

Umar Khalid

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PROFILE:

I am a Ph.D. researcher at the Center of Research in Computer Vision (CRCV) Lab, UCF under Dr. Mubarak shah and Dr. Chen Chen. My research topics include AI security, video privacy preservation, and federated learning. More recently, I am investigating **privacy preservation in videos using generative diffusion models**. In my industrial experience, I have worked on detection, tracking, segmentation and generative modeling. I have briefly investigated the multi-model tracking for autonomous vehicles using LiDAR, Radar and Camera sensor data.

OPEN TO: I am looking for a full-time machine learning researcher role in the industry. I am also open to internship positions.

EDUCATION

Doctor of Philosophy (Ph.D.) - Computer Engineering Aug 2020 - Dec 2023

University of Central, Central Florida

Courses: Advanced Computer Vision, Advanced AI (Artificial Intelligence), Machine Learning, 3D Computer Vision

Research Area: Diffusion Models, Federated Learning, Action Recognition, Self-Supervised and Semi-Supervised Learning, Out of Distribution Detection, Noisy Labels

MS Electrical Engineering Sep 2016 - Dec 2018

Shanghai Jiao Tong University, China

BE Electrical Engineering Sep 2010 - Jun 2014

National University of Sciences and Technology, Pakistan

SKILLS

- Machine Learning, Artificial Intelligence, Computer Vision Deep Learning
- Diffusion Models, Federated Learning, Action Recognition, Privacy Preservation, Vision Transformers
- PyTorch, Python, Keras, C++, C

PROFESSIONAL EXPERIENCE

Machine Learning Intern Jan 2022 - May 2022

CHEP, Orlando, Florida, USA

- Designed deep learning based crack detection technology in industrial pallets with a **95% detection rate**.
- Developed worker time tracking system with privacy-preserved surveillance with a performance difference of 1-2 minutes per day for each individual as compared to ground truth.

Software Engineer-Computer Vision Jan 2019 - Mar 2020

MengBaby Inc., Shanghai, China

- Headed the development of deep learning based Counterfeiting app for multiple clients with client-reported accuracy of **98-99%**. Computer vision tasks include are: segmentation, detection, text retrieval, GAN deblurring etc.
- Planned the extension of the counterfeiting app for **Castrol** and **Kohler** in the Chinese market.
- Developed Healthcare solutions based on traditional Chinese medicine using deep learning technologies such as facial recognition, facial segmentation, attribute detection. Based on the demo product, the company was able to raise the funding of **\$20 million** approx., in the year 2019.

Software Engineer-Machine Learning, Computer Vision May 2015 - Jun 2016

Pacsquare Technology Pvt. Ltd., Washington, USA

- Worked in the AI team to design techniques for Explicit Image filtering, message filtering, object detection, image-based auto-classification, etc. for the company's main product bechoonline.com- the prime online marketplace in Pakistan.

RESEARCH EXPERIENCE

Graduate Student Researcher

08/2022- present

CRCV Lab, University of Central Florida, Orlando, FL, USA

- Initiated the first study on the Federated Learning Video Understanding task and proposed the algorithm with **99 times fewer model parameters** for communication-efficient training.
- Leading IARPA-HAYSAC project to investigating the Diffusion models for privacy preservation in surveillance videos.
- Proposed an **out-of-distribution detection framework** in CVPR, 2022, which achieves SOTA performance in Image and Video tasks with 99.3% AUROC on CIFAR10, which is still unbeatable.
- Prepared and made public the RF communication dataset, **RF1024** to support future research

Visiting Researcher

08/2017-06/2018

Power Electronics and Renewable Energy Lab, Shanghai Tech University

- Conducted Research on designing the Electric Vehicle Charger.
- Proposed the topology of DC/DC power converters for electric vehicle applications and prototype was constructed.
- The research paper based on the experimental results was accepted at the **Applied Power Electronics Conference, 2019**, which is the most prestigious Power Electronics conference.

Undergraduate Research Assistant

10/2013-06/2014

School of EE & CS, NUST

- Led a team of researchers on **Cognitive radio networks** to develop a multicast multipath routing algorithm using machine learning.
- Proposed SVD (Singular Value Decomposition) based medical Image Resolution Enhancement algorithm
- Conducted and published research work in the area of Information Security and Data Integrity

Visiting Researcher

01/2013-06/2013

Autonomous Vehicles Lab, Fairleigh Dickinson University, USA

- Worked on computer vision algorithm development for autonomous vehicles.

SELECTED PUBLICATIONS

- *“CNLL: A Semi-supervised Approach for Continual Noisy Label Learning,”* IEEE/ CVPRW, 2022
- *“RODD: A Self-Supervised Approach for Robust Out-of-Distribution Detection,”* IEEE/ CVPRW, 2022
- *“Two-way Spectrum Pursuit for CUR Decomposition and Its Application in Joint Column/Row Subset Selection,”* Machine Learning for Signal Processing 2021, Queensland, Australia
- *“Detect-and-Describe: Joint Learning Framework for Detection and Description of Objects,”* CCVPR’ 18, Wellington, New Zealand.
- *“Dual-tree complex wavelet transform and SVD based medical image resolution enhancement,”* Signal Process., 105 (2014), pp. 430-437

ACHIEVEMENTS & DISTINCTIONS

- Selected for prestigious ORCGS PhD Fellowship at the University of Central Florida.
- Received High Achiever’s Scholarship in NUST for years 2010-2014
- Chinese Govt. Scholarship in SJTU for the year 2016.
- Selected for Global UGrad program 2013 by U.S Department of State.