

PANKAJ KASAR

Experienced AI & Computer Vision Engineer | Real-time Detection & Image Segmentation | LLMs, RAG, LangChain | Machine Vision & Image Processing | OpenCV • PyTorch • Deep Learning • NVIDIA Edge Devices

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SUMMARY

AI Engineer with 7+ years of combined research and industry experience in Computer Vision and LLM-based solutions. Skilled in real-time object detection, segmentation, and edge optimization, along with building RAG pipelines and LangChain workflows for intelligent retrieval and automation. Passionate about developing scalable, production-ready AI systems that blend vision and language capabilities.

TECHNICAL PROFICIENCY

- **Programming Languages:** Python, C++, LaTeX
- **Packages / Frameworks:** PyTorch, LangChain, HuggingFace, OpenCV, ONNX, TensorRT, Tensorflow, Pandas, NumPy, Scikit-Learn
- **Tools Platforms:** Gstreamer, Streamlit, FastAPIs, ChromaDB, Git, MediaMTX, Docker, Amazon Web Services (AWS)

EXPERIENCE

AI ML Engineer

Griffyn Robotech Private Limited

July 2022 – Ongoing

Pune MS

DeepSight | AI-Powered Cosmetic Grading for Mobile Devices (US, Japan Clients)

Enhanced a patented AI-based cosmetic grading platform for automated smartphone condition assessment.

Migrated the Micro-defect detection pipeline from **YOLOv5** to transformer-based **DFine**, improving detection accuracy by **2-3%** and increasing prediction confidence.

Applied **multi-exposure image fusion** (1k, 5k, 300k exposures) and image-processing techniques to improve Fine-grained defect visibility and grading consistency.

Led performance optimization of the **MacU-Net** segmentation model by evaluating alternative training strategies and loss-function combinations, improving robustness and reducing segmentation errors on heterogeneous mobile devices.

Impact: Improved grading accuracy and subtle defect detection reliability, enabling more consistent automated device valuation.

Software: DFine, MacU-Net, U-Net, U-Net++, YOLOv5, PyTorch, OpenCV, Python.

Document & Data Chatbot using Open-Source LLMs (Big Tech Company, U.S.)

Designed and deployed an on-premises conversational AI system enabling natural-language interaction with enterprise workflow documents and private manufacturing databases.

Implemented an **intent-based query classification and routing layer** to automatically route user queries to **document RAG**, **database QA**, or **general LLM reasoning** pipelines.

Built a production-grade **document RAG pipeline** using **bge-large-en** embeddings and **ChromaDB**, with **Llama-3** as the generator and a re-ranking stage to improve answer relevance and reduce hallucinations.

EDUCATION

PhD Researcher – AIML (Program Not Completed)

Dr. Babasaheb Ambedkar Technological University, Lonere, Raigad, MS, India

2018 – 2023

Lonere, Raigad, MS, India

M.TECH. in Computer Engineering

Dr. Babasaheb Ambedkar Technological University

July 2011 – July 2013

Lonere, Raigad, MS, India

7.71 CGPA, Distinction

B.E. in Computer Engineering

University of Mumbai

June 2006 – June 2010

Mumbai

68.26 %, First Class

Developed a secure **Database QA framework** that converts English queries into pandas based executable code for extraction of accurate numerical insights from **PostgreSQL** databases.

Deployed the complete solution fully **on-premises** to comply with enterprise data privacy and security requirements.

Impact: Enabled non-technical users to access production data and documents via natural language, significantly reducing reporting effort and decision latency.

Software: Llama-3, LangChain, PostgreSQL, ChromaDB, bge-large-en embeddings, Python, REST APIs.

Screw Hole Inspection | AOI for Smartphone Bodies (Big Tech Company, U.S.)

Built a high-precision AOI system for screw-hole diameter and thread inspection on CNC parts achieving $\pm 5 \mu\text{m}$ accuracy using Hough Circle + Sobel edge scanning and **RANSAC** fitting.

Special Contribution: Designed custom criteria to select the most reliable circle from multi-Hough detections and applied gradient-filtered semicircular edge constraints (**10% radius tolerance**) for stable diameter estimation.

Developed a YOLO-based thread detection model achieving **100% repeatability**.

Impact: Reduced inspection cycle time from **2 min to 30 sec** with consistent micron-level repeatability.

Hardware: Baumer/OPT cameras, telecentric lenses, arc/ring lights, PLC gantry.

Software: OpenCV-Image Processing, YOLOv11s, NeoAPI, C++, YOLOv11.

Forklift Safety Surveillance System (Leading Engineering & Forging, Company)

Developed a real-time driver monitoring and pedestrian detection system for forklift safety using MediaPipe (EAR/MAR drowsiness detection, helmet/mobile tracking) and a tuned **YOLOv5s** pipeline (**mAP 0.8**).

Special Contribution: Integrated a secondary **ResNet-18 classifier** on low-confidence detections (<70%) to suppress false positives and improve reliability in dynamic shop-floor environments; implemented auto-brake triggering when pedestrians entered **2-ft proximity**.

Impact: Deployed on **30 forklifts**, achieving stable **25 FPS** real-time operation with continuous recording and 7-day auto-purge for storage efficiency.

Hardware: NVIDIA Jetson Nano, CSI front camera, USB side/rear cameras.

Software: MediaPipe, YOLOv5s, TensorRT, ResNet-18, OpenCV.

ROBOCELL – Surveillance-Based Safety System (Leading Engineering & Forging, Company)

Designed and deployed a real-time pedestrian safety system for a **10m × 10m high-temperature forging robocell** using dual diagonally placed smart cameras powered by **Jetson Xavier NX**.

