Aditi Tyagi
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Professional Summary

Accomplished and results-oriented AI/ML Engineer with approximately 8 years of industry experience, combining deep expertise in artificial intelligence, machine learning, and computer vision. Adept at architecting, developing, and deploying advanced deep learning systems across automotive, telematics, and smart mobility domains. Recognized for delivering high-impact solutions that span edge-to-cloud ecosystems—including real-time vehicle tracking, driver behavior analytics, and safety monitoring.

Proven track record of building production-grade object detection systems using YOLO (v5/v8), Faster R-CNN, Vision Transformers, and 3D CNNs. Expertise includes large-scale telematics data processing, human activity recognition using pose estimation, and predictive analytics for electric vehicle and fleet management systems. Demonstrated ability to transform complex datasets into actionable insights and intuitive dashboards, with seamless integration into enterprise platforms.

Possesses a strong foundation in both research-driven experimentation and industry-grade deployment. Known for independently delivering novel detection frameworks (e.g., transformer-based phone detection, optical flow for excavator tracking) and effectively collaborating across cross-functional teams. Skilled in balancing innovation with reliability, ensuring solutions are explainable, accurate, and optimized for performance.

Core Competencies

Deep Learning & Computer Vision:
- Development and optimization of detection models using YOLOv5/v8, Faster R-CNN, Vision Transformers, and 3D CNN architectures
- Robust pipeline creation for complex visual tasks such as driver phone detection, vehicle load tracking, and fall detection

Human Activity & Behavior Analytics:
- Fall detection, pose estimation, gesture-based classification, and gaze tracking in safety-critical environments

Telematics & Mobility Intelligence:
- Location heatmaps, fleet behavior modeling, driver risk profiling, and predictive analytics for electric vehicles

Machine Learning & Statistical Modeling:

- Expertise in logistic regression, clustering, decision trees, Naïve Bayes, and sentiment analysis using real-world vehicular and social data

Generative AI & LLM Workflows:
- Applied GenAI methods using LLMs (6B+), RAG pipelines, LangChain, and Hugging Face transformers for domain-specific document and vision tasks

Programming & Integration:
- Advanced Python & R development, backend integration using JS (Node.js, REST), SQL/MongoDB, and pipeline orchestration

Visualization & Deployment:
- End-to-end model lifecycle management; deployment using ONNX/TensorRT on edge (Jetson), dashboarding with Plotly/Tableau, and cloud-hosted APIs

Tools & Frameworks:
- TensorFlow, PyTorch, OpenCV, Dash, FastAPI, AWS (Lambda, S3), Jetson Nano/TX2

Cross-Domain AI Application Areas:
- Smart vehicle safety systems, telematics optimization, insurance analytics, GSM/GPS signal intelligence

Innovation & Research Impact:
- Independently led development of transformer-based distracted driving detection, real-time excavation analytics, and human posture safety systems under real-world deployment constraints

Education

2024 **MTech, Artificial Intelligence and Machine Learning**
BITS Pillani (pursuing)

2020 **Business Analytics and Business Intelligence**
Great learning and University of Austin, Texas

2013 **BTech, Information Technology**
CCSU, Meerut ,India

Continuing Education

- Certification in "Data Science " from IIT Madras and NPTEL, April 2019(70%).

SKILLS and IT Exposure

Programming Languages	**Python (Expert), R (Expert), HTML, JavaScript (Intermediate), C, MATLAB (Basic)**
Machine Learning & Statistical Tools	Logistic Regression, Decision Trees, Clustering, Naïve Bayes, Sentiment Analysis
Deep Learning Frameworks	PyTorch, TensorFlow, Keras, Hugging Face Transformers
Computer Vision Libraries	OpenCV, Detectron2, YOLOv5/v8, 3D CNNs, Vision Transformers
Generative AI & LLM	LangChain, Retrieval-Augmented Generation (RAG), OpenAI API, LLMs (up to 6B)
Data Visualization	Plotly, Dash, Tableau, Matplotlib
Databases	SQL, MongoDB
Deployment & Integration	REST APIs, FastAPI, ONNX, TensorRT, Jetson Nano/TX2
Cloud & DevOps	AWS (Lambda, S3), Docker, Git
Communication Protocols	MQTT, HTTP/HTTPS, REST
Operating Systems	Ubuntu, Windows
Project Tools & Methods	Agile, Scrum, Confluence, JIRA
Soft Skills	Stakeholder Management, Customer Engagement, Technical Leadership, Presentation Skills

