Muhammad Muzammil

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Deep Learning • 3D Reconstruction • Inverse Graphics • Vision Transformers

EDUCATION

Friedrich-Alexander-Universität Erlangen-Nürnberg Erlangen, DE
Master of Science in Artificial Intelligence *2021 - 2024*
Grade 2,0, Thesis Grade: (Pending)

Sir Syed University of Engineering and Technology Karachi, PK
Bachelor of Science in Software Engineering *2015 - 2018*
Grade 3.38/4.0 ($\equiv$ German 1,9), Final Project Grade: 4.0/4.0 ($\equiv$ German 1,0)

WORK EXPERIENCE

Fraunhofer Institute for Integrated Circuits IIS Erlangen, DE
Research Assistant (Part-Time) *Dec. 2023 - Present*

- Working on improving capture-calibration-training pipeline for 3D Reconstruction from images using Neural Radiance Fields (NeRFs).

Adidas Herzogenaurach, DE
Graduate Intern - Future Creation Technologies *Sep. 2022 - Feb. 2023*

- Worked on improving existing material scanning pipeline through single-shot deep learning based material reflectance properties (SVBRDF) estimation methods with Jochen Süßmuth, Prof. Tim Weyrich, and Prof. Bernhard Egger.
- Captured a dataset of physical material samples with complex properties as well as built pipeline for calibrating and processing the captured materials.
- Evaluated and reported state-of-the-art Single-shot methods for estimating material reflectance properties on the captured dataset.

FAU Erlangen-Nürnberg - Cognitive Computer Vision Group Erlangen, DE
Research Assistant (Part-Time) *Mar. 2022 - Aug. 2022*

- Worked on light field networks for 3D reconstruction of objects using joint image color & extracted features supervision, in the Cognitive Computer Vision group at FAU under the supervision of Prof. Bernhard Egger.

LFD - Data Science Consultancy Karachi, PK
Data Analyst *Dec. 2018 - Sep. 2021*

- Developed a product for the banking industry that uses Machine Learning based Network & Link Analysis to detect suspicious account and activity.
- Worked on a data matching project and used stochastic combinatorial optimization to reach approximate solutions for intractable cases.
- Conducted Link Analysis using Call Detail Records (CDR) to detect criminal ties. Analyzed chat data of a leading textile brand of Pakistan to organize the most frequent queries according to seasons and sale periods.
- Built a recommendation engine for a large micro-finance bank of Pakistan to cross-sell digital financial inclusion services to their existing customer base.
- Developed prediction models for default and delinquency, customer churn, and forecasting for cargo handling.

RESEARCH PROJECTS

Friedrich–Alexander University Erlangen–Nürnberg *Winter 2024 (In Progress)*
Neural Signed Distance Fields for Multi-Class Object Representations *Masters Thesis*
Advisor: Pit Henrich, **Supervisor:** Prof. Franziska Mathis-Ullrich

- Comparing various methods of encoding single-view point cloud input in order to generate complete 3D Reconstruction represented by Neural Signed Distance Fields for multi-class non-rigid scenes.
Technologies used: PyTorch, PyTorch Geometric

Friedrich–Alexander University Erlangen–Nürnberg · *Summer 2024*
LiDAR Image translation using LiDAR NVS Data *(github)* · *Project*
Advisor: Richard Marcus, **Supervisor:** Prof. Marc Stamminger

- Image-to-Image style LiDAR intensity image generation from RGB data using KITTI and KITTI360 datasets.

- Utilized latest LiDAR Novel View Synthesis method for dense LiDAR input data generation.

- Evaluated performance on various scenes and LiDAR resolutions on the image translation task.
  Technologies used: PyTorch

Friedrich–Alexander University Erlangen–Nürnberg · *Winter 2023*
Distillation of 3D Representation · *Project*
Advisor: Mischa Dombrowski, **Supervisor:** Prof. Bernhard Kainz

- Distillation experiments on 3D generative representations from NeRF-like model (EG3D) to equivariant voxel-based 3D representations (ENR) for pose-free efficient and view-consistent novel view renderings.
  Technologies used: PyTorch

Friedrich–Alexander University Erlangen–Nürnberg · *Winter 2021*
Shape vs Texture bias in Vision Transformers *(slides)* · *Course Project*
Supervisors: Prof. Bernhard Egger and Prof. Andreas Kist

- Explored shape and texture bias in Vision Transformer (ViT) models. Concluded that ViT models exhibit more shape bias than ConvNets, while also noting quicker convergence of DeiT-S on Stylized-Imagenet compared to ResNet-50. Found SIN-trained DeiT narrowed the gap between human and machine shape bias. The evaluation of various ViT models suggested the emergence of high shape bias in ViT models trained on really large datasets, whether supervised or self-supervised.
  Technologies used: PyTorch

Sir Syed University of Engineering and Technology · *Academic Year 2018*
Detecting Abnormality in Radiographs through ConvNets *(demo video)* · *Bachelor's Final Project*
Supervisors: Moona Kanwal and Dur-E-Shawar Agha

- Collaborated with a team of four on a project involving ConvNets training for upper limb radiograph abnormality detection. Also worked on fracture detection with novel labels created with expert radiologist input. Utilized a boosting classifier on shared deep features for both tasks. Explored various CNN model architectures like ResNets, DenseNet and Inception-ResNets. Localized abnormalities using class activation maps. Developed a website and API to host the model.
  Technologies used: PyTorch, Scikit-Learn, Django web framework

TECHNICAL SKILLS

Programming Languages: Python, C++, R, Java, SQL

Tools and Frameworks: Pytorch, CUDA, Huggingface, OpenCV, Jax, Tidyverse, R-Shiny, git, LaTeX

Theory and Methods: Computer Graphics (3D Geometry and Materials), 3D Computer Vision (Point Cloud Understanding and Multi-View Geometry), 3D Reconstruction using Deep Learning

SUMMER SCHOOLS AND CERTIFICATIONS

Eastern European Machine Learning Summer School · Kraków, PL (Virtual)
Deep Learning & Reinforcement Learning (Organized by Deepmind) · *Summer 2020*

LANGUAGES

English · Full Professional Proficiency
German · Basic Proficiency

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November 11, 2024