

Ankit Pal

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SUMMARY

Highly skilled AI and robotics professional with a strong background in developing and deploying advanced machine learning, computer vision, and robotics systems. Experienced in solving complex problems in autonomous systems, data analytics, and reinforcement learning. Proficient in Python, PyTorch, TensorFlow, and ROS, with expertise in sensor fusion, deep learning, and cloud-based infrastructure.

- Developing **vision-based autonomous navigation and perception systems** for robotics, improving real-time decision-making.
 - **Deploying deep learning pipelines on edge devices** like NVIDIA Jetson Orin for low-latency applications.
 - **Implementing reinforcement learning** models to optimize motion planning and dynamic control.
 - Streamlining e-commerce image validation systems with **GANs and EfficientDet**, achieving 97% accuracy.
 - Advanced **data governance and ETL workflows**, enhancing data quality and reducing reporting time.
- Looking to drive innovation in AI, robotics, and data-driven decision-making, contributing to impactful solutions in dynamic and challenging environments.

EXPERIENCE

Research Assistant, San Jose State University (Autonomous Systems) | (California, USA)

Oct 2023 - Present

- Implemented **object detection** and **segmentation models** using **YOLOv11** and **Faster R-CNN** to enhance real-time robot navigation capabilities.
- Integrated **Kalman Filters** and **Extended Kalman Filters** for sensor fusion, significantly improving **object tracking** and **localization** in dynamic environments.
- Built scalable image classification pipelines using **Vision Transformers** and **Swin Transformers**, significantly enhancing feature extraction and model performance for high-resolution imagery.
- Deployed deep learning models on **NVIDIA Jetson Orin, GPU**, **optimizing inference** for low-power, real-time robotics applications.
- Utilized **PyTorch** and **MLFlow** to develop scalable deep learning pipelines, improving deployment efficiency by 40%.
- Leveraged **real-time feeds from cameras and LiDAR** to enable advanced perception and navigation capabilities.
- Implemented 3D object detection and LiDAR-based **3D reconstruction** using **MMDetection3D**, enabling robust environmental understanding for autonomous systems.

Data Scientist, Enliant Inc | Remote (Texas, USA)

May 2023 - Aug 2023

- Developed a computer vision-based quality assurance system for **e-commerce product image validation** using **EfficientDet** and **DETR** models, achieving 97% accuracy in identifying defective or non-compliant product images.
- Designed and deployed end-to-end machine learning pipelines on **AWS SageMaker** integrated with **NVIDIA CUDA-optimized TensorRT**, ensuring low-latency inference for real-time production systems.
- Designed **VAEs** and **implemented GAN-based models** for synthetic data generation, reducing dependency on real-world datasets.
- Utilized **OpenCV** and **Albumentations** for advanced preprocessing and data augmentation, improving model robustness against noisy inputs.

Data Analyst, Optum - UnitedHealth Group | India

Aug 2020 - July 2022

- Developed and improved **SAS, Python, and Scala** analytics for insurance claims processing, collaborating with business and operations teams to define **key performance indicators (KPIs)**.
- Established data governance across **SQL and cloud source (Azure)**, reducing data failures by 30% and report time by 20% through streamlined ETL workflows in Python and Scala.
- Orchestrated **Terraform (Infrastructure as Code)** scripts resulting in a 40% reduction in provisioning time.

Robotic Engineer (Team Lead), IIT Bombay | *e-Yantra* | India

Aug 2019 - July 2020

- Led a 4-member team to develop a drone movement controller with pathfinding algorithms and PID-based control, enhancing navigation speed by 22%.
- Integrated **camera sensors with marker detection** for automated goal identification, deploying the system on ROS for simulated autonomous control.
- Applied **DDPG** and **PPO** for motion planning, achieving optimal trajectory generation in complex environments.
- Deployed a **vision-based autonomous system** on ROS and simulated behavior in V-REP, achieving robust testing and validation for real-world scenarios.
- Improved the overall system's response time and accuracy in dynamic environments by optimizing algorithm performance and sensor integration.

