NeurIPS Paper Checklist

1. **Claims**

   Question: Do the main claims made in the abstract and introduction accurately reflect the paper's contributions and scope?

   Answer: [Yes]

   Justification: The abstract and introduction outline the claim that balancing a skin disease dataset by skin tone using stable-diffusion-generated images increases the fairness and accuracy of neural networks trained on the dataset. This was the paper's contribution and focus.

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2. **Limitations**

   Question: Does the paper discuss the limitations of the work performed by the authors?

   Answer: [Yes]

   Justification: Due to the four-page restriction, a Limitations section is not included. However, in the Dataset configuration section of Methods the limited number of images and consequent use of only two skin tones and three diseases, which doesn't represent all skin disease patients, is discussed. The limited diversity of the stable-diffusion-generated images used is discussed in the Results section. As a result these synthetic images should not be treated or used as real images despite their high level of realism. Additionally, the framework has only been tested on one dataset (Fitzpatrick17K) and one neural network architecture (VGG-16).

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   Question: Does the paper fully disclose all the information needed to reproduce the main experimental results of the paper to the extent that it affects the main claims and/or conclusions of the paper (regardless of whether the code and data are provided or not)?

   Answer: [Yes]

   Justification: The Dataset configuration section of Methods describes how the original Fitzpatrick17K dataset created by Groh et al. was configured to create the train and test sets. The Dataset balancing section describes how synthetic images were generated using DreamBooth, detailing how the prompts were written and engineered later on. Code is also available in the linked GitHub repository.

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5. **Open access to data and code**

   Question: Does the paper provide open access to the data and code, with sufficient instructions to faithfully reproduce the main experimental results, as described in supplemental material?

   Answer: [Yes]

   Justification: Code and a Google Form through which the synthetic images can be accessed are available in the linked GitHub repository.

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6. **Experimental Setting/Details**

   Question: Does the paper specify all the training and test details (e.g., data splits, hyperparameters, how they were chosen, type of optimizer, etc.) necessary to understand the results?

   Answer: [Yes]

   Justification: The number of images per disease and skin tone is the train and test sets are described in Table 1. Due to the four-page limit the specific hyperparameters of the stable diffusion model and diagnostic neural networks are not detailed as they are exactly the same as those used in the DreamBooth example and Fitzpatrick17K paper cited respectively. They can also be found in the code in the linked GitHub repository.

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Question: Does the paper report error bars suitably and correctly defined or other appropriate information about the statistical significance of the experiments?

Answer: [Yes]

Justification: For each graph (Figure 3) we provide 95% confidence interval bars and p values found using t-tests to support the statistical significance of the increases in fairness and accuracy we found. The fact that variability is due to the fact that the 17 networks were trained with different seeds is described in the Evaluation section of Methods.

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   Question: For each experiment, does the paper provide sufficient information on the computer resources (type of compute workers, memory, time of execution) needed to reproduce the experiments?

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   Justification: We state that we used the free GPU resources available on Google Colaboratory.

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   Answer: [Yes]

   Justification: There is no indication that the algorithm can injure anyone. It does not introduce security vulnerabilities or misuse of surveillance data. It explicitly addresses discrimination by increasing the fairness of skin disease diagnosis for minorities underserved in healthcare. There are no concerns related to deception, harassment, or environmental impact. The research does not facilitate illegal activities or deny human rights. Finally, the study acknowledges and addresses biases and fairness by suggesting future work to better represent more than the two skin tones we have used in the current study.

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    Justification: Due to the four-page limitation, potential negative impacts are not discussed. However, the limitation of only addressing two skin tones currently is mentioned. This may lead to decreases in fairness for other skin tones, though this was not seen. Additionally, though this too was not seen, if the stable diffusion model inadvertently introduces subtle biases during the image generation process, these biases could be propagated through the training dataset, leading to biased diagnostic outcomes. Additionally, if the model generates unrealistic images, these may decrease diagnostic fairness, so the quality of these generated images should be monitored, perhaps by a neural network trained on real skin disease images, filtering out unrealistic images like a GAN discriminator. Potential positive impacts are discussed in the Conclusions section.

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    Justification: We mention using five images for fine-tuning, as suggested by the creators of DreamBooth. Additionally, all the image sizes and hyperparameters used are taken from the original papers to prevent misuse. The Fitzpatrick17K dataset has been used by many papers before and we obtained it directly from one of its authors, Dr. Matt Groh.

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