Saurabh Khanduja

Email: khandujasaurabh@gmail.com
Github: https://github.com/saurabheights
Linkedin: https://linkedin.com/in/saurabheights

Phone: +49 1772075019
Address: Willi-graf-strasse 9, Room 337
Munich 80805

Summary

Computer Vision specialist with 5+ years professional experience, including 2 years devoted to developing real-time vision modules for national defense and 2 years to building image and video processing service for a social media platform. I specialized in neural network interpretatibility and its applications to weakly supervised semantic segmentation as part of my master's degree. As a work student at Terraloupe, I designed a training data management tool for geospatial annotations and at Edge Case Research I designed new SPIs for measuring safety of an autonomous vehicle perception system.

Professional Experience

ML Engineer **Edge Case Research Gmbh** **May 2020 – Present**

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

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

ML Engineer **Terraloupe Gmbh** **April 2018 - April 2020**

Training Data Management Tool (Python, Django, Postgres)

- Development of postgres-based inventory database.
- Development of inventory query service with support for filtering over data distribution to extract desired subset for training neural networks.

Core Deep Learning Pipeline (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 and CPU utilization to over 90%.
- Object based metrics implemented for semantic segmentation.

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 using SSIM metric increasing user retention by 40%.
- 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 500% with reduction of data payload by 99.5%.

Software Development Engineer **KritiKal Solutions Pvt. Ltd., India** **June 2012 – Oct 2014**

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

- Development of Atmosphere Turbulence Removal Module based on Non-Rigid Registration method [2].
- Optimizations added using libpthread and cuda, 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 of dissecting classification neural networks to extract semantic maps.
- The method improves mIOU metric by over 20% on 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]

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

Killing Fusion, CVPR 2017 (C++, Matlab) [4]

- Use Killing energy, Level-set energy and data energy to provide non-rigid registration between RGBD frames.

Scan completion and semantic segmentation (Python, Pytorch, hdf5)

- Multi-task learning to improve scan completion of RGBD Voxel Grid of indoor scenes.
- We proposed additional learning of semantic information loss will improve scan completion of indoor scenes.

Student Tutor — **Technical University of Munich** — **Oct 2018 – March 2019**

Machine Learning (IN2210) †

- The course is offered to master students at TUM and is attended by more than 500 students.
- Involved in creating assignments for the course and helped students with the homework.

Education

Munich, Germany — **Technical University of Munich** — **Oct 2017 – Present**

- M.Sc. in Informatics, GPA: 1.4/1.0
- Graduate Coursework: Machine Learning; Multiple View Geometry; Deep Learning; Protein Prediction;Tracking and Detection in Computer Vision; 3D Scanning & Motion Capture; Principles of Computer Vision.

Dhanbad, India — **Indian Institute of Technology** — **July 2008 – May 2012**

- B.Tech. in Computer Science and Engineering, CGPA: 7.51/10.0
- Undergraduate Coursework: Object Oriented Programming; Data Structure and Algorithms; Theory of Computation; Operating System; Computer Networks; Computer Architecture and Digital Image Processing.

Technical Skills

- Programming Languages: C, C++, Python, Java, Matlab.
- ML/CV Toolkits: PyTorch, Keras, Tensorflow, OpenCV, Numpy, SciPy, Rasterio, ffmpeg, Dlib.
- Application Developement: REST, Django, Neo4j, PostgreSQL, MongoDB, AWS, Docker and Kubernetes.

Additional Experience and Awards

- Achieved All India rank 1159 in All India Engineering Entrance Exam, 2008 out of 950,000 participants.
- Hiring Experience and leading Image Team at Roposo.
- Open source contributions: torchvision, metadata-extractor and imantics‡.

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.

[4] Miroslava Slavcheva et al. "Killingfusion: Non-rigid 3d reconstruction without correspondences". In: *CVPR*. 2017.

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

†https://www.in.tum.de/en/daml/home/

‡https://resume.github.io/?saurabheights