MUHAMMAD HAMZA MUGHAL

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EDUCATION

M.Sc. Visual Computing — *Oct 2021-Present*
Universität des Saarlandes, Germany — *Grade: 1.4*

Bachelor of Electrical Engineering — *2015-2019*
School of Electrical Engineering and Computer Science, NUST, Islamabad — *CGPA: 3.25/4.00*
Thesis: "Assisting UAV Localization via Deep Contextual Image Matching" — *81.25%*

F.Sc. – Pre-Engineering — *2013-2015*
Cadet College Hasan Abdal — *85.8%*

RESEARCH PUBLICATION

M. H. Mughal, M. J. Khokhar and M. Shahzad, **"Assisting UAV Localization Via Deep Contextual Image Matching,"** in *IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing*, vol. 14, pp. 2445-2457, 2021
DOI: 10.1109/JSTARS.2021.3054832
GitHub: github.com/m-hamza-mughal/Aerial-Template-Matching

PATENT

Methods and Systems for Classifying Human Attributes Using Low Quality Images from Surveillance Camera Without Facial Recognition — *May 2020*
U.S. Provisional Patent Application No: 63/033,391 – VisionX LLC.

Contributed to this patent as "First Inventor." It pertains to a system for classifying human attributes e.g. gender, age, clothing type and color etc.

WORK EXPERIENCE

Visiting Researcher — *Aug 2021 – Dec 2021*
Data Science in Earth Observation, Technische Universität München (TUM) Germany
Funded by German Academic Exchange Service (DAAD)

Research on **multi-modal representation learning** using **self-supervised learning** (SSL) methods including non-contrastive and contrastive optimization procedures. Supervised by Prof. Muhammad Shahzad & Prof. Xiaoxiang Zhu

Machine Learning Lead — *Sep 2020 – Nov 2021*
Scribe Audio Inc. Islamabad

Responsibilities included modifying, implementing and training **text-to-speech** algorithms like GST-Tacotron, TransformerTTS, TortoiseTTS & GradTTS to achieve control over emotion in **Expressive Speech Synthesis**. My tasks also involved training and improving **neural vocoders** like WaveRNN, Parallel WaveGAN, DiffWave and HiFiGAN for robust melspectrogram to sound wave conversion.
Designed and implemented deployment architecture using **Kubernetes** and **Azure Functions** for model inference.

Computer Vision Engineer — *Sep 2019 - Sep 2020*
VisionX LLC, New York

Responsibilities included designing and implementing algorithms for **3D Pose Estimation** using PoseNet on 2D images to enable **Motion Capture** in Augmented Reality. Moreover, my work also included designing, implementing and deploying custom deep learning models for tasks like **Human Attributes Classification** and **Human Activity Recognition** for Retail Analytics.

WORK EXPERIENCE

Computer Vision Intern
Jun 2019 - Sep 2019

VisionX LLC, New York

Tested and deployed **2D & 3D facial landmark detection** algorithms like 3D-FAN by Bulat et.al. and devised algorithm for **face pose detection** in 3D world coordinate system. Moreover, I also worked on imposing 3d models of objects on 3D facial landmarks. Moreover, I implemented a document boundary extraction system based on **Hough Transform** and **Polygon Approximation**.

Research Assistant
Sep 2018 - Sep 2019

Machine Vision & Intelligent Systems Lab, NUST, Islamabad

Worked on researching and implementing classical computer vision and deep learning based methods for UAV localization, which turned into bachelor thesis. Supervised by Dr. Muhammad Shahzad.

RELEVANT PROJECTS

Human Attributes Classification for Retail Analytics *VisionX LLC.*

Implemented multi-class classification framework for recognizing human attributes, using deep spatial and temporal features of human body in low-quality surveillance footage. The architecture employed ResNet based feature extractor along with Convolutional-LSTM based classifier. It was trained on human tracking output of FairMOT.

Activity Recognition for Cough and Sneeze Detection *VisionX LLC.*

Designed and trained CNN + LSTM based activity detection framework for COVID-19 SOP measures in Retail Analytics Project. This was trained on BII Sneeze-Cough Human Action Video Dataset and finetuned on in-house dataset for mall surveillance videos. BIISC dataset was augmented by changing backgrounds and illumination on the human subject to make it robust.

RELVANT COURSES

Image Acquistion Methods | Neural Networks: Theory and Implementation

Image Processing & Computer Vision | High Level Computer Vision | Text-to-Speech Synthesis

Digital Signal Processing

TECHNICAL SKILLS

Languages	Python, C++, SQL, Swift
Frameworks	Pytorch, Tensorflow, Keras, Cortex, Docker, Kubernetes, OpenCV, Librosa, Scikit-Image
Cloud Tools	AWS: Kinesis, SageMaker, boto3 API, Lambda Functions, Fargate Microsoft Azure: Azure Kubernetes Cluster (AKS), Functions Google Cloud: Python API, BigQuery, Firestore, Cloud Functions
Augmented Reality	Apple ARKit – SceneKit/RealityKit
Server Management	Experience in managing following Linux servers for machine learning engineers: NVIDIA HGX A100 (8-GPU), NVIDIA DGX A100, NVIDIA T4 Server (4/8-GPU)

LANGUAGE

English: TOEFL iBT Score: **110/120**

German: A1.2

References available on request