

# OSAHOR Michael Uche

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## RESEARCH EXPERIENCE

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### Apple Inc

Cupertino, California

- **PhD Machine Learning and Algorithms Intern**

Summer, 2022

- Conceptualized and proposed efficient deep learning strategies for display technology applications
- Completed the deep learning-based project from point of conceptualization to actual usage by the team
- Designed and implemented innovative algorithms for image performance and enhancement using deep learning
- Presented my project to top-level Apple managers to showcase the achievements of my task
- Extensive data analysis to establish model performance and requirements through measurement and modeling

### Deep Learning Research Lab

West Virginia University

- **Graduate Research Assistant**

Aug. 2018 - Present

- Initiated a multi-modal sketch to image synthesis guided by text description with the aid of state-of-the-art CLIP model; trained on over 400 million image-text pairs
- Created an open-source GAN model to synthesize over 200,000 synthetic sketches to aid researches involved in adversarial learning
- Studied the disparities between ethnic groups of over a million identities aimed at reducing bias
- Executed various SOTA models for image, text and sketch datasets
- Data integration of over 400,000 sketches from CelebA, Fair-Face and LFW datasets for sketch to image synthesis

### HealBig Lab - Health Outcomes and Big Data Informatics

West Virginia University

- **Graduate Research Assistant**

Aug. 2022 - Present

- Investigated the potentials of applying deep adversarial models on tabular data to mitigate data bias for under-represented patients
- Analysis of electronic health records to understand the implication of various antibiotics medication on Acute Kidney Injury
- Implemented core machine learning techniques to describe multiple case scenarios that could be responsible for inconsistencies in Acute Kidney Injury diagnosis

### Kunze Neuro Engineering Lab

Montana State University

- **Graduate Research**

Aug. 2017 - July. 2018

- Analyzed videos of random non-static simulated brain vesicle cells for cluster and behavioral analysis
- Built an image processing framework to track the dynamics of neuron activity in brain vesicles as part of research involved in axonal cell movement with possible applications in Alzheimer's disease
- Implemented python scripts to analyze data obtained from neuronal activity of brain vesicles

### iLab - [Carnegie Cooperation and MIT collaboration]

- **Graduate Research**

Aug. 2013 - July. 2015

- Designed a gesture controlled robotic arm as part of tools required towards building Massive Open Online Courses for application in remote labs
- Implemented joint algorithms to optimize the inverse and forward kinematics of a robotic arm for smoother object retrieval and deployment for various degrees of freedom (DOF)
- Created a graphical user interface to showcase the actual joint tracking of joints using a Microsoft Kinect sensor

## EDUCATION

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### West Virginia University

Morgantown, WV

- **Doctor of Philosophy in Electrical Engineering [Deep/Machine Learning] CGPA: 3.83**

Aug. 2018 - December 2022

### Montana State University

Bozeman, Montana

- **Graduate Courses [Neuro Engineering] CGPA: 3.90**

Aug. 2017 - July 2018

## SELECTED PUBLICATIONS

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- Osahor Uche, Nasrabadi, N.M: "Text-Guided Sketch-to-Photo Image Synthesis." (**IEEE 2022**): 98278-98289.
- Osahor Uche, Nasrabadi, N.M: "Ortho-Shot: Low Displacement Rank Regularization with Data Augmentation for Few-Shot Learning." 2022 IEEE/CVF Winter Conference on Applications of Computer Vision (**WACV 2022**): 2040-2049
- Osahor Uche, Nasrabadi: "Quality map fusion for adversarial learning." British Machine Vision Conference (**BMVC**)
- Osahor Uche, Kazemi, H., Dabouei, A., Nasrabadi, N.M: Quality Guided Sketch-to-Photo Image Synthesis. 2020 IEEE/CVF Conference on Computer Vision and Pattern Recognition Workshops (**CVPRW**), 3575-3584. , 16 June, 2020
- Osahor Uche, Nasrabadi, N.M: "Deep adversarial attack on target detection systems, In Artificial Intelligence and Machine Learning for Multi-Domain Operations Applications (Vol. 11006, p. 110061Q International Society for Optics and Photonics." (**SPIE 2019**), May 2019
- Osahor Uche and Lawrence Kehinde: Development of a Gesture Detection System for the Control of a Robotic Arm ISSN: 2375-3846, 2016; 3(1): 17-24 published online February, American Association for Science and Technology (**AASCIT 2016**)

## CURRENT RESEARCH

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### 3D GAN

- **Adversarial synthesis**
  - Investigation of deep generative models that represent 3D scenes in neural radiance fields
  - 3D-aware generative models for explicit control of viewpoint while preserving 3D consistency during image synthesis
  - Unsupervised learning of 3D shapes, using a collection of unconstrained 2D images

### 2D GAN

- **GAN-Based Face Frontalization from Extreme Pose**
  - We implemented a profile to frontal face GAN-based model while maintain subject identity by integrating Attention function, a Laplacian style learner, Gradient-based loss penalty and perceptual loss functions
  - I proposed a laplacian style learner (LSL) that computes style similarity between real and synthesized images extracted at different resolutions from the generator decoder model
  - Investigated the style similarity between each pair for real and synthesized images is computed in a laplacian pyramid fashion to ensure image perceptual quality without compromising subject identity

### CNN Model Compression

- **Error correction codes and deep model compression and orthogonal regularization**
  - Adaptation of both lossless compression and redundant bits (symbols) arranged in sequential order to ensure error-free decoding of the data by a detector/ decoder-based model (receiver)
  - Investigating the possibilities of keeping both compression and pooling layers in a convolutional model
  - Analysis of convolutional layers by understanding the feature representation interplay between CNN filters and encoding operations

## PROJECTS/EXPERTISE

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- **Facial Synthesis:** Deployed an image synthesis project that converts facial sketches to facial RGB images of different ethnicities
- **GAN Models:** Implemented various GAN models [STAR, CYCLE, VANILLA, QAGAN, FFGAN, etc] for Quality enhancement, attention and various image synthesis applications
- **Multiple Dataset Integration:** Collected and annotated of over 400,00 sketches, collated from CelebA, Fair-Face and LFW datasets to implement image synthesis GAN models
- **Adversarial Attack:** Developed an adversarial framework to compromise classification of neural networks
- **Image Quality Enhancement:** Improved the perceptual quality of images using Image quality assessment statistics for both Full reference, Supervised and Unsupervised cases
- **Robotics:** Applied both forward and inverse kinematics for Gesture Control of a robotic Arm

## LEADERSHIP/ AWARDS

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- **Meta (Facebook) Uniting Scholars Program:** 1 of 35 scholars invited to Meta-HQ as part of the 2022 cohort of Scholars involved in Artificial Intelligence
- **Supervision:** Supervised over 120 undergraduate students in courses related to electrical engineering and Computer Science
- **Minority Mentorship:** Mentored minority students to study graduate courses related to Artificial Intelligence across three continents (Africa, Europe and USA)
- **Reviewer:** IEEE Transactions, Winter Conference on Applications of Computer Vision WACV, Journal on Intelligence & Robotics, etc

## INTERESTS

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- **Machine Learning:** Deep learning, Computer vision, AR/VR, Image quality assessment, Adversarial learning, Object detection

## PROGRAMMING SKILLS

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- **Platforms:** PyTorch, Tensorflow, PyCharm, TorchScript, SLAM, Flask, MATLAB, Linux, Kinect-SDK, and GIT
- **Languages:** Python, C#, C/C++, SQL, Java, PHP