Prashant Rawat

rawatprashant.com linkedin.com/in/rawat-prashant prashantrawatmailbox@gmail.com +81-8085450101

SUMMARY

Machine Learning Engineer with 7+ years of experience building and deploying end-to-end machine learning solutions, owning projects from data collection through production deployment. Currently designing LLM-based agent systems with structured tool-calling, multi-step workflows, and RAG-backed retrieval for autonomous robotics. Background spanning ML pipelines, object detection, computer vision, document OCR, and real-time surveillance applications. Proven track record of leading cross-functional teams and delivering client-focused PoCs that converted into products

PROFESSIONAL EXPERIENCE

Senior AI Engineer | *Arithmer, Tokyo(Japan)* — Sep 2024 – Present

- **LLM Agent for Robot Control & Operations Q&A**: Led development of an LLM-based agent (OpenAI) that converts natural-language and voice input into executable robot behaviour. Designed a structured skill-registry architecture in which robot capabilities — `move_to(x, y, yaw)`, gestures such as hand wave and handshake, object pick, and others — are stored on-device in JSON, with the agent issuing structured skill invocations against that registry, supporting both named locations and arbitrary target coordinates. Implemented multi-step agent workflows that decompose a user goal into an ordered sequence of skill calls executed against robot state rather than single-turn command mapping, integrated Whisper-based speech recognition for hands-free voice control, and built a RAG pipeline enabling natural-language Q&A over robot operations. Used RabbitMQ for inter-robot and inter-system communication.

- **Autonomous Navigation for Humanoid Robot:** Built the full navigation stack for the Unitree G1 humanoid from scratch,implemented DWA-based global/local path planning, obstacle detection using top-mounted LiDAR and Intel RealSense D435i depth camera, and real-time SLAM using Fast-LIO for mapping and localization. Enabled autonomous point-to-point navigation with near-complete obstacle avoidance in indoor environments. Handled end-to-end development including cloud-side deployment with a web UI for route planning on point cloud maps, waypoint selection, and configuring specific actions at each waypoint. Currently architecting an onboard LLM-based AI agent for natural language understanding and real-time information retrieval.

- **Autonomous Navigation & Surveillance for Quadruped Robot:** Engineered the autonomous control system for Unitree Go2/Go2-W from scratch using DWA path planning with Unitree's built-in localization, onboard LiDAR, and vision sensors for real-time obstacle avoidance along complex trajectories. Built a cloud-connected web UI for route configuration on point cloud maps with waypoint and action assignment. Integrated hands-free voice command interface via Bluetooth microphone. Implemented an autonomous surveillance mode where the robot patrols a designated area, detects suspicious persons using onboard vision, and reports alerts to a cloud application in real time.

- **Generative AI Virtual Try-On:** Developed a pipeline combining face-swap techniques with Runway's video generation model to transform a user's static image into a dynamic video realistically simulating them wearing selected garments in motion.

- **Drone-Based Box Detection & Counting:** Owned the full pipeline from data collection and annotation to model training and deployment on AWS (EC2, S3, CloudWatch, RDS), for processing drone video feeds to detect, count, and identify missing boxes in warehouse/logistics operations.

- **Manufacturing Defect Detection (8+ AI Modules)**:Architected and delivered end-to-end object detection solutions for manufacturing quality inspection, including copper sheet surface defect detection, rust detection on bolts, and cut/tear detection on bottle wrappers. All solutions containerized with Docker, achieving ¿90% AP on target defect classes.

- Collaborated with cross-functional teams to integrate AI models into existing workflows, contributing to process automation and operational efficiency.

Sr. Machine Learning Engineer | *Celusion Technologies, Thane* — Apr 2023 – Aug 2024

- **Credit Card Fraud Detection:** Led a team of engineers to develop an anomaly detection model for identifying fraudulent credit card transactions, enabling scalable real-time fraud prevention for banking clients.

- **KYC System - End-to-End (PoC to Production):** Owned the full lifecycle of an automated KYC platform for major Indian banks — started with a facial recognition PoC, extended to passive liveness detection (defending against printed photo and screen replay attacks), and then integrated document verification (Aadhaar, PAN) with OCR, delivering a complete identity validation system from scratch to production deployment.

Machine Learning Engineer | *Celusion Technologies, Thane* — Sep 2021 – Mar 2023

- **Document Intelligence Pipeline:** Engineered an OCR pipeline using PaddleOCR, computer vision, and object detection to extract structured data from identity documents (Aadhaar, PAN). Processed 100,000 documents for a major Indian bank as a core component of their automated KYC system.
- **Fraud Detection System:** Developed a facial landmark-based fraud detection system using K-means clustering to identify fraudulent users, deployed across automated KYC workflows for major Indian banks.
- **Bank Reconciliation:** Built an ML solution in Python to automate transaction matching between bank statements and internal records, achieving 97% matching accuracy and significantly reducing manual reconciliation effort.

