



Bias in AI: Skin Cancer Detection

Chris Zhang, Rachel Rodrigues, Sanjana Konka, Gorgeous Azobi

Introduction & Background

- AI is a powerful and rapidly advancing technology.
- Its application in the medical field, particularly for skin cancer diagnosis, is relatively new and experimental.

This study aims to:

- Assess the current effectiveness of AI in skin cancer diagnosis.
- Determine its potential future viability in medical diagnostics.

Contact us!



Research Question

Demographic Representation in AI Training Models:

Are AI systems trained on datasets that reflect the actual demographic proportions of the diagnosed skin cancer population?

Physicians' Perspectives on AI in Skin Cancer Detection:

What are the views of physicians and dermatologists regarding the use of AI in diagnosing skin cancer? Do they trust the technology, and what concerns do they have, especially in terms of fairness and reliability?

Methods

A mixed-methods study to assess bias in AI for skin cancer detection.

Qualitative Data:

- Physicians and dermatologists completed a questionnaire on AI's role in skin cancer diagnosis, experiences with AI accuracy and bias, and comparisons with traditional methods.

Quantitative Data:

- Used R to analyze the demographics of image datasets (HAM10000, SLICE-3D, and ISIC Challenge) used to train AI models
- Conducted chi square tests to compare age and sex distributions against general statistics from sources like the Cancer UK and American Cancer Society.

Challenges:

- Obtaining responses for the questionnaire was difficult due to physicians' busy schedules.
- This limited the sample size and diversity of perspectives.

Results/Findings

Physicians' Perspectives on AI Skin Cancer Detection

What has been your experience with AI in dermatology?

"N/a - may begin using AI in charting, but not in exam any time soon."