Experience

IOTian Technologies Pvt Ltd, Koramangala, Bengaluru, Karnataka
AI Engineer (Server & AWS Platforms)
May 2021 to Present

- Worked on Teltonika and Aries Telematics Unit Analytics to analyze the data, connect to the server, and display reports with visualization on web pages.
- Worked on Vision transformer for detecting whether person is talking over phone while driving.
- Developed object detection models using Faster RCNN and YOLOv5 for accurate
- detection in images and videos.
- Worked on object detection algorithms like Faster RCNN and YOLOV for detecting
- objects in images and videos.
- Developed 3D-based vision models using 3D CNN and Pose Estimation to recognize human activities and detect accidental falls, integrating advanced 3D reconstruction methods for improved scene understanding.
- Worked on Truck and Excavator Detection, Truck count, excavator bucket count per truck.
- Worked on DMS used cases like Drowsiness, neck falling, eyes yawning etc.
- Built a Retrieval-Augmented Generation (RAG) system using a 6B-parameter LLM that answers company-specific document queries with high accuracy.

Core Time Solution, New Delhi

Software Engineer
August 2017 to April 2021

- Classification techniques like Multinomial Logistics Regression in order to find Areas with less Network coverage including GSM – for Vodafone, Airtel and GPS – for sensor-based data received from Vehicle server.
- Performed Sentiment Analysis on data available at Vehicle server of vehicle driving for insurance companies using Multinomial Naïve Bayes highlighting safety-related driving crossovers like speed limit, Rash turning, Harsh Braking and Harsh Accelerations.
- Designed Dashboards for Customer and Insurance companies like Driving behavior, Risk analysis, Sentiment analysis, Safety-related driving crossovers, GPS coverage areas and Less GSM Network coverage areas for SIM manufacturers.

Significant Performance

1. Truck and Excavator Activity Detection and Operational Analytics

Client: Tata Hitachi (India)

Designed and implemented a computer vision-powered analytics system to monitor earth-moving activities on live construction sites. The solution automated detection, tracking, and reporting of truck loading cycles and excavator bucket counts to optimize material movement workflows and site productivity.

- Developed a YOLOv5-based object detection pipeline to detect trucks and excavator buckets in real-time video streams captured from static overhead and mobile cameras.
- Implemented a frame-wise optical flow logic to track the vertical motion of the bucket for precise dump detection and bucket fill counts per truck.
- Used Deep SORT to maintain identity tracking of trucks across scenes, including handling occlusions and lighting variations.
- Computed per-truck KPIs including number of buckets loaded, ideal time spent at the pit, waiting time, and cycle efficiency.
- Final analytics integrated with an Excel-based dashboard and report generation system used by construction site supervisors and logistics managers
- **Technical Contributions:**
  - Designed and trained custom YOLOv5 models with hard mining techniques for low-angle and night scenes.
  - Developed a modular vision processing pipeline using OpenCV and NumPy for optical flow and truck-bucket intersection analysis.
  - Built automated CSV and Excel report generation modules for shift-wise summary.
  - Collaborated with site engineers to iteratively calibrate detection thresholds, minimum dump duration, and inactivity windows.
  - Achieved over 92% accuracy in per-truck cycle reporting under variable daylight conditions and dust interference.

2. Driver Distraction Detection using Vision Transformers

Client: SmartDrive Mobility Solutions (Pilot with Municipal Fleet Safety Program)

Developed a cutting-edge AI system to detect distracted driving behaviour—specifically mobile phone usage—using cabin-facing cameras. The project aimed at enhancing public transport and commercial fleet safety using transformer-based vision models.

