




# UMAR MASUD

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## Education

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### University of Toronto

Sep 2023 – Dec 2024

*Master of Science in Applied Computing (MScAC) - AI Concentration*

*Toronto, Canada*

**Relevant Coursework:** Computational Imaging, Neural Networks and Deep Learning, Software engineering for machine learning, Visual and mobile computing systems.

### Jamia Millia Islamia

Aug 2019 – May 2023

*Bachelor of Technology in Electronics and Communications (9.82/10).*

*New Delhi, India*

## Publications

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1. **Masud, U.**, Cohen, E., Bendidi, I., Bollot, G., & Genovesio, A. (2022). Comparison of semi-supervised learning methods for High Content Screening quality control. *BioImage Computing workshop at ECCV 2022*. [LINK](#)
2. **Masud, U.**, Siddiqui, M., Sadiq, Mohd., & Masood, S. (2022). SCS-Net: An efficient and practical approach towards Face Mask Detection. *ICMLDE, 2022*. [LINK](#)
3. Jambigi, C., **Masud, U.**, & Chakraborty, A. (2022). G-PReDICT: Generalizable Person Re-ID using Domain Invariant Contrastive Techniques. *ICVGIP 2022*. [LINK](#)
4. **Masud, U.**, & Shwenker, F. (2022). Compressed Image Super-Resolution using Pre-trained Model Assistance. *COMSYS 2022*. [LINK](#)
5. **Masud, U.**, Sadiq, Mohd., Masood, S., Ahmad, M., and Ahmed A. Abd El-Latif. 2023. LW-DeepFakeNet: A Lightweight Time Distributed CNN-LSTM network for real-time DeepFake Video Detection. *Signal, Image and Video Processing*. [LINK](#)
6. **Masud, U.**, & Agarwal, A. Analysing Statistical methods for Automatic Detection of Image Forgery. *arXiv*. [LINK](#)

## Applied Research

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### INDUSTRY

#### Samsung AI Center Toronto

May 2024 – Present

*ML Research Intern*

*Toronto, Canada*

- Working with the Camera technology team, focusing on computational imaging problems. Involves researching ways to turn heuristic software dominant ISP to AI-enabled.

### ACADEMIA

#### Ulm University

Jun 2022 – Jul 2022

*DAAD-WISE Scholar*

*Ulm, Germany*

Principle Investigator - Prof. Friedhelm Schwenker

- With only a 4.19M parameter model, could effectively address jpeg compression and super-resolution simultaneously, achieving up to 27.62 PSNR and 0.771 SSIM.
- To overcome additional compression artefacts, devised a lightweight CNN-based model leveraging a pre-trained feature extractor during training for information fusion. During inference, it operates independently saving a lot of computation.

#### Indian Institute of Science (IISc)

Jan 2022 – Jul 2022

*Research Intern*

*Remote*

- Utilised simple techniques of supervised contrastive learning in Domain Generalisation for Person Re-identification task, getting up to 53.7 mAP and 77.8 Rank-1.
- Introduced novel perturbation strategies to realistically model domain variations and preserve target identities. Also contributed person attribute annotations for CUHK-03 and MSMT17 benchmark datasets.

#### École normale supérieure - PSL

Dec 2021 – Mar 2022

*Research collaborator*

*Remote*

- For phenotypic screening, devised a method for data quality check on 2.1M images reaching beyond 98% success.
- Compared transfer learning and self-supervised learning methods to detect abnormal single-cell images, fine-tuning downstream classification with as little as 350 annotated pairs.

*Turn the page.*

Principle Investigator - Prof. Anupam Agarwal.

- Found 40-45% drop in performance of Image Forgery solutions, questioning the reliability and robustness of several over-estimated results.
- Implemented 5 papers from scratch and tested them across 13 different datasets in cross-evaluation and out-of-distribution training/testing environments, commenting on their generalizability across datasets.

**Jamia Millia Islamia***Undergraduate Researcher***Apr 2021 – Dec 2022***New Delhi, India*

Principle Investigator - Prof. Sarfaraz Masood.

- Designed a novel, lightweight model with up to 496x reduction in parameter count for facial mask detection. Developed a large synthetic dataset by stitching masks at incorrect positions on faces. The dataset has 1000+ downloads on Kaggle.
- Created a 152x times lighter model for DeepFake Video detection while achieving a significant accuracy of 99.24% at a remarkable rate of 80 fps. Accomplished by using both spatial and temporal information through pre-trained CNN encoders, topped up by LSTMs saving up training data and time.

## Projects

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- **Knowledge Distillation** **Diffusion** ~ Clicking better Images with *Under Display Cameras (UDC)* in Smartphones. A 7.78M params model with KD gets 30.59 PSNR, and diffusion beats SOTA getting 42.37 PSNR. ([Report](#))
- **ML Engineering** **Image Captioning** ~ Integrating ML functionalities - generating tags and descriptions for uploaded images, in an existing Instagram clone web-app in Flask. ([Report](#))
- **Attention Mechanism** ~ Different Descriptors for Squeeze and Excitation Attention Block - experimented with standard deviation, trace, largest singular value, and DC coefficient of DCT instead of usual GlobalAvgPool2d. The SVD approach gives a 0.78% improvement but with an 80% increase in training time. ([Report](#))
- **Inverse Problem** ~ Image Inpainting using a U-Net model with a fused ConvMixer encoder. The feature fusion method showed 1.34% improvement in terms of dice coefficient. ([Report](#))
- **Segmentation** ~ *Background Remover* tool for portrait images of humans, made using a U-Net model trained for semantic segmentation of the image. The model achieved 0.981 IOU-score on test data. Also deployed on a [web-app](#).