

Saurabh Khanduja

• Head of Perception • Backend Engineer

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Summary

Computer Vision and Machine Learning specialist with expertise in real-time multi-camera multi-object tracking, object re-identification, and robust software engineering.

Professional Experience

ML Engineer→Head of Perception **Ikara Vision Systems Gmbh** **Sept 2021 – July 2025**

Multi-Camera Multi-Person Tracking (Terraform, Docker, Python, PyTorch, AWS (S3, EC2 & IAM), Pandas, MMLabs, Optuna)

- Developed real-time multi-camera tracking across 50+ synchronized cameras for secure site monitoring.
- Enhanced multi-camera joins using pose triangulation (RTMPose) and appearance embeddings (Clip-ReID).
- Improved re-identification pipeline, achieving 55% improvement in mAP over Clip-ReID baseline (40% →62%).
- In-house built tools for Multi-Camera Labeling, Visualization and Analysis.
- **AutoLabel++**: A scalable framework to train object detection models to new sites using knowledge distillation.

Distributed Computer Vision solutions for Customer Behavioral Analysis (Docker, Python, Celery, Ansible, Mongo, PostgreSQL, InfluxDB, TensorRT, Rabbitmq, Telegraf, Grafana, Jira, SQLite)

- **Core Responsibility** - Took ownership of a mismanaged third-party project with over 30K lines-of-code and deployed across 1,000+ stores in 3 countries.
- Led team of 7 engineers to demystify the monolithic application, introduced structure to undocumented processes, resolved high volumes of client complaints, and restored product stability and client confidence.
- Redesigned high demand components of application from a centralized management server to a distributed management system.
- Redesign periodic polling with event-driven push, reducing read requests by ~94%.
- Reviewed over 20K LOC and implemented unit and integration testing followed with continuous integration pipelines to uncover inherent bugs and ensure long-term product robustness and stability.
- Achieved a complete 100% resolution of client complaints related to software (non-ML) issues.
- Improved the core computer vision product with state of the art models and tracking algorithm tuned to specific sites using anonymized feed collection and automated labeling with human-in-the-loop.
- Successfully deployed solutions across 1000+ stores using a cost-effective in-house deployment manager.

Cargo Volume measurement for an airline (Docker, Python, C++, Open3D, Qt, Depth Cameras - Helios & Nerion)

- Multi-process real-time pipe & filter architecture for 3D Reconstruction, pointcloud cleaning and contour fitting.
- Anonymization Software (FastAPI, Milestone VMS, AI Bridge, Pytorch, Tensorrt, PyNvVideoCodec, C++)*
- Implement low-latency face and license plate detection software to anonymize RTSP streams.
- Improved load balancing to ensure high GPU utilization using shared decoders and batching.

Work Student **Terraloupe & ECR Gmbh** **April 2018 – August 2021**

Improving Core ML Products and Production Infrastructure (Python, Go, Docker, Kubernetes)

- Implement serving and testing of PyTorch models over Kubernetes pods.
- Implement tracking metrics to benchmark multi-object tracking associators.
- Designed benchmark to evaluate internal defect predictors on real data as well as synthetically introduced defects.
- Designed 4 new safety performance indicators to measure safety of autonomous vehicles.

Training Data Management Tool (Python, Django, PostgreSQL, PostGIS)

- Development of PostgreSQL-based inventory database with geo-coordinate support for world map datasets and a query service for sampling datasets from the database.

Core Deep Learning Pipeline (Docker, Python, Keras, Tensorflow)

- Development of single pipeline supporting Image Classification, Object Detection and Semantic segmentation tasks.
- Optimization of training and inference phase with resulting GPU utilization of over 90%.

Image Team Lead **Roposo, India** **Nov 2015 – Oct 2017**

Image Processing Service Development (Java, AWS, OpenCV, ffmpeg)

- Optimizations to efficiently use servers, leading to 70% cost reduction.
- Enable dynamic compression of media using SSIM metric.
- Quantifying social posts ownership by measuring plagiarism using image metadata analysis.
- Implemented Beauty filter based on variational approach by Farbman, Zeev, et al. [1]

Software Development Engineer

Amazon, India

Oct 2014 – Nov 2015

Resell Product Form (Java, DynamoDB)

- Development of data model to reduce user interaction for form completion and data payload for mobile usage.
- Improved form completion rate by 5× with reduction of data payload by 99.5%.

Catalog Labeling Quality Platform (Python, Apache Spark)

- Developed a platform to cluster Amazon catalog data with Human-in-the-Loop analysis, reducing catalog quality check time from several weeks (previously infeasible) to under an hour.

Software Development Engineer

KritiKal Solutions Pvt. Ltd., India

June 2012 – Oct 2014

Atmosphere Turbulence Removal Module (C++, Cuda, DLib, OpenCV, Qt, libpthread)

- Development of Atmosphere Turbulence Removal Module based on Non-Rigid Registration method [2].
- Optimizations added using Pipe-And-Filter architecture and cuda implementation, achieving **240x** speedup.

Wide Area Tracking Module (C++, OpenCV, Qt)

- Designed and implemented a module for controlling Pan and Tilt Device.
- Real time stitching of multiple CCD/Infrared Cameras to produce a wider view.
- Change Detection and Tracking module to detect and track objects of interest.

Academic Projects

Master Thesis

CAMP*, Technical University of Munich

Dec 2020 – June 2021

Weakly Supervised Semantic Segmentation using Low-level neural network features

- We proposed a novel approach for dissecting classification neural networks to extract semantic maps.
- The method improves the mIOU metric by more than 20% on the vgg and resnet backbone models w.r.t. class activation maps.

Research Assistance Project

Technical University of Munich

Dec 2019 – May 2020

Neural Response Interpretation through the Lens of Critical Paths, CVPR 2021 (Pytorch, python) [3]

- **CVPR 2021** - Improving interpretability using path selection via neurons' contributions to the response.

Education

Munich, Germany

Technical University of Munich

Oct 2017 – July 2021

- M.Sc. in Informatics with *Distinction*, GPA: 1.3/1.0
- Graduate Coursework: Machine Learning; Deep Learning; Principles of Computer Vision; Multiple View Geometry; Tracking and Detection in Computer Vision; 3D Scanning & Motion Capture; Protein Prediction.

Dhanbad, India

Indian Institute of Technology

July 2008 – May 2012

- B.Tech. in Computer Science and Engineering, CGPA: 7.51/10.0

Technical Skills

- Programming Languages: Python, C, C++ with minor dabbles in Go, Matlab, HTML, CSS, JS.
- ML/CV Toolkits: PyTorch, OpenCV, Open3D, Numpy, Pandas and many more.
- Application Development: Docker, Kubernetes, Rabbitmq, Redis, Kafka, Telegraf, Grafana, Celery, Ansible, Terraform, PyQT, MongoDB, PostgreSQL, InfluxDB.
- Project and Team Management - Jira, Linear.

References

- [1] Zeev Farbman et al. "Edge-preserving decompositions for multi-scale tone and detail manipulation". In: *ACM Transactions on Graphics (TOG)* 27.3 (2008), pp. 1–10.
- [2] Daniel Rueckert et al. "Nonrigid registration using free-form deformations: application to breast MR images". In: *IEEE transactions on medical imaging* 18.8 (1999), pp. 712–721.
- [3] Ashkan Khakzar et al. "Neural Response Interpretation through the Lens of Critical Paths". In: *CVPR*. 2021.

*<http://campar.in.tum.de/Chair/ResearchIssueComputerVision>