- Created a custom Vision Transformer (ViT) model architecture tailored for detecting subtle visual cues like hand-to-ear gestures, phone-in-hand positions, and eye-gaze direction.
- Curated a diverse dataset of drivers across multiple lighting scenarios, angles, and ethnic groups to ensure robustness and fairness.
- Integrated attention heatmap overlays to visualize model focus and increase explainability for compliance and audit teams.
- Engineered the deployment pipeline for edge inference using NVIDIA Jetson Nano with real-time alert generation and dashboard sync.
- **Technical Contributions**:
  - Built the full data pipeline: curated dataset, created bounding box annotations, augmented data for night/blur/sunglasses variations.
  - Fine-tuned pre-trained ViT backbone using contrastive learning and focal loss to handle class imbalance.
  - Designed post-processing rules to filter false positives using temporal motion logic and driver gaze anchoring.
  - Integrated model with an AWS-hosted dashboard for alert logging and video snapshot retrieval.
  - Reduced latency by 40% using ONNX model optimization and TensorRT deployment.

3. Fall Detection and Human Activity Recognition using 3D Vision

Client: MedTech Robotics Lab (Prototype)

- Designed a vision-based safety module for detecting falls and unusual human posture activity in industrial environments.
- Developed deep learning models using 3D CNNs and pose estimation techniques for robust recognition in cluttered and dynamic scenes.
- Applied biomechanical constraints to improve false positive rejection and scene adaptation.
- **Technical Contributions:**
  - Developed the full deep learning pipeline with OpenPose + 3D CNN integration.
  - Optimized the model for edge inference on Jetson TX2 using TensorRT.
  - Performed temporal smoothing using LSTM to reduce prediction jitter.
  - Created synthetic datasets for edge case augmentation using Unity-based simulation environments.

4. Electric Vehicle Telematics and Location Intelligence

Client: eBikeGo, India (Mobility-as-a-Service Provider)

- Worked with e-bike telematics data from Delhi, Bangalore, Hyderabad, and Mumbai to derive operational insights and performance diagnostics.

- Applied data-driven testing capabilities to analyze usage patterns and system health metrics to optimize fleet operations and battery lifecycle.
- Implemented location intelligence algorithms to identify high-frequency usage zones and idle hotspots for fleet optimization.
- **Technical Contributions:**
    - Developed backend services in Python to process and serve analytics data from MQTT and REST sources.
    - Integrated JavaScript and Python-based ML inference engines with AWS Lambda and S3.
    - Built and deployed interactive dashboards using Dash and Plotly for real-time insights.
    - Collaborated with the client on KPIs for operational efficiency, downtime reduction, and utilization heatmaps.

5. Document Intelligence- "Ask Anything" LLM Interface

Client: Internal R & D Project(confidential)

- Developed an interactive interface that enables users to ask natural language questions and retrieve
- answers from internal organizational documents.
- Ingested diverse unstructured data sources including PDFs, PowerPoint presentations, plain text files,
- and URLs to build a unified knowledge base.
- Implemented document preprocessing pipelines for OCR, chunking, and metadata tagging to support downstream retrieval and summarization tasks.
- Evaluated transformer models for Q&A and summarization, selecting optimal architecture for different
- document types.
- **Technical Contributions:**
    - Built an ingestion pipeline to clean and preprocess multi-format documents using PyMuPDF, BeautifulSoup, and OCR libraries.
    - Experimented with multiple LLMs from Hugging Face including Tiny LLaMA for lightweight QA
    - and bart-large-cnn for abstractive summarization.
    - Integrated the solution into a front-end interface with real-time search and QA capability using
    - Streamlit and Flask.
    - Used ROUGE score and manual evaluation to benchmark summarization quality and
    - information retrieval accuracy.
    - Planned future improvements including table-specific extraction using layout-aware models
    - like LayoutLMv3 and TAPAS.