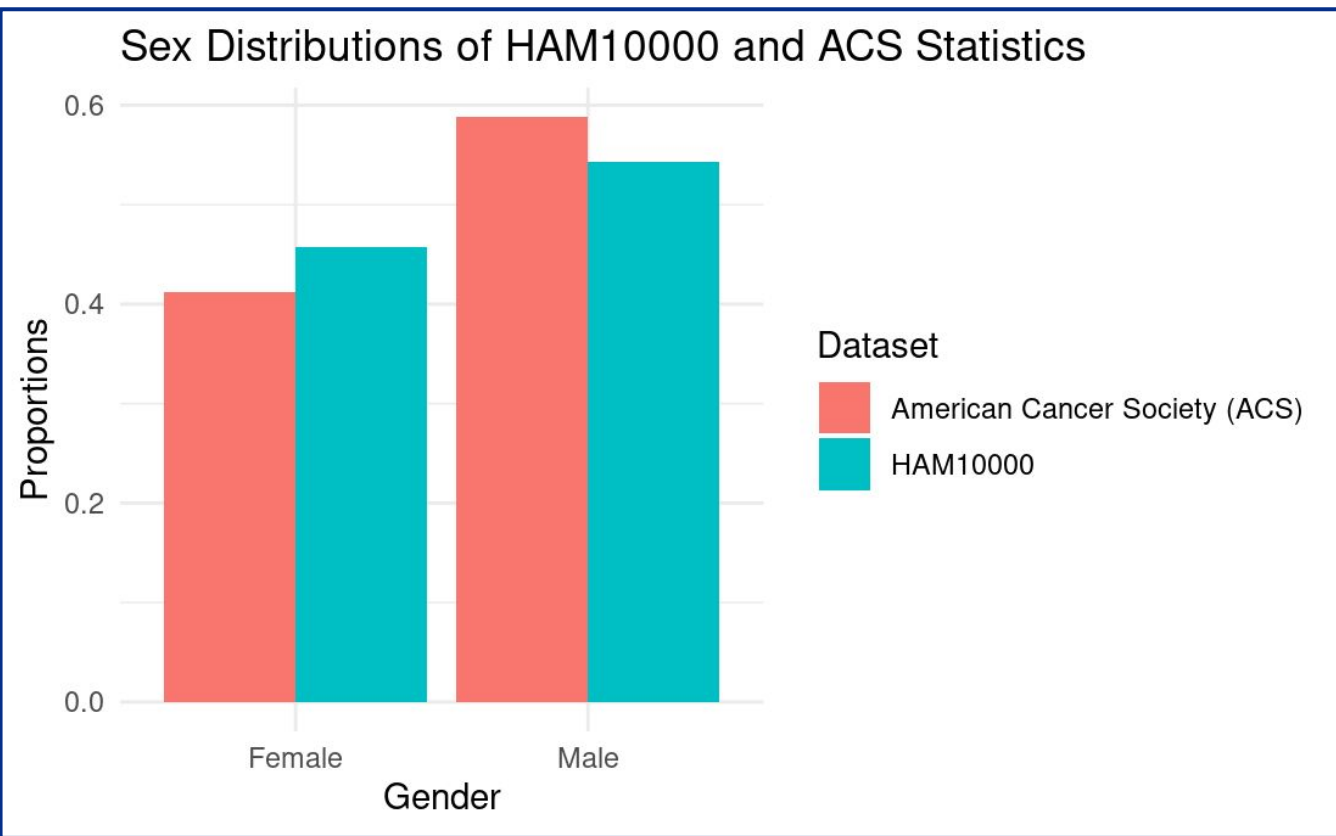
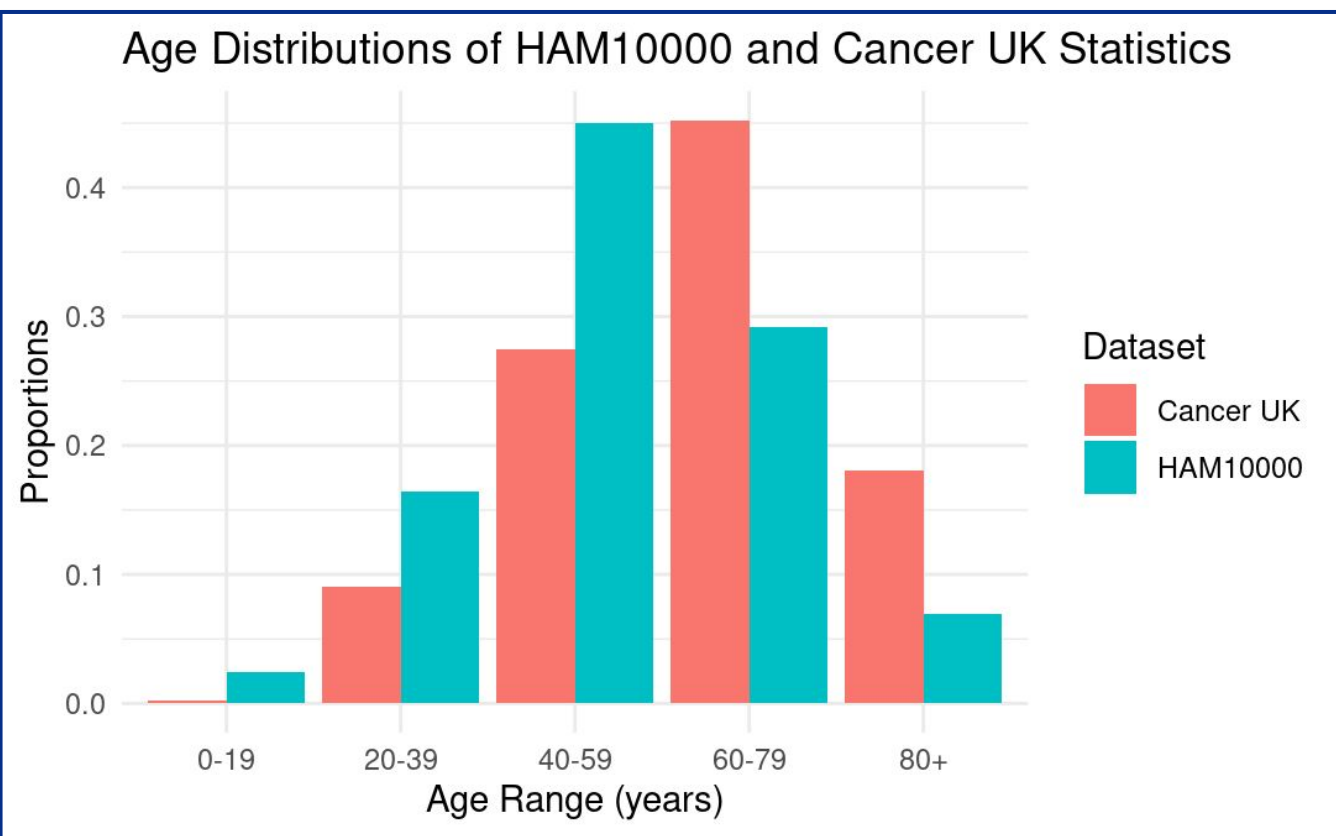
"Been at meetings that have discussed it but really I'm not familiar with it at all as an everyday tool to use in clinic"

What do you think would be the most important factors to consider when designing unbiased AI systems for dermatology?

"Large error free data sets. More data rich information for input, including relevant clinical information. Discovery of additional means to train a computer besides recognition of patterns in photos."

"Great database for photographs with diversity"

Chi Squared Goodness-of-Fit Tests



Expected Values*

Age Range	0-19	20-39	40-59	60-79	80+
Proportion	0.0022	0.0902	0.2744	0.4522	0.1810

*Values extracted from Cancer UK

Test Statistics

X-squared = 5165.4
df = 4
p-value < 2.2e-16.

Expected Values

According to the American Cancer Society, approximately 58.79% of melanoma cases are in men, and 41.21% in women

Test Statistics

X-squared = 83.445
df = 1
p-value < 2.2e-16.

Discussion

Quantitative Data:

- Since the p-value falls below the 0.05 threshold, we reject the null hypothesis, indicating a significant discrepancy between the observed and expected distributions for age and sex.
- The image datasets do not accurately represent the demographics of the general skin cancer population. Such misrepresentation may affect the accuracy of machine learning models and introduce bias to such technologies.
- While the lesion images in the datasets were labeled with factors like age, sex, location, and type, race was not recorded. This may be due to the lack of racial diversity amongst the skin cancer population since darker skin tones are not as susceptible to skin cancer.

Qualitative Data:

- Dermatologists generally seemed unfamiliar with using AI for skin cancer diagnosis, mainly due to lack of access to the technology.
- Besides access issues, dermatologists expressed reservations about incorporating AI into their practice, showing doubts about its accuracy and capabilities.
- Concerns about potential bias in the technology were also noted.