KARAEN SENTHILKUMAR

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EDUCATION

The University of Chicago Chicago, IL
Master of Science in Computer Science (specializing in High Performance Computing) December 2025 (Expected)
Coursework: High Performance Computing, GPU Programming, Scientific Computing, Compilers

National Institute of Technology - Tiruchirappalli Tiruchirappalli, India
Bachelor of Technology in Electrical and Electronics Engineering (Minor in Computer Science) May 2021
Coursework: Neural Networks, Fuzzy and Genetic Algorithms, Microprocessors and Microcontrollers

RESEARCH INTERESTS

Architectures and algorithms for large-scale High-Performance Computing systems; parallel scheduling, synchronization, and resource management; error correction and fault-tolerance in Quantum Computing; heterogeneous and GPU-accelerated systems for scientific applications.

RESEARCH EXPERIENCE

Weighted Fair Queuing of HPC systems October 2025 - Present
- Researched under Prof. Kyle Chard for Globus Labs on weighted fair queuing algorithms for HPC systems.
- Performed workload analysis for ALCF Polaris, grouped by users/projects based on node hours requested, inter-arrival time distributions, and variation in job sizes to assess fairness in HPC workloads and develop an online scheduling algorithm that can assure the same.
- Evaluating the new online algorithm against ensembles of other standard algorithms, such as FIFO, EDF, BF, etc.

Short-Term Electricity Price Forecasting November 2020 - May 2021
- Developed an ensemble model using deep neural networks to forecast the market-clearing price (MCP) of the Indian Energy Exchange for every 15-minute interval of the day at a given location.
- Analyzed different models by tuning hyperparameters after processing and organizing input data to capture seasonal and temporal trends in energy consumption of an Indian household.
- The finalized CNN-LSTM model presented for my final year thesis achieved a 9% MAPE for a 6-month dataset.

PROFESSIONAL EXPERIENCE

STAGE Center Chicago, IL
Game Developer January 2025 - Present
- Programmed using GameMaker to develop Quantum Labyrinth, a 2D educational game to introduce core quantum physics concepts in an interactive format through level mechanics and narratives; Showcased for 300 school children in fairs and presented at the American Physical Society Conference, receiving widespread acclaim.
- Developing a 3D multiplayer game in Unity and C# with realistic terrain behaviour and mini-games to educate players on genetic coding, molecular biology, and ASO treatment, scheduled for release on the App Store in the upcoming winter.

Oracle Bengaluru, India
Senior Member of Technical Staff, Autonomous Database (Shared) Cloud July 2021 - August 2024
- Implemented four production-grade metrics using Java, SQL, and Shell scripting, based on database health parameters such as storage, connectivity, and backup, in collaboration with the Database and Oracle REST Data Services teams. Delivered critical insights for observability and monitoring to customers across 40 global regions.
- Collaborated on the Zero Data Loss project to fetch stats for Autonomous Data Guard from live streaming pods for seamless failover planning, ensuring an RTO of less than 2 mins with near-zero data loss and Gold MAA certification.
- Developed dedicated broker workers to aggregate and parallel process database health-check stats directly from Central Container Database to reduce runtime SQL usage, improving metric computation by up to 2.5x.
- Created a unified connection metrics worker that consolidated CMAN logs parsing, removing redundant processing overhead by 70% and cutting total CMAN metrics compute time from 15s to under 4.5s per interval.

Samsung R&D Institute Bengaluru, India
Summer SDE Intern, Voice Intelligence Research May 2020 - July 2020
- Built capsules for Samsung's voice assistant, Bixby, using the Bixby SDK, Django, and MySQL to guide users through IoT device features via contextual NLP. Implemented keyword extraction using Bixby ASR and NLU, and developed dynamic action workflows based on user activity to generate adaptive responses. Received praise from architects and managers for delivering a robust module that anticipated diverse user intents.

Sirius Computer Solutions Chennai, India
Summer SDE Intern May 2019 - June 2019

- Developed an Office Assistant chatbot for internal tasks like food ordering, meeting scheduling, and web searches.
- Trained ML models using limdu.js to tailor chatbot responses based on individual employee behavior. Designed conversation flows in Dialogflow and built the backend using Node.js, Express, and MongoDB.

RECENT PROJECTS

Autonomous Object Organizer with Q-Learning and Computer Vision October 2025 - November 2025

- Programmed a Turtlebot4 robot to pick colored objects and place them in front of their destinations autonomously.
- Used Q-learning to build an optimal policy to achieve target state and accomplished robot arm control using ROS2.

Robot Localization using Particle Filter Algorithm October 2025

- Implemented the particle filter algorithm to estimate the robot's position and orientation within a mapped maze.
- Used beam model for range finders to learn about the robot's surroundings and apply them to the particle cloud.

Rasterized Digit Classification with cuBLAS and CUDA February 2025 - May 2025

- Implemented a fully-connected neural network to classify handwritten digits from the MNIST database on GPUs.
- Benchmarked performance across NVIDIA GPUs with optimizations like batching, CUDA streams, thread coarsening, and memory coalescing. Achieved 521K grind rate, 97.55% accuracy, and 80% occupancy on V100.

Real-Time Traffic Hazard Detection in CUDA May 2025

- Built a multi-stream GPU pipeline using streams and pinned memory to process real-time vehicle sensor batches.
- Optimized hazard scoring with coalesced memory access and concurrent host-device transfers for high throughput.

GoLD - End-to-end compiler in Go January 2025 - March 2025

- Built a compiler with AST parsing, LLVM IR generation from control flow graphs, and ARM code generation.
- Used linear scan register allocation and dead code elimination with 2SAT-based optimization for unreachable paths.

Monte-Carlo Raytracing for HPC systems February 2025

- Developed ray-tracing to generate 7 billion rays to render a sphere with 1200x speedup on V100 vs. serial version.
- Explored shared memory version with OpenMP and distributed memory multi-GPU version with MPI for double precision.

ACHIEVEMENTS

- **Won the Smart India Hackathon (2021)**, the national-level hackathon organized by the Indian Ministry of Education, for a blockchain-based evidence management system for the Police Department of the state of Madhya Pradesh, to counter tampering of paper-based evidence and produce leads for the judiciary using NLP models.
- **Runner-up at Transfinitte (2020)**, the intra-NITT hackathon, for developing a unified campus payment portal.
- Awarded the **T. V. Sundram Iyengar Award for the Best All-Rounder (2014)** for displaying exemplary performance in academics, sports, and extracurricular activities.
- **Won the International Quality Quiz (2013)**, held during the 16th ICSQCC in Lucknow.
- Received four consecutive **proficiency awards (2011–2014)** in recognition of consistent academic excellence.

LEADERSHIP

Treasurer, EEE Association of NIT Tiruchirappalli

- Managed departmental finances, organized outreach initiatives such as rural solar lamp installations, and coordinated student engagement programs.

Webapp Developer, Delta Force

- Built and maintained internal web applications and tools, contributing to streamlined workflows for campus events.

Member and Organizer, Nakshatra Astronomy Club

- Conducted workshops and telescope observations to promote astronomy among students and local communities.

Organizer, Festember

- Coordinated logistics and event execution for one of South India's largest student-run cultural festivals.

SKILLS

Technical Languages: Java, Python, C, C++, JavaScript, SQL, Golang, CUDA, C#, ARM Assembly, MATLAB
Frameworks/Libraries: ReactJS, Django, MongoDB, WebGL, JUnit, cuBLAS
Technologies/Frameworks: Linux, Git, Oracle Cloud Infrastructure, Ethereum, NVIDIA CUDA Toolkit