Vineeth Bhat

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EDUCATION

International Institute of Information Technology, Hyderabad (IIIT-H) Sep 2021 – May 2025
B.Tech. (Honours) in Computer Science and Engineering *GPA: 9.80/10.0*
Institute Gold Medalist (Highest GPA in graduating cohort)
Relevant courses: *AI Safety, Statistical Methods in AI, Computer Vision, Machine Learning, Mobile Robotics*

PUBLICATIONS

** denotes equal contribution*

[1] P. Paul*, **V. Bhat***, T. Salian, M. Omama, K. M. Jatavallabhula, N. Arulselvan, and K. M. Krishna, "Sparseloc: Sparse open-set landmark-based global localization for autonomous navigation," in *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, Oral Presentation, 2025.

[2] S. Garg*, D. Craggs*, **V. Bhat**, L. Mares, S. Podgorski, M. Krishna, F. Dayoub, and I. Reid, "Objectreact: Learning object-relative control for visual navigation," in *Conference on Robot Learning (CoRL)*, 2025.

[3] D. Paleka*, A. P. Sudhir*, A. Alvarez, **V. Bhat**, A. Shen, E. Wang, and F. Tramèr, "Consistency checks for language model forecasters," in *International Conference on Learning Representations (ICLR)*, Oral Acceptance, 2025.

RESEARCH EXPERIENCE

Undergraduate Researcher Aug 2023 – May 2025
Advisors: K Madhava Krishna, Sourav Garg Robotics Research Center, IIIT-H

- Focused on bridging foundation models with classical robotics pipelines to solve problems in localization and navigation.
- Co-led development of landmark-based *city-scale global localization* achieving $< 10m$ error across 10+ km trajectories, with 500× fewer points than dense methods, in [1] (IROS 2025). Designed novel object association module using vision foundation models and engineered a PGO-inspired particle filter for robust data association under extreme sparsity. *Successfully deployed* in IIIT's self-driving car, as well as *Ati Motors* for industrial autonomous navigation.
- Investigated transformer and diffusion-based architectures for *embodiment-independent navigation* in [2] (CoRL 2025), integrating topometric representations with learned visuomotor policies. Conducted extensive ablation studies across 500+ navigation trials, analyzing the impact of object matchers on task success rates and generalization performance.
- *Mentored three undergraduates* on foundations for machine learning, mobile robotics, and ROS with lab robots.

Research Mentee Aug 2024 – Dec 2024
Advisor: Daniel Paleka Supervised Program for Alignment Research

- Contributed to [3] (ICLR 2025), evaluating the consistency of LLM forecasters as a proxy for ground-truth accuracy.
- Architected an automated three-stage data generation pipeline orchestrating multiple LLMs, for extraction, refinement and cross-model consensus validation, that synthesized over 2,600 ground-truth resolved forecasting questions from news streams. Implemented deduplication and verification protocols, and achieved resolution label error rate $< 5\%$.

TEACHING

Teaching Assistant Jan 2025 – May 2025
Software Engineering (Advisor: Karthik Vaidhyanathan) IIIT Hyderabad

- Designed and graded assignments on software architecture patterns, focusing on building robust and modular systems.
- Held tutorials for 90+ students on software design principles, focusing on architecture patterns and technical debt.

Teaching Assistant Aug 2023 – Dec 2023
Operating Systems & Networks (Advisor: Karthik Vaidhyanathan) IIIT Hyderabad

- Spearheaded the design of the course's final project: implementing a Network File System from scratch, requiring students to manage network protocols and ensure thread-safe concurrent operations across different computers.
- Contributed to the design of a C-shell project, mentoring students on low-level systems programming, process management, inter-process communication (IPC)—specifically pipes and signal handling, and background processes.

INDUSTRY EXPERIENCE

Software Engineer Jun 2025 – Present
Commerce (Billing) Systems Stripe, Bangalore

- Architecting record completeness guarantees for a fee reporting system processing over 400 billion records daily.
- Rolled out a unified Cost Management page, migrating multiple legacy product surfaces for the Stripe Dashboard.

Software Engineering Intern May 2024 – Jun 2024
Front Office (R&D) Tech Department D.E. Shaw and Co., Bangalore

- Engineered one-step deployment modules that created local clones of remote (cross-geo) data-processing nodes.
- Reduced developer debugging time by 50% (per QA analysis) by eliminating multi-hour remote debugging.

REPRESENTATIVE PROJECTS

Muad'dib: Concept-based Knowledge Distillation

- Developed a concept distillation framework for transferring explainable semantic knowledge via Concept Activation Vectors (CAVs), achieving 75.60% accuracy with significantly improved concept coherence for vision models.
- Demonstrated that explicit concept-space alignment maintains similar predictive performance to traditional KD methods while preserving interpretable internal representations and semantic alignment between teacher and student.

Multi-Modal Re-Identification for Global Localization

- Built a multi-modal object re-identification system leveraging foundation models (RAM, SAM, Grounding DINO) to create semantic scene representations from RGB-D data, enabling visual place recognition and camera relocalization.
- Performed extensive ablation studies across simulated and real-world (TUM-RGBD) benchmarks, achieving 83% localization accuracy and demonstrating the effectiveness of foundation model integration for robust visual understanding.

ModelHub: ML Training & Deployment Platform

- Architected an application for model training, experiment tracking, and logging, implementing chunked file transfer protocols for large dataset handling and conducting comparative analysis of monolithic vs. microservices architectures.
- Developed an automated pipeline leveraging LLMs for design smell detection and refactoring, integrating continuous analyses that generate pull requests with metrics-driven code improvements and architectural recommendations.

Flip-Flop Neurons: Cognitive Memory Modeling

- Evaluated Flip-Flop Neuron architectures against LSTMs and GRUs across sequence tasks, demonstrating superior interference robustness and stable convergence while achieving competitive performance with fewer parameters.
- Designed novel memory retention and working memory benchmarks, performing mechanistic analysis through gate visualization and trajectory comparisons to understand sequential encoding and generalization dynamics.

Object-Centric 3D Pose Reconstruction

- Developed a learning-based 3D reconstruction pipeline from monocular RGB input, integrating classical optimization with deep learning to produce metrically consistent meshes and pose estimates for downstream vision tasks.
- Applied optimization techniques including ICP, pose-graph optimization, and bundle adjustment to achieve sub-2px reprojection error; explored neural radiance fields for learning appearance representations and novel view synthesis.

SKILLS & EXTRA-CURRICULARS

Technical Skills: Python, C/C++, Scala, PyTorch, OpenCV, Ceres Solver, Open3D, Git, Linux, Docker
Technical Head, E-Cell: Led problem statement scoping for *Megathon* (deemed Hyderabad's largest hackathon) with stakeholders such as the Government of Telangana and Qualcomm. *2024*
Editor, Ping! (Campus Magazine): Authored articles highlighting campus-alumni operational disconnects and campus infrastructure; edited and managed content written by other members. *2023*

ACHIEVEMENTS

Admitted into *Institute Research List* by IIIT Hyderabad for making contributions to robotics & ML research *2025*
Admitted into the *Deans List* by IIIT Hyderabad across all semesters for outstanding academic performance *2025*
Ranked *610th* in JEE Main and *877th* in JEE Advanced among *939,000 candidates* for engineering degrees *2021*