Member Research Engineer-II | *Central Research Laboratory-B.E.L , Ghaziabad* — Jul 2019 – Sep 2021

- Developed and deployed a machine learning-based weapon detection system processing real-time feeds from cameras, radar, and electric fence sensors for border security applications.
- Built and deployed a coastal surveillance system to detect unauthorized vessels using multi-sensor fusion and machine learning algorithms.
- Led the development of the Air Traffic Management System (ATMS) for coordinating aircraft movement in and out of controlled airspace.
- Led the implementation of RTI-DDS for inter-module communication across multiple defense projects, resulting in significant improvement in system performance and reliability.

EDUCATION

Indian Institute of Information Technology Allahabad 2017 - 2019
M.Tech | Machine Learning and Intelligent Systems

College of Engineering Roorkee 2012 - 2016
B.Tech | Computer Science Engineering

SKILLS

Languages & Data: Python, C / C++, ROS, SQL, MATLAB, Pandas, Numpy, Scikit-Learn, Matplotlib
Deep Learning & Vision: PyTorch, TensorFlow, Keras, Hugging Face, Transformers, OpenCV, Detectron, PaDiM
LLM & Agents: OpenAI APIs, tool/skill orchestration, RAG, Whisper (ASR), Transformers, Hugging Face, Agentic AI, Runway.
Robotics: ROS, DWA, Fast-LIO, SLAM, LiDAR, Intel RealSense
Infrastructure, MLOps & API: FastAPI, AWS, GCP, Docker, Git, Jira, RabbitMQ, ROS
Generative AI: Agentic AI, OpenAI APIs, Runway
Core Concepts: AI, Machine Learning, Deep Learning, NLP, Computer Vision, Reinforcement Learning, Object Detection, Anomaly Detection, Data Science, Predictive Analytics

OPEN SOURCE

alchemycv: All-in-one image processing and computer vision desktop tool with a multi-stage processing pipeline (blur, histogram equalization, CLAHE, Fourier transforms, color space filtering), binary mask generation, edge detection (Canny, Sobel, Prewitt), and automated contour detection and counting. Features real-time parameter tuning via interactive GUI and session save/load to JSON.
alchemyannotate: Lightweight desktop image annotation tool for preparing object detection datasets. Supports bounding box and polygon annotations with export to YOLO, Pascal VOC (XML), and COCO (JSON) formats. Includes class management with auto color-coding, session persistence, and keyboard-driven navigation.
alchemydetect: Desktop GUI application for training and deploying Detectron2 models. Supports Faster R-CNN, RetinaNet, and Mask R-CNN architectures with customizable hyperparameters, live loss graph monitoring, and batch inference on images or folders. Accepts COCO JSON format datasets.

ACADEMIC PROJECTS

Localization using Machine Learning in Partially Dynamic Environments | *IIIT-Allahabad*

- Designed and evaluated a machine learning–based localization approach using a CNN–LSTM architecture that fuses LiDAR and 2D camera data to estimate a robot's position in real time within static and partially dynamic environments, achieving improved accuracy compared to existing state-of-the-art methods.

Line-Following Robot & Maze Solver | *IIIT-Allahabad*

- Built a line-following robot (LFR) and an autonomous maze-solving algorithm in MATLAB, using image-based path detection and pathfinding logic for real-time navigation decisions.

Self Driving Car on Simulation | *IIIT-Allahabad*

- Nvidia-based CNN architecture for predicting Steering Angle, Throttle, Brake, Speed which are the basic parameters for driving a car. These predicted parameters are then inferred in real-time for each frame.

Human Pose for Live Dance Learning

- Using machine learning and computer vision, compare the poses of instructor and student. The goal of this project is to give real-time feedback to the student to improve their form in areas like dance, yoga or other exercises and subsequently, help him/her to understand their areas of improvement.

Robot Navigation using Overhead Camera and Reinforcement Learning | *C.O.E.R*

- Implemented a real-time reinforcement learning solution in MATLAB to autonomously navigate a robot from its start position, collect a ball, and score a goal using overhead-camera tracking.

CERTIFICATIONS & ACHIEVEMENTS

- **Machine Learning** (Stanford/Coursera) · **Applied ML** (Applied AI) · **Google Cloud Platform** (Udemy) · **SQL** (Udemy) · **REST API (Python & Django)** (Udemy) · **Leaflet JS** (Udemy)
- **ROS 2 Nav2 (Navigation 2 Stack) — SLAM & Navigation**: Hands-on with SLAM, localization, and autonomous navigation; applied directly to Unitree Go2/Go2-W and G1 for real-time mapping and navigation.
- **Vision Language Models (VLM) Bootcamp OpenCV.org (2024)**: CLIP, Qwen-VL for zero-shot classification, captioning, and object detection.
- Placed **12th out of 1604** participants in the international Shell.ai Hackathon 2023.
- GATE percentile **99.05**.
- Badminton: National School Level (2011), 1st place RUNN'16 & 2nd place RUNN'15 (Team Captain).