Vatsal Jha

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Research Interests

Decision-making under uncertainty and scarcity (bandits, RL); reliable and accountable ML systems (evaluation, robustness, calibration); agentic and federated systems for infrastructure and public-interest applications.

Education

Vellore Institute of Technology **2022–2026**
B.Tech. Computer Science & Engineering, specialization in Internet of Things *Vellore, India*
CGPA: 9.23/10. Top 1% nationally, NPTEL Reinforcement Learning (IIT Madras) – invited to interview for Instructor, Reinforcement Learning, IIT Madras BS Degree Program; Top 5% nationally, Responsible & Safe AI Systems (IIIT Hyderabad × IIT Madras).

Research & Engineering Experience

testAIng **Jan–Jul 2026**
Machine Learning Intern *Remote*
- Owned ML systems and research for multilingual audio-deepfake detection: ECAPA-TDNN, WavLM and mixture-of-experts models; internal multilingual benchmarks reached 0.94–0.96 AUC and Hindi fine-tuning reached 1.97% EER.
- Migrated model-heavy inference to Docker/Kubernetes with HPA, probes, rolling deployment and Prometheus/Grafana; built Playwright/Xvfb meeting analysis with WhisperX/Pyannote and a KEDA-scaled bot path. Placed 1st among 70+ interns in research presentation. [blog]

Samsung Research India **May–Jul 2025**
Software Engineering Intern, Server Platform / MAGPIE *Bangalore, India*
- Individually designed and built a multi-agent root-cause analysis prototype from literature review through evaluation/handoff, using Google ADK and MCP tools over Prometheus, Kubernetes, Jaeger, OpenSearch and Milvus.
- Implemented modality-specialist evidence collection, hypothesis validation/halting, cross-incident retrieval memory, context reduction and diagnosis-only safety boundaries; built an OpenTelemetry Demo + Chaos Mesh fault-injection testbed. Received a full-time Pre-Placement Offer (PPO).

Samsung R&D Institute Bangalore – PRISM **Oct 2024–May 2025**
Team Lead / Co-primary Researcher *Hybrid*
- Co-led four student researchers on HOMA, a multilingual SLM-orchestrated smart-home system that decomposes multi-device commands and coordinates sequential/concurrent execution across 11+ languages.
- Built synthetic multilingual evaluation and benchmarked Gemma/Qwen/Phi-family models under edge constraints. Samsung PRISM Excellent Worklet Award; work presented at ICCCNT 2025. [code]

Vellore Institute of Technology – Dr. B. Ashok **Aug 2024–Present**
Researcher *Vellore / Remote*
- Research spanning federated in-vehicle recommendation, simulator-in-the-loop EV infrastructure planning, selection-aware carbon claims, and robustness/decision-making under heterogeneous or shifted data.
- Co-inventor on Indian Patent Application 202641089937 (Published) for privacy-preserving federated in-vehicle recommendation (BehaviorFL/BehaviorFL-MT) under heterogeneous sensors and partial task supervision; discovery-aware client sampling gives a 5.8× increase in rare-task-client exposure at a fixed communication budget, evaluated across three public mobility datasets (VED, GeoLife, T-Drive).
- Leads HERO, a two-stage EV-charging-station placement system: an XGBoost city-level demand model feeds a simulator-in-the-loop multi-armed-bandit search that treats each complete station layout as a persistent arm; outperforms 13 facility-location, metaheuristic and bandit baselines by up to 39.9% composite reward in Ann Arbor SUMO microsimulation, with zero-shot cross-city demand transfer validated by rank correlation.
- Audited carbon-claim overstatement arising from post-selection bias in real supplier EPD data; a selection-aware reporting bound reduces overstatement from 51% to 11% without changing the recommended product.

NTNU × BITS Pilani **Mar 2024–Aug 2025**
Remote Research Collaborator, with Dr. Sukalpa Chanda and Aniket Anand Gurav *Remote*
- Built an end-to-end handwriting detection+recognition pipeline on IAM: shared ResNet-50 backbone, FOTS-style region detector, rotated ROI alignment, and an attention-augmented PHOSC word recognizer (custom 8-head scaled dot-product attention), jointly trained under constrained compute; selected internal development/test runs reached roughly 6–8% CER.

