

Ashutosh Kumar

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Experience

Senior Engineer – AI/ML Model Validation, Automation & GenAI Solutions

Tata Elxsi, Bangalore

Nov 2021 – July 2025

- Designed and implemented **data preprocessing**, **model testing**, and **scenario integration workflows** in **Python** for **perception** and **prediction** modules, improving defect detection and analysis speed.
- Leveraged **supervised deep learning (CNNs)** with **synthetic image augmentation (OpenCV)** to handle rare and underrepresented edge cases, increasing training dataset diversity and improving model coverage by **40%**.
- Performed **A/B testing**, **statistical hypothesis testing**, and regression analysis on model versions, **reducing false positives** by **25%**.
- Integrated **LLMs (OpenAI GPT, Hugging Face Transformers)** with **RAG pipelines** using **FAISS** for fast **vector search** and **contextual retrieval**, cutting scenario lookup time by **60%**.
- Built real-time **dashboards** in **Power BI** and **pandas** to monitor **precision**, **recall**, **latency**, and **false alarms**.
- Containerized workflows with **Docker** and integrated **MLflow** for experiment tracking via **CI/CD pipelines**.
- Worked extensively in **Linux (Ubuntu)** environments for development, deployment, and automation workflows.
- Collaborated in an **Agile product development environment** using **JIRA** for sprint tracking, backlog grooming, and cross-functional alignment.

Key Projects

Autonomous RoboTaxi – Predictive Modeling & GenAI Integration

Remote, Jan 2024 – July 2025

- Built **LSTM-based time-series models** to forecast **vehicle trajectories**, **pedestrian risks**, and **braking events**, improving hazard detection lead time by **2.5s**.
- Designed a **risk scoring engine** with sliding-window predictions, enabling early alerts in **92%** of critical cases.
- Applied **Multi Agent RL** for cooperative traffic simulation, reducing predicted collision risk by **18%**.
- Developed a **RAG pipeline (LangChain, FAISS, SentenceTransformers)** for retrieving past driving scenarios.
- Used a **PEFT approach (LoRA)** to **fine-tune** a **Generative AI** model for synthetic data generation, improving the **F1-score** for rare-event detection by **15%**.
- Automated **feature engineering** and validation (**scikit-learn, PyTorch, pandas**), cut preprocessing time by **45%**.
- Validated models on **NVIDIA Omniverse AV simulator** with **Drive AGX-inspired SoC architecture**, generating high-fidelity multi-sensor data (**camera, LiDAR, radar**) and performing closed-loop edge-case testing in a **Linux** orchestration environment, increasing simulation throughput.
- Deployed AI workflows on **Azure Machine Learning** for model training, monitoring, and pipeline automation, and leveraged **GCP Vertex AI** for **scalable inference** and cross-environment testing.

Technical Skills

Languages: **Python, SQL, C**

AI/ML: **Supervised, Unsupervised, Reinforcement Learning, Computer Vision, OpenCV, CNN, Scikit-learn, TensorFlow, PyTorch, ARIMA, XGBoost, GAN**

Generative AI: **LLMs (GPT, Gemini, Claude, Ollama, LLaMA, Mistral, Mixtral), Hugging Face, LangChain, RAG, FAISS, Pinecone, Chroma, Vector DB, Prompt Engineering, Fine-tuning, PEFT (LoRA, QLoRA, Quantization), OpenAI API, Anthropic API, Cohere API**

APIs/MLOps/Cloud/Data/Collab: **FastAPI, REST API, Flask, Django, Docker, MLflow, CI/CD, Azure, AWS, GCP, Linux, Ubuntu, ONNX, NumPy, pandas, Power BI, Looker, Excel, JIRA, Confluence, Git**

Education

B.Tech, Computer Science & Engineering – University of Engineering and Management, Kolkata

2017–2021

CGPA: **8.6/10**

Awards & Achievements

Extra Mile Award – Led **ADAS predictive modeling & automation**, boosting accuracy by **40%**.

Project Excellence Award – Fine-tuned **ML models** & improved stability, meeting delivery timelines.

Certifications

Machine Learning • Python for Data Science • Automation • Data Analytics Essentials • Elements of AI