**Ethical Evaluation**

Bias Analysis

The dataset used for the project is ISIC 2020 Challenge Dataset which is provided by Kaggle, a well-established data science community. The dataset was created to conduct a challenge where machine learning could help in diagnosing melanoma in lesion images (1). As our project and the dataset deal with human skin and illnesses, there are quite few biases that need to be considered, especially when the body part that is being dealt with is skin. The main biases found within the dataset are:

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| Racial bias | The dataset mostly consists of fair-skinned images and lack images of people with darker skin. While light-skinned people do have a higher chance of getting skin cancer, darker-skinned people also get skin cancer and are often diagnosed at later stages (2). |
| Socioeconomic bias |  |
| Gender bias | While not as big of a problem as racial bias, gender bias still exists in this dataset. |

Racial bias usually is the biggest problem that artificial intelligence applications that work with human body face. Our team are not in a position that would allow us to quickly fix the problem as we do not have access to patients with melanoma.

Ethical Discussion

In the “Bias Analysis” part it was repeatedly mentioned that the dataset and the project itself deals with human body and health issues such as cancer. With that comes a lot of discussions about the ethics of using artificial intelligence to diagnose illnesses on human beings instead of asking human professionals who had trained and studied for years to be able to diagnose such problems.

First, the patient could possibly refuse to be examined by artificial intelligence application for many reasons such as people are still not fully trusting AI as it is relatively new and many do not understand how it works and so not knowing leads to fear. The patient might not agree to get their diagnosis this way because they would rather trust a human being who they can relate to despite the fact that usually the artificial intelligence application detects the problems much faster and more accurate than human doctors (1).

Secondly, doctors themselves might refuse to use AI applications. As it may seem improper to use artificial intelligence applications that are deemed to be more accurate in case they misdiagnose the problem. As mentioned before, AI usage, especially in medical field, is still relatively new and there many doubts in whether they should be trusted or not. There might be doubts if it is okay to use such applications if they are not 100% accurate, is it okay to use them on humans if they cannot guarantee that the diagnosis will be 100% accurate.

While 100% accuracy is not guaranteed, there would have to be many agreements between doctors and patients if they agree to use it and if they are aware of the chances of misdiagnosis. There is also this question if the usage of AI applications that are not 100% accurate on humans would count as laboratory testing as it is hoped that the accuracy would be wished to be increased until it becomes 100% accurate and each diagnosis or misdiagnosis could help to improve the application.

Third, as it deals with human body, diversity of human bodies must be taken into the account. As discussed in “Bias Analysis”, there is racial bias as well as gender bias. However, age and body type must be also taken into the consideration. As previously discussed, racial bias is quite a big problem in AI applications meant for diagnosing skin problems. While it may be because light-skinned people are more at risk of getting skin cancer (or other skin problems) that does not mean that dark-skinned people should be forgotten or thought as less important. Racial bias results in more misdiagnoses and diagnoses in later stages for people who have darker skin which puts them in bigger risk. While human doctor may not necessarily struggle with giving correct diagnosis to darker-skinned people, AI applications struggle with that because the datasets usually lack the diversity in skin colours. Then age bias is also important as with age skin usually changes (wrinkles appear, gets more texture) and that might have a big impact on the diagnosis. The older the patient may be the hard it might be to diagnose the skin problem. While there are not many studies that I managed to find that talk about gender bias problem in diagnosing skin cancer with AI application, there appears to be one. Combining these problems, the artificial intelligence application does not seem as reliable as it might have seemed before. The patients, especially the ones who are minorities, will have to take those factors into consideration before agreeing or disagreeing to use AI application to get diagnosis.

Fourth, in order to use technology in medical field it has to be made sure that the application will not cause any harm to the patients or doctors. Which brings up a point that if the application is not 100% accurate and can misdiagnose the problem, would the misdiagnosis be counted as harm? From patients view, it would most likely be seen as harm as misdiagnosis could potentially put the patient’s life at risk. That means that using the AI application alone would be morally irresponsible.

However, us doing this project is contributing to advancing in AI application usage for medical purposes, to be more specific, diagnosing skin cancer.

References:

## [1] “2020 SIIM-ISIC Melanoma Classification Challenge Dataset [Draft]”, accessed on <https://datanutrition.org/labels/isic-2020/>

# [2] M. Goyal, T. Knackstedt, S. Yan and S. Hassanpour, “Artificial intelligence-based image classification methods for diagnosis of skin cancer: Challenges and opportunities”, accessed on <https://www.sciencedirect.com/science/article/pii/S0010482520303966>