Council on Energy, Environment and Water (CEEW) **Jun–Aug 2024**
Data Science Intern *Delhi, India*
- Built NLP over 93K performance-criteria/task segments from 600+ occupations using BERTopic, transformer embeddings, UMAP/HDBSCAN and semantic matching; shipped a public job-transition prototype that later informed the public CEEW–ADB SMART platform and a 2026 CEEW coal-workforce report. [HF] [SMART] [report]
- Co-developed ML bias correction for Delhi WRF-CAMx forecasts: PM2.5 MAPE 43%→27%, RMSE 73→42 $\mu g/m^3$, correlation 0.70→0.78; coauthored IICAQM 2024 poster.
- Implemented a modular 3.1K-line Python/Streamlit solar/BESS techno-economic decision tool covering dispatch, tariffs, outages, sizing and multi-year financial modeling. [code]

VIT × King Saud University **Dec 2022–Jul 2024**
ML Research Intern, advised by Dr. B. Ashok *Hybrid*

- Designed a stochastic trip-segmentation pipeline and ML methodology for electric two-wheeler battery SoC prediction using real on-road CAN/BMS telemetry, under a Royal Academy of Engineering Distinguished International Associate grant (DIA-2022-150) with King Saud University; test **MSE ≈ 0.041** (Voting Regressor). Published in *Journal of Energy Storage*.

Peer-Reviewed Publications

V. Jha, Y. Babu S. "CA-AMFA: Context-Aware Adaptive Multi-Factor Authentication for IoT-Based Household Security Systems." *IEEE ICDSINC*, 2025. **Best Paper Award**. [IEEE]

A. Jain, **V. Jha**, F. Alsaif, B. Ashok, I. Vairavasundaram, C. Kavitha. "Machine learning framework using on-road realtime data for battery SoC level prediction in electric two-wheelers." *Journal of Energy Storage*, 97, 112884, 2024. DOI: 10.1016/j.est.2024.112884. [ScienceDirect]

Accepted / Presented; Proceedings Pending

V. Jha. "AdaptiveCareArena: Decision-Facing Evaluation of Patient World Models Under Healthcare Resource Constraints." NeurIPS 2026 Workshop on World Models for High-Stakes Health (WMHS). Accepted (poster). Single author.

V. Jha, A. Srivastava, B. Ashok. "Ranking Is Not Valuation: Selection-Aware Carbon Claims under Supplier Shift." NeurIPS 2026 Tackling Climate Change with Machine Learning (TCCML) Workshop. Accepted.

V. Jha, B. Ashok. "BehaviorFL-MT: Federated Multi-Task Learning under Unequal Vehicle Sensors and Partial Supervision." NeurIPS 2026 NewInML Workshop. Accepted.

A. Jain, **V. Jha**, et al. "HOMA: Home Orchestration using Multi-Agent systems." ICCCNT 2025. Presented; proceedings appearance pending/finalizing. [code]

S. Murugaiyan, A. Venkatesa, **V. Jha**, A. Jain. "Nonlinear Model Predictive Control for Dynamic Obstacle Avoidance in RoboCup SSL." HINT'25. Accepted/presented; Springer LNNS proceedings pending. [code]

Posters / Extended Research Outputs

S. Tiwari, **V. Jha**, M. Rafiuddin, S. K. Guttikunda. "Bias Correction of Forecasts from a Chemical Transport Model using Machine Learning for Delhi." IICAQM 2024, IIT Madras. Poster.

Under Review / Submitted Research

V. Jha. "The Priority Stability Index: A Pre-Deployment Audit Instrument for Seed Instability in Predictive Policing." AAAI 2027 AI for Social Impact Track. Under review. Single author.

V. Jha. "Diagnosing Identifiability Failure in Reporting-Adjusted Crime Models: A Template Applied to India's Recorded Rape Data." AAAI 2027 AI for Social Impact Track. Under review. Single author.

