Saurabh Khanduja

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Academic Projects

Master Thesis	CAMP*, Technical University of Munich	Dec 2020 − Present

Weakly Supervised Semantic Segmentation using Low-level neural network features
- Proposed a new loss that bridges gap between localization and semantic segmentation map.
- The method improves mIOU metric by over 5% on vgg, resnet and inception backbone models.

Inter-Disciplinary Project	Technical University of Munich	Dec 2019 − May 2020

Neural Response Interpretation through the Lens of Critical Paths, CVPR 2021 (Pytorch, python) [1]
- Our work focuses on improving interpretability using path selection via neurons' contributions to the response.

Student Projects	Technical University of Munich	Nov 2018 − Jan 2019

Killing Fusion, CVPR 2017 (C++, Matlab) [2]
- Open-source implementation of Killing Fusion.
- Use Killing energy, Levelset 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.

Employment

ML Engineer	Edge Case Research Gmbh	May 2019 − Present

Improving Core ML Products and Production Infrastructure
- Improving edgecase(model failure) discovery.
- Infrastructure improvements involving better UX - Error reporting and ML backend optimization.

Student Tutor	Technical University of Munich	Oct 2018 − March 2019

Machine Learning (IN2210) †
- The course is offered every winter semester 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.

Work Student‡	Terraloupe Gmbh	April 2018 - April 2020

Geo Data Management Tool (Python, Django, Postgres)
- Development of inventory database supporting GIS query.
- Development of Django based server application for querying the inventory.

Core Deep Learning Pipeline (Python, Keras, Tensorflow)
- Development of single pipeline supporting Image Classification, Object Detection and Semantic segmentation tasks.
- Data loading from both local and remote(google storage) supported.
- Object based metrics implemented for semantic segmentation.

Image Team Lead	Roposo, India	Nov 2015 − Oct 2017

Image Processing Service Development (Java, AWS, OpenCV, ffmpeg)
- Enable dynamic compression using SSIM metric
- Reduction in image plagiarism using metadata analysis.
- Improve robustness to different image formats, such as webp, png, gif, etc.
- Implemented Beauty filter based on variational approach by Farbman, Zeev, et al. [3]
- Optimizations to efficiently use servers, leading to 70% cost reduction.

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*http://campar.in.tum.de/Chair/ResearchIssueComputerVision
†https://www.in.tum.de/en/daml/home/
‡Deep Learning and Computer Vision

Software Development Engineer   **Amazon, India**   **Oct 2014 − Nov 2015**
Resell Product Form (Java, DynamoDB)
- Development of data model to reduce the payload data of selling used product form.
- Redesign form completion to reduce number of clicks.
- The payload was reduced over 99.5% and improved form completion rate by 500%.

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 [4].
- 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 objects of interest.

Education

Munich, Germany   **Technical University of Munich**   **Oct 2017 − Present**
- M.Sc. in Informatics, GPA: 1.5/1.0
- Graduate Coursework: Machine Learning; Multiple View Geometry; Deep Learning for Computer Vision; 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.

Technical Skills

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

Additional Experience and Awards

- Achieved Outstanding rank in performance review at KritiKal Solutions for WATM.
- Highest project completion rate at KritiKal Solutions.
- Achieved All India rank 1159 in All India Engineering Entrance Exam (AIEEE-2008) out of 950,000 participants.
- Hiring Experience and leading Image Team at Roposo.
- Open source contributions: torchvision, metadata-extractor and imantics[§].

Languages

- English (Full Professional Proficiency), German (A1 Level), Hindi (Native).

References

[1] Ashkan Khakzar et al. "Neural Response Interpretation through the Lens of Critical Paths". In: *CVPR*. 2021.
[2] Miroslava Slavcheva et al. "Killingfusion: Non-rigid 3d reconstruction without correspondences". In: *CVPR*. 2017.
[3] 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.
[4] 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.

[§]https://resume.github.io/?saurabheights