RAHUL MITRA

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EDUCATION

National University of Singapore **Aug 2023 – Jul 2027**
Bachelor of Engineering, Industrial Systems Engineering

- Pursuing a Second Major in Computer Science and a Minor in Mathematics.
- Awarded Certificate of Outstanding Performance in 3D Computer Vision (CS4277): top student in a class of 24, NUS School of Computing.
- Relevant coursework: Software Engineering, Data Structures and Algorithms, Artificial Intelligence, 3D Computer Vision, Operations Research, Simulation, Statistics, Linear Algebra.

WORK EXPERIENCE

Operations Research (Contract), STMicroelectronics (NUS System Design Project) **Aug 2026 – Present**

- Design an AI-driven put-away recommendation system for STMicroelectronics' Singapore warehouse, replacing experience-based slotting with capacity-aware decisions drawn from 3 live inputs: picking history, demand forecasts, and available capacity.

Global Operational AI Systems & Data Engineer (Contract), Abbott Laboratories **Jun 2026 – Present**

- Assemble a 5-stage offline process-intelligence platform for globally distributed spray-drying plants: GPU OCR and layout parsing, recursive chunking, ONNX embeddings, a Chroma vector store, and LangChain over a locally hosted Gemma model.
- Convert globally distributed plants' Advanced Process Control models from Excel master files into a single HiGHS linear program returning setpoints, binding constraints, and shadow prices at millisecond latency.
- Build MCP servers, 20+ regression tests, a headless notebook runner, and a deterministic model stand-in for GPU-free CI, with golden snapshots committed for reproducible runs.

Robotics Vision Engineer (AI+X Global Challenge), Amazon **Jul 2026 – Oct 2026**

- Built vision systems turning raw camera feeds into perception-ready frames across 3 workstreams: camera ISP, super-resolution, and image restoration under real-world blur.
- Reproduced a published UNet super-resolution model in PyTorch from broken author code, recovering its undocumented evaluation protocol and training 12 models across 3 scales, 2 datasets, and 2 losses, matching reported results at 8x and landing within 0.78 dB at 2x and 4x.
- Diagnosed a robustness gap where fixed-blur models lost most PSNR gains under unseen blur, then added randomised-blur training and fine-tuning to recover up to 0.7 dB across 3 real-world blur types: lens, out-of-focus, and resampling.
- Authored and presented a super-resolution literature review spanning multi-image, video, and single-image methods, organised around camera information loss and recovery through calibration, extra frames, or learned priors, comparing 4 model families on fidelity and hallucination risk.
- Deployed 3 trained models as a public web app: a one-click Flask inference API on a Colab T4 GPU loading weights from a GitHub release, a secure tunnel on a reserved domain, and a hosted front end for image upload, scale selection, and download.

Platform & Solutions Engineer (Sparks Citizen Developer), People's Association **Sep 2025 – Sep 2026**

- Delivered a digital garden-plot balloting platform across admin and public frontends, backend, GIS mapping, and deployment, now production-ready for national rollout across Singapore.
- Integrated Singpass Login (OIDC) to secure resident sign-in and Myinfo to verify identity and address, keeping garden-plot balloting fair for 150 residents signed up at release.
- Won a S$20,000 Sparks Community Innovation Fund award for public good initiatives, then led deployment planning, multi-repo coordination, and stakeholder management across product, engineering, and operations.
- Provisioned AWS infrastructure with Terraform across 8 services: ECS Fargate, Multi-AZ RDS Postgres with PostGIS, ALB fronted by WAFv2, Route 53, ACM, KMS, and Secrets Manager.
- Engineered keyless GitHub Actions CI/CD on IAM OIDC federation across 5 pinned service repos, with gated Fargate migrations, mandatory RDS snapshots, and circuit-breaker auto-rollback.
- Conducted field surveys of garden sites and structured physical plot records into geospatial datasets driving 3 platform workflows: mapping, plot allocation, and site planning.
- Designed rules-based balloting workflows across 4 control points: eligibility checks, conflict resolution, exception handling, and administrative oversight, keeping allocation transparent and auditable.

Data Analytics & Product Management Intern, Abbott Laboratories **Jan 2026 – Jun 2026**

- Developed a SimPy discrete-event digital twin and OR-Tools CP-SAT solver for hybrid flow-shop scheduling, then compared 3 approaches (heuristic, MIP, and genetic algorithm) to turn production objectives and constraints into decision-ready schedules.
- Validated a non-destructive, 15-stage changeover-data pipeline against 5 years of unseen raw data with zero execution failures across operator- and machine-generated anomalies.
- Productionized a team-built APC simulator for live internal users on Azure App Service with Docker packaging, access restrictions, and runtime and session hardening.
- Trained regional engineering teams across Asia and Europe on repeatable AI workflows spanning 7 areas: prompting, model selection, benchmarks, cost awareness, agents, validation, and safeguards.
- Strengthened Excel, VBA, Python, master-data, and scheduling workflows with 3 safeguards: validation rules, correction tables, and reproducible intermediate stages, leaving every transformation auditable.
- Documented deployment, access provisioning, and technical handover across 3 procedures, so internal manufacturing and engineer-training users stayed supported after transfer to owning teams.