V. Jha, Sathya K. "SOPRA: Context, Not Scaffolding: A Simplifying Finding for LLM-Based Java Test-Case Repair." SANER 2027. Under review.

V. Jha, A. Jain, B. Ashok, C. Kavitha. "HERO: A Hybrid Machine Learning and Multi-Armed Bandit Framework for Electric Vehicle Charging Station Placement via High-Fidelity Traffic Simulation." Engineering Applications of Artificial Intelligence. Under review.

Patents & Intellectual Property

B. Ashok, **Vatsal Jha**. "System and Method for Privacy-Preserving In-Vehicle Recommendation using Federated Learning and Cross-Domain Feature Alignment." Indian Application No. **202641089937**, filed 24 Jul 2026, published 31 Jul 2026.

Selected Software & Engineering Projects

Eldermere. A multiplayer systems project: built/deployed a Go + SvelteKit + PostgreSQL browser MUD with WebSocket presence, persistent player state, data-driven content packs, tests, Docker Compose and procedural visual/ambient-audio generation. [code] [live] [docs]

ChatterBot. A scalable LLM-serving prototype: FastAPI + Ray Serve/vLLM + Redis + RabbitMQ + PostgreSQL, with sync, queued-async and SSE streaming modes, context caching, an AWQ quantization path, retries/circuit breakers and Locust load tests; designed to scale horizontally under high concurrency. [code]

PromptTrend. A published PyPI package for bandit-inspired online contextual prompt recommendation: FastAPI service with BERT intent classification, Redis/PostgreSQL persistence and feedback-driven incremental regressors under stochastic exploration. [code] [PyPI]

CtrlAltHeal / Vita Sana. Freelance platform engineering: sole engineer of two backend stacks (Node/Express/Prisma/PostgreSQL; C# ASP.NET/EF Core) for a diet and clinical-data management platform, including DOCX/XLSX/CSV pipelines converting legacy clinical documents into structured data.

Narad (IISF–ISRO/NRSC Bhuvan). National-winning 22-language voice/query system; owned personalized recommendation and model fine-tuning/detoxification; system used AI4Bharat, FAISS, FastAPI and quantized models. [code] [challenge]

Maieutic Research. MIT-licensed Claude Code skill for Socratic human-AI research collaboration. [code]

Honors & Awards

- Best Paper Award, IEEE ICDSINC 2025, for CA-AMFA (first author).

- Samsung PRISM Excellent Worklet Award, for HOMA.
- National Winner, IISF 2023 Students Innovation Festival Space Hackathon (ISRO/NRSC Bhuvan challenge; 4,000+ registered teams); National Winner, Samsung PRISM hackathon; Top-3 finalist, Karnataka State Police Datathon (380 teams).
- 1st Prize, testAIng intern research presentation competition, among 70+ interns.
- Raman Research Award, VIT, for EV SoC research.

Leadership & Service

Co-Founder & Co-Team Lead, Team Prometheus, VIT RoboCup Small-Size League: founded VIT's first SSL team from zero; built and mentored a 30+ member robotics research/engineering group and secured major in-kind engineering-software sponsorships (SolidWorks, ANSYS, Altium).

Youth Red Cross, VIT: Vice Chairperson (2024) and Chairperson (2025); facilitated 1,000+ blood donations across the tenure, including a flagship camp I organized that set VIT's single-day donation record (750+ units).

Technical Skills

ML/Research: PyTorch, TensorFlow, Hugging Face, scikit-learn, Flower, RL/bandits, federated learning, LLM/agent systems, RAG, statistical evaluation, experiment design.
Systems: Docker, Kubernetes, KEDA, FastAPI, Ray Serve/vLLM, MCP/Google ADK, PostgreSQL, Redis, Milvus, RabbitMQ, Prometheus/Grafana, OpenSearch, Jaeger, SUMO.
Languages: Python, Java, C++, Go, SQL, JavaScript/TypeScript, C#.