



# COLLEGE OF ENGINEERING AND COMPUTER SCIENCE

FLORIDA ATLANTIC UNIVERSITY

Announces the Ph.D. Dissertation Defense of

## Adam Corbin

for the degree of Doctor of Philosophy (Ph.D.)

### “Investigating and Improving Fairness and Bias in Machine Learning Models for Dermatology”

March 27, 2023, 9:00 a.m

Virtual defense

Zoom: <https://fau->

[edu.zoom.us/j/7041237256?pwd=b2lmbThoZU84ZFdDWHc3QlVqWjFOQT09](https://fau-edu.zoom.us/j/7041237256?pwd=b2lmbThoZU84ZFdDWHc3QlVqWjFOQT09)

#### DEPARTMENT:

Electrical Engineering and Computer Science

#### ADVISOR:

Oge Marques, Ph.D.

#### PH.D. SUPERVISORY COMMITTEE:

Oge Marques, Ph.D., Chair

Shihong Huang, Ph.D.

Borko Furht, Ph.D.

Hari Kalva, Ph.D.

#### ABSTRACT OF DISSERTATION

Advancements in Artificial Intelligence (AI) and Machine Learning (ML) have significantly improved their application in dermatology. However, bias issues in AI systems can result in missed diagnoses and disparities in healthcare, especially for individuals with different skin types. This dissertation aims to investigate and improve the fairness and bias in machine learning models for dermatology by evaluating and enhancing their performance across different Fitzpatrick skin types.

The technical contributions of the dissertation include generating metadata for Fitzpatrick Skin Type using Individual Typology Angle; outlining best practices for Explainable AI (XAI) and the use of colormaps; developing and enhancing ML models through skin color transformation and extending the models to include XAI methods for better interpretation and improvement of fairness and bias; and providing a list of steps for successful application of deep learning in medical image analysis.

The research findings of this dissertation have the potential to contribute to the development of fair and unbiased AI/ML models in dermatology. This can ultimately lead to better health outcomes and reduced healthcare costs, particularly for individuals with different skin types.

#### BIOGRAPHICAL SKETCH

Born in Clearwater, Florida

B.S., Florida Atlantic University, Boca Raton, Florida, 2011

M.S., Florida Atlantic University, Boca Raton, Florida, 2012

Ph.D., Florida Atlantic University, Boca Raton, Florida, 2023

#### CONCERNING PERIOD OF PREPARATION

**& QUALIFYING EXAMINATION**

**Time in Preparation:** 2019-2023

**Qualifying Examination Passed:** Fall 2020

**Published Papers:**

A. Corbin and O. Marques, "Exploring strategies to generate Fitzpatrick skin type metadata for dermoscopic images using individual typology angle techniques," *Multimedia Tools and Applications* (2022). <https://doi.org/10.1007/s11042-022-14211-1>

A. Corbin and O. Marques, "Strategies for computing Fitzpatrick skin type to evaluate fairness in dermoscopic datasets," SIIM Annual Meeting, Kissimmee, FL, June 2022.

O. Marques, A. Corbin, V. Persaud, N. Marques, and C. Garbin, "On the use of colormaps in the context of post-hoc explainable AI methods," SIIM Annual Meeting, Kissimmee, FL, June 2022.

O. Marques and A. Corbin, "Deep learning for medical imaging: a recipe for success," SIIM Annual Meeting, Kissimmee, FL, June 2022.

A. Corbin and O. Marques, "Assessing Bias in Skin Lesion Classifiers with Contemporary Deep Learning and Post-Hoc Explainability Techniques," (Under review).