Garv Sachdev | Mobile No.: +65 80491140 | Email: sachdev.garv@gmail.com

EDUCATION

Nanyang Technological University (NTU), Singapore
COLLEGE OF COMPUTING AND DATA SCIENCE (CCDS) Jul 2023 - Present
Bachelor of Engineering (Hons.), Computer Engineering with a Second Major in Data Analytics

Delhi Public School (DPS) Aug 2019 - Jun 2023
AISSCE Certificate
CBSE Secondary & Senior Secondary | Aug 2019 - Jun 2023
- Gold Medalist - National Science Olympiad (NSO)
- Silver Medalist - International Informatics Olympiad (IIO)

PROJECTS

Emergent Individuality in Neural Networks Feb 2026 – present
Persistent Internal State Dynamics | Neuroscience-Inspired ML Research
- Demonstrated that identically initialised leaky-integrator RNNs, exposed to different experiential streams, develop measurably distinct internal dynamics: a linear decoder trained on idle hidden states identified which of 4 experiential histories a network underwent with 1.000 accuracy (chance: 0.250).
- Implemented a biologically-inspired sleep consolidation phase (modelled on Tadros et al. 2022 and the Synaptic Homeostasis Hypothesis) where the network runs on its own recurrent limit-cycle dynamics for 600 steps with local Hebbian weight updates, no backprop, no stored data.
- Found that tasks experienced in reversed order produced 86% of the divergence of completely different tasks, showing the network encodes experiential sequence, not just content—with no explicit individuality objective or architectural differences between networks.

NTU Machine Learning & Data Analytics Club (MLDA@EEE) Nov 2025 – present
FPGA Acceleration Researcher | AMD Open Hardware 2026 Team
- Designed and implemented a BPE Transformer with hardware-accelerated inference on the AMD Kria KR260 FPGA for the AMD Open Hardware competition.
- Offloaded all INT8 matrix multiplications and multi-head attention to FPGA programmable logic, with weights permanently loaded into on-chip BRAM to eliminate DDR bottlenecks.
- Achieved consistent ~6-7× overall speedup and ~8-9× speedup for attention compared to CPU execution, enabling real-time on-device autoregressive generation.
- Demoed the live system at NTU Open House, showcasing the practical potential of low-latency edge AI inference.
- Focused on quantization strategy, memory orchestration, and hardware/software co-design, moving beyond FLOP-centric thinking to address real-world deployment constraints.

Hybrid Protein Secondary Structure Prediction Oct 2025 – Nov 2025
HybridPSSP | SC4001 Deep Learning and Neural Networks
- Progressed through four architectural generations (Transformer baseline → CNN+BiLSTM → hybrid PSSP v1–v3 → HybridPSSP v4) to improve protein secondary structure prediction, iterating on data hygiene, loss functions, and model capacity at each stage.
- Achieved Q3 macro-F1 of 0.8707 and Q8 macro-F1 of 0.5210 in the final architecture by fusing Transformer encoders, dilated residual CNNs, and ESM protein language model embeddings, approaching the current Q3 state-of-the-art (~87% on CB513).
- Introduced joint Q3/Q8 prediction heads, learned positional encodings, AMP-ready data loaders, and ESM embedding integration, with results tracked through per-class confusion matrices and macro-F1 checkpointing.

Hardware Trojan Detection Using AI Sep 2025 – Oct 2025
RTL & GDSII Security Research
- Developed an AI-powered hardware Trojan detection tool targeting RTL code and post-silicon GDSII layouts, combining Graph Neural Networks (GNNs) with anomaly detection to flag malicious circuit modifications pre-fabrication.
- Designed the system to integrate into semiconductor design workflows as a pre-silicon security checkpoint, targeting IC design houses, foundries, and defence organisations with a focus on securing high-value chip supply chains.
- Employed GNN-based representation of circuit netlists alongside unsupervised anomaly scoring to distinguish legitimate design patterns from statistically rare Trojan insertions across both structural and physical layout domains.

Nanyang Technological University Aug 2025 – Oct 2025

SC2079 Multidisciplinary Project

- Designed a deterministic STM32 RTOS pipeline across 6 concurrent tasks (Communication → Control → Motor, IMU/Encoder, OLED) with priority-based preemptive scheduling and semaphore-gated timer callbacks for stable sensor cadence.
- Implemented queue-based decoupling between command parser, motion controller, and motor executor, isolating UART ingress from actuator control to tolerate bursty traffic without corrupting motor loops.
- Designed a structured 7-char command protocol with strict frame validation and explicit invalid classification, ensuring malformed packets are rejected before entering the control/motion pipeline.
- Built the RPi multiprocess orchestration layer bridging Bluetooth Android control, ACK-gated STM serial command flow, and camera-based image recognition via API inference using Picamera2.
- Structured the initialization sequence (peripherals → actuators → sensors → IMU calibration → RTOS objects → scheduler) to ensure the first command always runs with initialized actuators and valid sensor context.
- Reused the same RTOS skeleton and command contract across Task 1 and Task 2 mission variants, limiting inter-task adaptation to behavior-level changes only.

Nanyang Technological University Sep 2024 – June 2025
Undergraduate Research Programme | Applied AI Research

- Architected a dual-channel system grounded in Zimmerman's SRL model and Pintrich's motivational framework, designing custom interaction pipelines for academic and metacognitive assistance.
- Designed novel interpretable evaluation metrics, Goal Specificity Score (GSS) and Reflection Depth Score (RDS), as quantitative proxies for qualitative learning outcomes.
- Built an intelligent journaling system with SWOT-based self-insight generation and a dynamic dashboard tracking engagement, SRL metrics, and quiz performance.
- Deployed auto-generated micro-quizzes with real-time AI feedback loops, integrating LLM capabilities into a cohesive learning architecture.
- Conducted a controlled 3-week empirical study (n=15) demonstrating +21% quiz score improvement and +22 min/session engagement increase.
- Presented findings at two research venues: International Conference of Undergraduate Research and NTU's Discover URECA Showcase.

