

# Dhruvkumar Patel

Robotics Researcher & AI Systems Engineer

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## RESEARCH EXPERIENCE

**San Jose State University — Robotics & Digital Twin Lab**  
*Research Assistant*

Jan 2026 — Present  
San Jose, CA

- Fine-tune and evaluate Vision-Language-Action policies for Unitree G1 and Go2 using imitation learning and behavior cloning on task-specific teleoperation demonstrations.
- Built robot-training data pipelines for structured episode storage, filtering, synchronization, and quality validation, aligned with Open X-Embodiment-style conventions.
- Designed a three-tier semantic navigation system using ROS 2, SLAM, Nav2, and LangGraph: orchestrator decomposition, waypoint planning, and ROS-connected execution agents.
- Train PPO/SAC policies across Isaac Sim/Gym, MuJoCo, and Gazebo with reward shaping, curriculum design, domain randomization, and systematic sim-to-real failure analysis.
- Run reproducible multi-GPU experiments with SLURM and W&B, connecting simulation, dataset versions, policy checkpoints, and hardware validation.

## INDUSTRY EXPERIENCE

**Bain & Company**  
*Software Engineer II*

Apr 2024 — Jul 2025  
New Delhi, India

- Built a hybrid dense+sparse RAG and semantic-cache pipeline in Elasticsearch across 12 workflows, reducing LLM API cost by 35% and response latency by 220 ms.
- Developed TensorFlow GNN models for General Ledger classification using account relationships and transaction edges; tracked experiments with MLflow and contributed to 20% higher profit on supported cases.
- Delivered React workflows and OAuth authentication for Map AI, reducing case-processing time by approximately three weeks per case.

**Samsung R&D Institute India**  
*Software Engineer*

Aug 2021 — Apr 2024  
Bengaluru, India

- Built and optimized large-scale data pipelines and machine-learning workflows for high-volume product and analytics data.
- Developed Java/Spring Boot microservices and Kafka-based processing services with production monitoring and operational safeguards.
- Automated data-quality checks and analytics reporting, improving reliability and reducing manual investigation for downstream teams.

## TECHNICAL SKILLS

|                  |                                                                                                                                                         |
|------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| Robotics         | ROS 2, Nav2, SLAM Toolbox, Cartographer, visual odometry, Unitree SDK, xArm SDK, OpenClaw, Isaac Sim/Gym, MuJoCo, Gazebo                                |
| ML / Physical AI | VLA models, OpenVLA-style architectures, imitation learning, behavior cloning, PPO, SAC, reward shaping, domain randomization, PyTorch, TensorFlow, GNN |
| Infrastructure   | SLURM, distributed PyTorch, W&B, MLflow, Docker, Kubernetes, CI/CD, AWS                                                                                 |
| Data & Systems   | Elasticsearch, Kafka, PySpark, Airflow, Snowflake, dbt, Redis, PostgreSQL, Pinecone                                                                     |
| Languages        | Python, C++, Java, C#, JavaScript/TypeScript, SQL                                                                                                       |

## EDUCATION & LEADERSHIP

**San Jose State University — M.S. Applied Data Science**  
*GPA: 3.8 / 4.0 · President, Applied Intelligent Systems*

Aug 2025 — May 2027  
San Jose, CA

**Sardar Vallabhbhai National Institute of Technology — B.Tech ECE**  
*GPA: 3.7 / 4.0*

Jun 2018 — May 2022  
Surat, India

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## SELECTED PROJECTS

### Persistent Semantic Navigation — Unitree Go2

*ROS 2 · Nav2 · SLAM · LangGraph · Python/C++*

- Built teach/resume navigation with saved maps, AMCL-based re-localization, semantic place labels, natural-language goal grounding, dynamic replanning, and recovery-aware execution.
- Separated the stable base stack from experimental agent overlays and established a mirrored real/simulation topic contract for sensors, TF, odometry, and velocity control.

### xArm-7 Dexterous Manipulation & OpenClaw Integration

*ROS 2 · xArm SDK · PyTorch · Isaac Sim*

- Integrated force-aware gripper control and synchronized joint, gripper, force/torque, and wrist-camera streams for teleoperation demonstration collection.
- Trained behavior-cloning policies in simulation and reduced the sim-to-real gap through domain randomization of object poses, lighting, and contact parameters.

### Monocular Visual Odometry

*OpenCV · ROS 2 · C++ · NumPy*

- Implemented ORB features, optical-flow tracking, RANSAC essential-matrix estimation, SVD pose recovery, and ROS 2 odometry publication from scratch.
- Fused visual motion with IMU estimates and evaluated trajectory error against benchmark sequences, including low-texture failure cases.

### Data Science Agent Evaluation Harness

*Python · Containers · LLM Agents · Verifiers*

- Created ten real-data tasks with captured trajectories, deterministic output checks, semantic scoring, and repeated-run pass@3 evaluation.
- Designed the benchmark to expose step-level failures and reproducibility rather than relying on subjective final-answer grading.

### Big Photos — Distributed Visual Intelligence

*Kafka · HDFS · Spark · Ray Serve · FastAPI · React*

- Designed an eleven-service photo-intelligence platform spanning ingestion, distributed storage, model serving, vector retrieval, APIs, and a product interface.

### The Last Degree — College ROI Intelligence

*Airflow · Snowflake · dbt · Adzuna API*

- Built a daily ETL architecture for job listings, salary normalization, deduplication, merge-based Snowflake loads, and analytical views for skill demand and career ROI.

### Pinecone Semantic Search Pipeline

*Sentence Transformers · Pinecone · Airflow · Docker*

- Orchestrated data ingestion, cleaning, 384-dimensional embedding generation, vector upsert, and verification queries as a reproducible Airflow DAG.

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## RESEARCH INTERESTS

Embodied AI · Robot autonomy · Vision-Language-Action models · Semantic perception · 3D scene representations · Digital twins  
· Sim-to-real transfer · Human-robot interaction