 2024
- Developed a custom Redis server in Go, leveraging an event loop architecture to efficiently handle concurrent requests.
- Engineered support for reading and parsing Redis RDB files, enabling seamless data persistence and recovery.
- Implemented a distributed replication system, ensuring consensus and fault tolerance for in-memory data storage.
- Enhanced server functionality by integrating Redis Streams and transaction support for advanced data processing.

Distributed Hash Table for Peer-to-Peer Networks — Dec 2022
- Implemented the Chord Protocol, a peer-to-peer distributed hash table, in Go, and deployed it on a 100-node network.
- Achieved O(log N) scaling of fetch times, demonstrating high performance as key counts grew from 100k to 1.6M.

Raft Consensus Algorithm for Distributed Systems — Dec 2022
- Developed a replicated state machine using the Raft consensus algorithm to ensure log consistency across system replicas.
- mplemented log replication and leader election, validated through tests on simulated node failures for robustness.

Parallelizing Graph Algorithms — May 2022
- Implemented a framework for parallel graph algorithms on shared memory machines using OpenMP.
- Optimized the data access pattern, avoiding race conditions, to achieve a speedup of 8x for Bellman-Ford, 7x for Connected Components, and 3x for Breadth-First Search algorithms on a graph with 1 million vertices and 15 million edges.

Satellite Image Segmentation using U-Nets — Dec 2022
- Preprocessed and augmented satellite imagery from the Landcover.ai dataset to balance the data and reduce bias.
- Designed and implemented an ML pipeline using PyTorch for U-Net based semantic image segmentation.
- Experimented with multiple U-Net architectures, selecting the best model with a ResNet-18 encoder, achieving 67% IoU.

Skills and Courseworks

Programming Languages: C++, Python, JavaScript, TypeScript, Go, SQL, HTML/CSS

Libraries and Frameworks: React, Next.js, PyTorch, Node.js, WebGL, Three.js, Docker, Jasmine

Courseworks: Data Structures and Algorithms, Programming Languages, Linear Algebra, Numerical Methods, Computer Graphics, Machine Learning (Bayesian Framework), High-Performance Computing (Multi-threading, GPU Architecture, CUDA, MPI), Stochastic Calculus, Computer Vision, Monte Carlo Sampling Methods, Distributed Systems, Algorithmic Trading, and Quantitative Strategies