EXPERIENCE

Keppel Ltd, Singapore Jan 2026 – present
AI & Data Engineering Intern

- Leading research into dynamic conceptual modelling for enterprise knowledge systems, exploring how AI systems can represent, abstract, and reorganize concepts from complex business data beyond the limitations of static retrieval architectures.
- Investigating fundamental limitations of standard information systems and knowledge graph approaches at scale, with the goal of designing systems that separate dynamic concept representations from raw data without heavy retraining or model finetuning.
- Designed a novel metadata-aware embedding architecture fusing document metadata with content representations, achieving substantially more precise semantic retrieval than conventional methods.
- Built a custom multi-stage retrieval and response engine incorporating query enhancement, intelligent entity resolution, and context-aware ranking, outperforming commercial tools on complex enterprise queries.

Boskalis, Singapore May 2025 – Dec 2025
AI Engineering Intern

- Led the development of GeoChat, an offline geotechnical intelligence system that translates natural language queries into reports, insights, and maps without LLMs, achieving sub-second response on CPU-only infrastructure for use on-site in Tuas Finger Pier 3.
- Built a dual-path intent engine combining a custom Transformer classifier with a rule-based parser for precise, interpretable query understanding.
- Designed a conversational dispatcher with intelligent slot-filling and multi-format date normalization using regex patterns and contextual inference.
- Created a deterministic NLP response engine using template composition, statistical insight extraction, and Markov-based conversation tracking.
- Developed a multi-faceted NLU layer with sentiment analysis, dialog-act classification, and glossary retrieval for context-aware explanations.
- Implemented geotechnical analytics modules for Asaoka consolidation modeling, automated PDF reporting, and settlement visualization via SQL and REST APIs.
- Built a spatial-query interpreter that renders interactive, hierarchical site maps with real-time filtering for field operations.

- Delivered full system documentation (SDD/LLD) with architectural diagrams and training pipelines to ensure maintainability and smooth onboarding.

PSA International May 2024 - Aug 2024
Innovation Engineer Intern
- Partnered with 4 MESA business units to scope and prototype AI and cybersecurity solutions, translating technical requirements into actionable innovation proposals submitted to the KHP Innovation Awards (Category A).
- Led innovation workshops and events, applying creative problem-solving techniques.
- Engaged with executives and technical teams, bridging the gap between productivity and Innovative Thinking.

Jawaharlal Nehru Port Authority (JNPA) May 2022 - Jun 2022
Information Technology Intern
- Conducted in-depth data analysis to optimize port operations, presenting findings to management in clear and actionable reports.
- Built a machine learning model to forecast port operational trends, reducing manual analysis time and surfacing actionable insights presented to senior management.
- Ensured data accuracy and accessibility by collaborating with cross-functional teams.

OTHER EXPERIENCE

NTU Welfare Services Club - RSP Mental Health
Vice Chair (Aug 2025 – present)
Regular Member (Aug 2024 – Jul 2025)
- Spearheading strategic planning and execution of RSP Mental Health's service initiatives aimed at destigmatising mental health and supporting long-stay psychiatric patients at the Institute of Mental Health (IMH).
- Leading a core committee in volunteer management, inter-organisational collaborations, and large-scale campus outreach efforts (e.g., Mind Matters Festival), targeting over 1,000 students.
- Designed and implemented engagement frameworks to enhance volunteer retention, onboarding, and training—ensuring smooth weekly interaction sessions and long-term beneficiary impact.
- Contributed as an active volunteer in weekly IMH sessions, facilitating therapeutic activities (e.g., art, sports, conversation circles) to build trust, resilience, and social well-being among service users.

NTU Machine Learning & Data Analytics Club (MLDA@EEE) – Deep Learning Week
Vice Chair (Academics) (Aug 2025 – present)
- Architected and led academic direction for Deep Learning Week 2026, NTU's flagship AI event engaging 1000+ participants across three technical tracks, workshops, and the annual hackathon.
- Designed and delivered a premium beginner AI workshop on LLMs, NLP, and text generation, attracting 300+ attendees and establishing foundational AI literacy across disciplines.
- Built a full-stack serverless grading platform on AWS (React/Vite frontend on CloudFront + S3, API Gateway + Lambda backend, SQS for async processing, single-table DynamoDB design with GSIs) to streamline hackathon evaluation at scale.
- Integrated automated submission ingestion with GitHub repo analysis, video transcription (Transcribe), document OCR (Textract), and AI summarization via Bedrock (Claude) with OpenAI fallback, presenting graders with AI-generated summaries and coherence checks alongside source materials for efficient evaluation of 1000+ participants.
- Engineered the platform to handle production-scale load with auto-scaling serverless infrastructure, S3 lifecycle policies, and CloudFront caching for cost optimization.
- Orchestrated end-to-end event operations including workshop curation, industry partner collaboration, and mentorship coordination for participants ranging from beginners to advanced developers.

CERTIFICATIONS

- Industry-Level Machine Learning Course, Internshaala
- AWS Certified AI Practitioner
- dbt Fundamentals
- AWS Knowledge: Amazon Q Fundamentals

CONTACT

Location: Singapore
LinkedIn: linkedin.com/in/garv-sachdev-838287227/
GitHub: github.com/gavkujo
Secondary Email: garv001@e.ntu.edu.sg