

Vihan Patil

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EDUCATION

University of California, Santa Cruz

M.S., Computer Science and Engineering | GPA: 3.77/4.00

Sep 2024 – Mar 2026

B.S., Computer Science

Sep 2020 – Jun 2024

Coursework: Machine Learning, Deep Learning, Natural Language Processing, Computer Vision, Distributed Systems

TECHNICAL SKILLS

Languages: Python, C++, C, SQL, TypeScript, JavaScript, Java

Machine Learning & AI: PyTorch, TensorFlow, scikit-learn, XGBoost, OpenCV, reinforcement learning, computer vision, natural language processing, LLMs, RAG, LLM evaluation, embeddings, vector search, FAISS, HNSW, knowledge graphs

Robotics & Systems: ROS 2, MAVLink, ArduPilot, Gazebo, Raspberry Pi, Docker, Kubernetes, Linux, Git, CI/CD

Data, Cloud & Web: pandas, NumPy, SQLite, AWS (EC2), GCP (Cloud Storage), REST APIs, Node.js, Express.js, React

EXPERIENCE

Graduate Researcher — AI Explainability & Accountability (AIEA) Lab, UCSC

Sep 2024 – Mar 2026

- Prototyped neurosymbolic and LLM-verification workflows for grounded question answering, combining structured knowledge retrieval with generation, source verification, and retry logic to reduce unsupported responses.
- Ran it on Kubernetes and built an evaluation harness for answer correctness, citation support, and hallucinations.

Software Engineering Intern — Vaara Drone

Jun–Sep 2024, Jun–Sep 2025

- Automated an end-to-end drone survey workflow: converted four GPS field corners and a user-set altitude into an overlap-aware boustrophedon coverage path, generated MAVLink mission commands, and flew them on physical drones.
- Built a Raspberry Pi post-flight pipeline that detected network availability, auto-transferred aerial imagery, and ran stitching and NDVI analysis, replacing manual processing steps with ready-to-review crop-health maps.
- Parallelized image ingestion and preprocessing with async multiprocessing over OpenCV, stitching, and NDVI workloads.

Teaching Assistant — Management of Technology (TIM 172), UC Santa Cruz

Sep 2025 – Mar 2026

- Coordinated grading and rubrics for a 150+ student course; led project check-ins and office hours with technical feedback.

PROJECTS

SwathKeeper — Agricultural Drone Autonomy & Safety Simulator (GitHub)

In Progress

- Built an agricultural drone autonomy simulator (ArduPilot SITL, Gazebo, ROS 2, MAVLink) with reactive obstacle avoidance that interrupts survey missions, executes geofence-safe 3D evasive maneuvers, and resumes coverage; latest end-to-end flight completed **720/720** survey cells with zero coverage debt, recovering 116 at-risk cells across four diverts.
- Developed the NDVI mapping pipeline and diagnosed a Fast DDS shared-memory bottleneck, raising image-recording cadence from 0.41 to **5.0 Hz** and enabling complete 720-cell crop-health coverage on a 2.5 m grid.
- Built an independent ground-truth safety check that exposed a 6.7 mm obstacle-clearance failure despite successful mission completion and near-continuous perception, blocking the run from counting as a valid safety result.
- Replayed the encounter across 81 aircraft-dynamics configurations: the nadir camera yields at most 0.41 s of warning vs. a 1.25 s minimum response, motivating forward-looking sensing; **1,000+** automated tests and CI evidence gates.

FinScreen — Financial Text-Signal Research Pipeline (GitHub)

In Progress

- Built a point-in-time NLP pipeline across **1,271 SEC** filings from 25 companies, extracting MD&A, risk-factor, and earnings-release text into 6,747 deduplicated chunks and labeling them for sentiment, guidance, and financial-risk signals.
- Audited 400 sampled chunks via blind second-rater and adjudication passes: sentiment and guidance hit 94.6% and 95.2% model-consensus agreement; red flags reached only 63.4% and were kept as a limitation, not ground truth.
- Compared XGBoost models on fundamentals only vs. with filing-derived text signals over six chronological walk-forward folds; text gave no consistent lift after controlling for near-duplicate filings, so the null result was reported.

MatchDesk — Local-First CV/Job-Description Matching App (GitHub)

Aug 2026

- Built a local-first CV/job-description matcher (TypeScript, Node.js, SQLite) with deterministic, evidence-highlighted scoring, PDF/DOCX ingestion, and no generative model in the scoring path; candidate data stays on-device.
- Hardened the scoring core with **1,100+** automated tests, property-based and metamorphic tests, adversarial cases, and an **80%** Stryker mutation-score ratchet; a findings-driven release gate blocks known wrong-score defects.

Retrieval Algorithm Benchmarking (GitHub)

Mar 2026

- Benchmarked five ANN indexes on synthetic and RootWise/ZoneWise embedding datasets (recall, tail latency, throughput, memory, index size) via parameter sweeps; on ZoneWise, FAISS HNSW matched exact Flat's perfect Recall@10 at 54.06K vs. 16.35K QPS and 0.0179 vs. 0.0593 ms p50 latency: **3.3×** the throughput, **70%** lower median latency.

HealthWise — RAG Health Coach (M.S. Capstone) · Advisor: Prof. Leilani Gilpin, AIEA Lab

Mar 2026

- Built an Android client that fed physiological health data into the HealthWise web app for personalized analysis.
- Implemented a lightweight Corrective RAG (CRAG) loop over a medical-research corpus that re-retrieves context when grounding checks fall below threshold; evaluated retrieval and responses for relevance, groundedness, and verifiability.

Blockchain Analytics Platform — Full-Stack Client Project for UXly

Jun 2024

- Built a TypeScript/React + Node.js/Express platform for real-time blockchain visualization and smart-contract analysis in weekly agile sprints with UXly's CEO and engineers (rotating scrum lead); deployed to production on AWS EC2.