PROJECTS

Team Lead & Finalist, Swarmline: SG Defense Tech Hackathon (1,300+ applicants) **Sep 2026**

- Directed a 5-person team to architect decentralised drone-swarm coordination on correlated random-walk search, gradient-flow dispersion, delay-tolerant gossip, cross-inhibition consensus, and response-threshold task allocation.

- Implemented a deterministic Unreal Engine 5.8 C++ simulation with Claude Code; under a ground-link jam, 30 drones confirmed all 8 walking targets in 10 of 10 seeded runs, against 2.1 for an operator-run fleet.

Personal Project, Hailo Edge AI Training and Deployment **Mar 2026**
- Trained YOLO26 through transfer learning and reshaped its architecture with the Hailo Dataflow Compiler, running document detection on a Hailo-8L rated 13 TOPS at 1.5 W to speed up large-batch scanning.

Finalist, Volt Pulse SG: SMU Hack For Cities (Top 8 Finalist of 50+ teams) **Jan 2026**
- Integrated SEALION embeddings, Supabase vector search, RRF routing, and scheduler-agent planning into an autonomous loop managing electricity and utility savings across multiple HDB households at once, placing top 8 of 50+ teams.

Hackathon Project, Waaah Comics: 24-Hour Gesture-to-Comic Build **Jan 2026**
- Turned MediaPipe 3D hand landmarks into generated comic strips in a 24-hour sprint with Gemini 2.0 Flash, Veo 3, and Konva.js canvas tooling.

Team Lead, Maritime Deficiency Severity Forecasting: Maritime Hackathon **Jun 2025**
- Led model training for a maritime-inspection NLP system, fine-tuning a 109M-parameter BERT with DNN layers and gradient clipping on the ASPIRE 2A supercomputer.

Competitor, DSTA BrainHack 2025 CTF **Feb 2025**
- Solved web, crypto, reverse-engineering, and systems-security challenges under time pressure, finishing around 90th of 400+ teams.

LEADERSHIP AND ACTIVITIES

YesWeHack, Independent Bug Bounty Researcher **May 2024 – Present**
- Assessed GovTech GBBP12/13, the Land Transport Authority, and 13+ other programs for SSRF, CSRF, SQL/NoSQL injection, authentication bypass, and access-control weaknesses.
- Automated endpoint discovery, payload delivery, and evidence collection for responsible-disclosure reports with Burp Suite, Wireshark, Python, Bash, and custom fuzzing scripts.
- Applied Burp Suite for MitM HTTP interception and Wireshark for OSI Layer 3-4 deep packet inspection and TLS handshake analysis.

NTUC Health Active Ageing Centre, Elderly Care Volunteer **Sep 2025 – Sep 2026**
- Coordinate weekly senior-engagement activities, building empathy for healthcare, accessibility, and community-focused product design.

Republic of Singapore Navy, Base Support Assistant **Jan 2022 – Jan 2023**
- Compressed a 6-month food-waste analysis cycle into a 3-minute reporting process with an Excel VBA automation workflow inside a security-constrained environment.

STEM Inc. (Anderson Serangoon Junior College), Astronomy Head & Robotics Member **Mar 2019 – Aug 2020**
- Led astronomy outreach, competed in Singapore's 7th Astronomical Olympiad, and engineered an autonomous robot for the National Robotics Challenge.

SKILLS AND CERTIFICATIONS

Languages: Python, TypeScript, JavaScript, Java, Rust, C++, SQL, Bash, Excel VBA
Web and Cloud: React, Next.js, Three.js, FastAPI, Flask, Docker, AWS (ECS Fargate, RDS, ALB, WAFv2, VPC, ECR, S3, Secrets Manager, KMS, IAM/STS OIDC, Route 53, ACM, CloudWatch, Lambda, API Gateway), Terraform, AWS SAM, Azure App Service, GitHub Actions and Bitbucket CI/CD, Supabase, Singpass Login and Myinfo (OIDC), API design, GIS mapping
AI and Machine Learning: RAG, AI agents, vector search, LangChain, PyTorch, ONNX, Chroma, BERT/transformer fine-tuning, model evaluation, deep RL (PPO, A2C, DDPG, DQN), CUDA/HPC on ASPIRE 2A
AI Foundations: informed search and heuristics, constraint satisfaction, adversarial search, logical inference and resolution, probabilistic reasoning, Bayesian networks
3D Vision: camera models and calibration, homography estimation, single-view metrology, epipolar geometry (fundamental and essential matrices), absolute pose estimation (PnP), three-view geometry, generalised camera models, structure-from-motion with bundle adjustment, two-view and multi-view stereo
Simulation and Operations Research: discrete-event simulation, input modelling, output analysis, verification and validation, random variate generation, queuing systems, SimPy, OR-Tools CP-SAT, HiGHS linear and quadratic programming, hybrid flow-shop scheduling
Statistics: hypothesis testing, confidence and prediction intervals, maximum likelihood estimation, linear regression, ANOVA, bootstrap methods, goodness-of-fit tests
Security: OWASP Top 10, Burp Suite, Wireshark, OAuth2/JWT, SSRF/CSRF/injection testing, fuzzing, secure design
Certifications: NVIDIA Disaster Risk Monitoring with Satellite Imagery; Reinforcement Learning and Deep RL Python (Packt); Reverse Engineering Windows Executables; Excel 2019 Advanced (Intellezy)