INTRODUCTION

The Danger of Algorithmic Bias in Healthcare

A 2019 clinical Artificial Intelligence (AI) applied to ~200 million Americans undiagnosed patients of color by 5%.

The global market for AI in Medical Imaging is estimated to grow >10 times by 2033.

Al-powered medical imaging tools are expanding and exacerbating inequity in clinical care for Black and Brown patients, and other vulnerable communities.

AI Can Learn Self-Reported Race And Ethnicity

In 2021, AI models were trained to recognize patients’ self-reported race and ethnicity from medical images, even when there are no indications of race or ethnicity visible to human experts. This has stumped experts worldwide.

AI might be learning false correlations between race or ethnicity and disease, but we’re not sure because the hidden features that signal AI to race and ethnicity are unknown.

We need to discover how AI learns self-reported race and ethnicity when humans cannot.

RESEARCH GOAL

Discover the hidden signals in retinal images that enable algorithms to learn self-reported race and ethnicity.

METHODS

Discovering Hidden Signals Using CNNs

My goal was therefore: (1) to identify key image features that could be hidden signals, (2) to extract each feature from RVMs, and (3) to train an AI model to learn race and ethnicity from the isolated feature to assess its individual significance.

After conducting 100+ experiments to identify key image features, I designed a novel approach to deconstruct an RVM into three key features: Number of Nonzero Pixels (NNP), Pixel Intensity Values (PIVs), and Spatial Arrangement (SA).

RESULTS

1. Black RVMs contain more fragmented veins than White RVMs

2. Fewer large veins are present in Black RVMs vs. White RVMs in the central regions near the optic disc.

3. The peripheral regions in Black RVMs contain more choroidal vessels/capillaries than White RVMs.

All images created by student researcher unless stated otherwise.