Karan Mehta

+1 (814) 769-3548 | kmehta2012@icloud.com | linkedin.com/in/karanmehtaa/ | github.com/kmehta2012

Education

The Pennsylvania State University State College, PA
Bachelor of Science in Computer Science | Bachelor of Science in Math Dec 2024
Computer Science Coursework: Operating Systems, Database Management Systems, Machine Learning, Data Structures, Algorithms, Computer Organization & Design, Object Oriented Programming, Automata & Complexity Theory
Math Coursework: Diff Equations, Graph Theory, Real Analysis, Linear Algebra, Logic, Numerical Analysis, Linear Optimization

Work Experience

Yash Technologies Indore, India
Software Engineering Intern Jun 2024 - Aug 2024
- Developed a **Retrieval Augmented Generation (RAG)**-powered sales proposal generator using **Python**, **Google's Gemini API**, **Langchain**, and **Chroma**, **reducing proposal creation time from days to hours** and improving proposal relevance and clarity.
- Implemented a **Slack Bot** using **Slack API** and **Bolt SDK**, enabling sales teams to interact with the RAG system, generate client proposals, and send proposals directly through Slack, streamlining the entire Sales workflow.
- Engineered data processing pipelines using **Beautiful Soup** and **Playwright** to scrape and format **35+ company software services** from JavaScript-rendered web pages, substantially expanding the RAG's knowledge base.

Computer Science Theory Lab, Penn State University Park, PA
Research Assistant Mar 2023 - Jun 2023
- Conducted comprehensive research on **approximation algorithms** for the **k-median problem**, including literature review and independent analysis of existing proofs.
- Developed strong theoretical foundations in approximation algorithms and computational complexity.

College of Engineering, Penn State University Park, PA
Undergraduate Teaching Assistant Jan 2023 - May 2023
- Served as Teaching Assistant for **CMPSC 465: Data Structures and Algorithms**, leading weekly study sessions for 200+ students, dedicating 8 hours per week to instruction and grading, enhancing student comprehension of complex algorithms.
- Developed a conceptual teaching approach emphasizing broad applicability of algorithmic principles, particularly in **Dynamic Programming**, **Divide and Conquer**, and **Greedy algorithms**, enabling students to apply these strategies across various domains.

Projects

Concurrent Web Server (In Progress) | C, POSIX Threads, Socket Programming Nov 2024 - Present
- Developing a high-performance, **multi-threaded web server in C** for handling concurrent client connections.
- Implementing thread pool and non-blocking I/O for efficient resource management and improved scalability.
- Focusing on low-level system programming, performance optimization, and robust error handling.

Basketball League Management System | Python, PostgreSQL Nov 2024 - Dec 2024
- Engineered a comprehensive sports league management system with a modular backend architecture, implementing critical features including **player trading**, **injury tracking**, and **statistical analysis** pipelines.
- Designed and implemented robust **database transactions** with **rollback mechanisms** for data integrity, handling complex operations like multi-table player trades while maintaining referential consistency.
- Developed high-performance **SQL queries** and **stored procedures** for real-time analytics, including season statistics tracking and player performance metrics across multiple dimensions.

Dynamic Memory Allocator | C, GDB, Valgrind Jan 2024 - Feb 2024
- Engineered a dynamic memory allocator in **C**, implementing custom versions of malloc, free, and realloc.
- Implemented **segregated free lists** via a first-fit allocation strategy with a **hash function** for free list selection and techniques like **coalescing**, **splitting**, and **footer optimization**, **decreasing allocation time** and **increasing space efficiency.**
- Developed a comprehensive **heap consistency checker** with invariant validation, ensuring allocator reliability, while leveraging **GDB** and **Valgrind** for debugging memory errors such as seg-faults and memory corruption.

Rubik's Cube Solver | Python, Graph Theory Nov 2023 - Dec 2023
- Implemented an **optimal 2x2 Rubik's Cube** solver in **Python**, **generating least-move solutions instantaneously** by modelling the cube as a graph with edges between any states one moves away, applying a two-way Breadth-First Search algorithm.
- Dramatically **improved solver performance from ~20 minutes to less than a second** for most challenging configurations (up to 14 moves) by implementing a two-way BFS approach.
- Demonstrated strong problem-solving skills by efficiently representing cube states as a 1D array and leveraging graph theory to tackle a complex computational problem, showcasing proficiency in algorithm optimization.

Skills

Languages: Python, C, SQL(PostgreSQL), Java, MATLAB, C++, MIPS assembly, Verilog, Bash
Libraries: Scikit-Learn, NumPy, matplotlib, Pandas, LangChain, Beautiful Soup, Playwright, ChromaDB.
Developer tools: Git, GitHub, GDB, Valgrind, VS Code