Built a real-time deep-learning based face recognition system using **YOLOFace** and **InsightFace** optimized for high FPS, low memory usage, and robust on-device identity verification.

Implemented a **YOLOv8** detection pipeline (**mAP 0.8**) with a secondary **ResNet-18 classifier** to suppress false positives, enabling highly reliable human-presence alerts and **automatic cell shutdown with alarms**.

Impact: Improved shop-floor safety by enabling instantaneous machine stoppage on human entry, significantly reducing accident risk.

Hardware: In-house smart cameras, 6mm lenses, NVIDIA Jetson Xavier NX.

Software: YOLOv8, ResNet-18, GStreamer, MediaMTX, RTSP streaming, inotify-tools.

Vehicle Surveillance System | Vehicle Video Analytics

Developed an Automatic Number Plate Recognition (ANPR) system for civil and defense vehicles for client **Indian Defense**, optimized to handle motion-blurred vehicle footage.

Leveraged state-of-the-art models, such as **YOLOv5** for vehicle and numberplate detection, with **CRAFT** for character detection and **PArSeq** (transformer-based) for character recognition, which does OCR for varied cases of detected license-plate .

Integrated the **NAFNet** deblurring network to enhance license-plate clarity under motion blur and low-light conditions.

Achieved consistent end-to-end ANPR accuracy of **95%+** across varying traffic speeds, illumination levels, and camera viewpoints.

Impact: Significantly improved vehicle identification reliability in real-world field deployments, strengthening operational monitoring for civil and defense surveillance.

Research Scholar

Dr. Babasaheb Ambedkar Technological University

📅 June 2018 – July 2023

📍 Lonere, MS

Brain MRI Image Segmentation for Tumor Localization

Developed and evaluated deep learning-based semantic segmentation pipelines for automated brain tumor localization from MRI datasets for clinical decision support.

Worked with public datasets including **Figshare Brain MRI (T1)** and **BRATS 2021** multi-modal images (T1, T1c, T2, FLAIR).

Benchmarked multiple encoder-decoder architectures: **U-Net**, **SegNet**, **U-Net+CBAM**, **ResU-Net**, **MultiResU-Net**, **MacU-Net**. Applied preprocessing and augmentation including intensity normalization, patch extraction, spatial augmentation, and elastic deformation.

Key Results:

- **Figshare MRI:** U-Net outperformed SegNet with DSC scores of **0.76 vs 0.67**.
- **BRATS 2021:** **MacU-Net** achieved top performance with DSC scores of **0.9203 (whole tumor)**, **0.9113 (enhancing tumor)**, **0.8726 (tumor core)**.

Established a high-accuracy segmentation workflow suitable for clinical-grade tumor localization and architectural benchmarking.

Assistant Professor

R. C. Patel Institute Of Technology, Shirpur, An Autonomous Institute

📅 Aug 2013 – July 2022

📍 Shirpur, Dist- Dhule MS

- o Delivered undergraduate courses in **Machine Learning, Deep Learning, AI, Algorithms, and System Programming**, combining theory with practical industry-oriented applications.
- o Designed curriculum modules and conducted workshops on AI/ML applications in healthcare, manufacturing, and data-driven decision systems.
- o Supervised and mentored students on research and final-year projects in machine learning, computer vision, and data science.
- o Organized and contributed to national-level training programs, webinars, and technical workshops focused on emerging technologies.
- o Published research papers and collaborated on sponsored R&D projects, including a **TEQIP-III funded Computer-Aided Diagnosis system** using machine learning.
- o Served as reviewer for reputed Scopus/SCI-indexed venues including the **Imaging Science Journal (Taylor & Francis)**, **International Journal of Data Mining and Bioinformatics**, and the **i-CREATE 2020** conference.

INVITED TALKS / WORKSHOPS

- Delivered a one-day workshop on “**RAG (Retrieval Augmented Generation) with LangChain**” at RCPIT, Shirpur (22 Nov 2025).
- Presented a webinar on “**Introduction to Machine Learning using Python**” at K. J. College of Engineering and Management Research, Pune (13 Nov 2021).
- Served as Resource Person for “**Machine Learning using Python**” in the AICTE-ISTE Induction/Refresher Program (Phase III), Government Polytechnic, Nanded (18–24 May 2021).
- Served as Resource Person for “**Machine Learning**” in the AICTE-ISTE Induction/Refresher Program (Phase II), Government Polytechnic, Nanded (16–22 Feb 2021).
- Coordinator for the TEQIP-III national workshop “**Machine Learning and Its Healthcare Applications**” at R. C. Patel Institute of Technology, Shirpur (13–15 Feb 2021).
- Delivered three expert sessions on “**Machine Learning using Python**” at Government Polytechnic, Jalgaon (10 Feb 2020).

ACHIEVEMENTS



University Research Grant Project

Title: Implementation of Computer Aided Diagnosis (CAD) System using Machine Learning for Tribal Areas. **Funding Agency:** TEQIP-III, Dr Babasaheb Ambedkar Technological University, Lonere. **Sanctioned Amount & Date:** Rs. 3 Lacs, 01/08/2019 **Amount Utilized:** Rs. 3 Lacs **Project Duration:** 1 Year **Project Status:** Completed



GATE Qualification

Qualified **GATE (Computer Science)** three times: 2015 (Score: 357), 2014 (Score: 330), and 2011 (Score: 335).



AICTE Subject Expert

Served as a Subject Matter Expert for AICTE's Student Learning Assessment Project (ASLAP), contributing original, unplagiarized questions for the emerging area **Data Science**.