- Developed a positioning and control system for autonomous drones using **Wi-Fi and GPS-based navigation**, integrating the Pixhawk flight controller and internal compass for maintaining drone stability and position.
- Designed a drone monitoring system using **Raspberry Pi, processing video feeds** for continuous position tracking and transmitting data to the ground station.
- Researched and proposed reinforcement learning techniques, including Q-learning and DQN, for optimizing **camera-based pathfinding and obstacle avoidance**.
- Collaborated with a team to integrate onboard sensors with computer vision modules, ensuring precise control and feedback for enhanced navigation.

SKILLS

Languages	Python, C/C++, Java, Scala, Javascript, SQL, PySpark
Databases	Relational (MySQL, SQL Server, PostgreSQL), NoSQL (MongoDB, Cassandra), Snowflake
Cloud	AWS, Microsoft Azure, Azure Data Factory, Microsoft SQL Server, AWS S3, Kubernetes
DL Framework	PyTorch, TensorFlow, Keras, Scikit-learn
Big Data Tools	Apache Kafka, Spark, GCP (BigQuery), Airflow, Hadoop, Hive
ML Tools	MLFlow, Kubeflow, Google Cloud Vertex AI, TensorRT
Computer Vision	OpenCV, EfficientDet, DETR, Transformers, DeepLabV3+, DensePose, ResNet, MobileNet
Robotics	ROS 1/2, V-Rep, Gazebo, MuJoCo, Sensor Fusion, Jetson Orin, MoveIt2, Rviz2, LiDAR, Perception, Planning

EDUCATION

San Jose State University, MS in Artificial Intelligence California, USA	GPA: 3.63 / 4.0	Dec 2024
National Institute of Technology, B.Tech in Electrics and Communication Delhi, India	GPA: 7.49 / 10	Aug 2020

THESIS

Vision Based Empowerment - Intrinsic Motivation Python, Mathematics, Dynamical Systems	Jan 2023 - Dec 2024
<ul style="list-style-type: none">This thesis explores empowerment as an intrinsic motivation model in robotics. It focuses on how differentiable sensors, particularly visual data, can enhance an agent's ability to influence and perceive its environment, simulating human-like multi-sensory engagement to optimize decision-making and interaction in dynamic scenarios.	

PUBLICATION

Algorithm for Distracted Driver Detection and Alert Using Deep Learning Springer	July 2021
<ul style="list-style-type: none">Model divides driving behavior into ten categories, nine dealing with drivers distracted by other activities and one with "safe driving". Our system will alert the driver if he is determined to be in any of the nine distracted classes, reducing the likelihood of an accident.	

PROJECTS

Human Pose Detection in Self-Driving - Autonomous Systems Python, CUDA Pytorch, Transformer,	Aug 2023 - Dev 2023
<ul style="list-style-type: none">Created a transformer-driven model for self-driving applications, specifically designed to identify human poses using the Waymo v2.0 dataset. Implemented the transformer's encoder architecture to analyze image patches, enabling the model to predict the 14 key points in the dataset.	
PPO Implementation – Reinforcement Learning	Jan 2023 - May 2023
<ul style="list-style-type: none">Executed the PPO algorithm (Reinforcement Learning approach) across diverse scenarios, incorporating full state, partial state, and image inputs into the neural networks for the Pendulum environment within OpenAI Gym. Variational Autoencoders (VAE) also inspired a latent space network to convey image information to the actor-critic network. In this project, I successfully navigated the complexities of reinforcement learning in various input modalities, demonstrating adaptability and innovation in algorithm implementation.	
Dc-GANs (Deep Convolutional Generative Adversarial Network) – Fashion MNIST	Nov 2022 - Dec 2022
<ul style="list-style-type: none">Devised a DcGAN architecture & successfully trained within 50 epochs to generate of realistic synthetic images.Attained an impressive DcGAN loss rate of 0.014 for the generator model.	