Muhammad Usama Saleem

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Research Interests

Computer Vision, Generative AI, 3D Reconstruction, 3D Human Motion Generation

Education

University of North Carolina at Charlotte (UNCC) Aug. 2021 – Expected 2026
Ph.D. in Computer Science *Advisor: Dr. Pu Wang*

- *Research Focus: 3D Human Reconstruction and Multi-Modal 3D Motion Generation*

Lahore University of Management Sciences (LUMS) Sept. 2017 – May 2021
B.Sc. in Computer Science

Publications

- DanceMosaic: Multimodality Masked Dance Generation
  Muhammad Usama Saleem, F Shah*, P Shah*, Ekkasit Pinyoanuntapong, P Wang, H Xue, A Helmy*
  Under Review at SIGGRAPH 2025. (tier 1) *Equal contribution(*)*

- MMHMR: Generative Masked Modeling for Hand Mesh Recovery
  Muhammad Usama Saleem, Ekkasit Pinyoanuntapong, MJ Patel, H Xue, A Helmy, S Das, P Wang
  Under Review at CVPR 2025. (tier 1)

- ControlMM: Controllable Masked Motion Generation
  Ekkasit Pinyoanuntapong, Muhammad Usama Saleem, Korrawe Karunratanakul, Pu Wang, Hongfei Xue, Chen Chen, Chuan Guo, Junli Cao, Jian Ren, Sergey Tulyakov.
  Under Review at ICLR 2025. (tier 1)

- GenHMR: Generative Human Mesh Recovery
  Muhammad Usama Saleem, P Wang, H Xue, S Das, Chen Chen
  AAAI 2025. (tier 1)

- BioPose: Biomechanically-accurate 3D Pose Estimation from Monocular Videos
  Muhammad Usama Saleem, F Koleini,* P Wang, H Xue, A Helmy, A Fenwick*
  WACV 2025. *Equal contribution(*)*

- BAMM: Bidirectional Autoregressive Motion Model
  Ekkasit Pinyoanuntapong, Muhammad Usama Saleem, P Wang, M Lee, S Das, Chen Chen
  ECCV 2024. (tier 1)

- Private Data Synthesis from Decentralized Non-IID Data
  Muhammad Usama Saleem and L. Fan
  IEEE International Joint Conference on Neural Networks (**IJCNN 2023**), Gold Coast, Australia.

- Privacy-Preserving Image Data Synthesis
  Muhammad Usama Saleem and L. Fan
  Poster Presented at (**SIAM 2023**) Doctoral Forum

- Privacy Enhancement for Cloud-Based Few-Shot Learning
  A. Parnami, Muhammad Usama Saleem, L. Fan and M. Lee.
  IEEE WCCI International Joint Conference on Neural Networks (**IJCNN 2022**), Padua, Italy.

- DP-Shield: Face Obfuscation with Differential Privacy (demo)
  Muhammad Usama Saleem, D Reilly and L. Fan
  Extending Database Technology Conference (**EDBT 2022**) Edinburgh, UK.

Work Experience

GENIUS Lab, NC Sept. 2023 – Present

Graduate Research Assistant

- Proposed a novel approach for 3D Human Pose Estimation and Multi-Modal Motion Generation
- Research Lead at Lowe's Companies Partnership: Led a research team of Ph.D. and Masters students for projects
- Published 3 papers (AAAI'25, ECCV'24, WACV'25) and 3 Under Review (CVPR'25, ICLR'25, SIGGRAPH'25)

Image Privacy Lab, NC Sept. 2021 – Aug. 2023

Graduate Research Assistant

- Proposed a federated solution for private image data synthesis from decentralized, non-IID data
- Developed privacy-preserving deep learning frameworks to improve reliability in computer vision research

Afiniti, Lahore June 2021 – Aug. 2021

Junior Data Scientist

- Designed ML models to optimize AI-driven call routing, improving client sales performance.

Selected Research Projects

Real-time Interactive Multi-Modality 3D Human Motion Generation Jan. 2025 – Present

- Designing an autoregressive 3D motion model capable of generating real-time whole-body human motion
- Enabling adaptive motion generation with dynamic responses to interactive inputs like speech, commands & actions

Generative Masking Model for Audio-conditioned Video Animation June. 2024 – Present

- Designed a novel generative model for high-fidelity talking head synthesis, conditioned on audio and reference image, enabling realistic video animations.
- Leveraged pretrained facial codebooks and masked transformers for detailed and realistic talking head synthesis

Multi Camera People Tracking (MCPT) for Lowe's Companies, Inc. Sept. 2023 – May 2024

- Developed in-house multi-camera tracking system using anchor-guided clustering & spatio-temporal ID re-assignment
- Implemented YoloV8 for detection, OSNet for re-ID, & Hungarian algo for global ID assignment to enhance accuracy
- Led MCPT data collection, resolving occlusions, re-entries, and trajectory overlaps in complex scenarios.

Action Detection in Untrimmed Videos for Lowe's Companies, Inc. Sept. 2023 – May 2024

- Utilized SOTA (ViFi-CLIP, InternVideo, Video-ChatGPT) for fine-grained action recognition in untrimmed videos.
- Improved model robustness with semi-supervised learning (FixMatch) using regularization & pseudo-labeling

Saliency-based Image Compression and Bias Analysis in Facial Recognition Jan. 2022 – May 2023

- Developed saliency-based model for image downsampling, reducing privacy risks while preserving diagnostic utility
- Achieved 15% privacy risk (gender/age inference) reduction while preserving 90%+ disease classification accuracy
- Identified higher re-ID risks for White individuals than Asians, exposing demographic biases in facial recognition.
- Presented the first demo analyzing differential privacy's impact on utility & re-ID against SOTA facial recognition

Text-to-Speech (TTS) Model - Digital Deepfakes - Meta Research Funded May 2020 – May 2021

- Developed a Tacotron (TTS) to analyze fake news impact on low digital literacy groups via realistic audio generation
- Created a dataset of Urdu-speaking politicians to support TTS model development and fake news research.

Technical Skills

Languages: Python, C/C++, R, JavaScript, Go, SQL, HTML5/CSS
Frameworks/Libraries: Pytorch, Tensorflow, React, Node.js, Vue, Flask, Bootstrap, Firebase, Selenium, REST APIs
Developer Tools: EC2, Git, Linux, Trello, Jira, Heroku, Jupyter, VSCode, VSCode, Burpsuit, Frida, Adobe XD

Awards & Honors

- *2023:* Granted Student Travel Award for IJCNN 2023 and SIAM 2023
- *2021:* National Winner, AI-Guru Data Science Competition and LUMS Robotics Competition.
- *2021:* PKR 3.0 Million Scholarship from LUMS

Relevant Courses

Artificial Intelligence: Computer Vision, Deep Learning, Machine Learning, Data Mining, Big Data Analytics, AI
Mathematics: Applied Probability, Statistics, Calculus-II, Linear Algebra
Systems & Security: Software System Design & Dev, Data Privacy, Network Security, Operating Systems