

CHAPTER V

CONCLUSION

5.1 Conclusion

Based on the results of the research that has been conducted, the Swin Transformer architecture has been successfully designed and implemented to classify multi-class skin disease images consisting of four categories, namely *Acne*, *Melanoma*, *Tinea*, and *Verruca/Warts*. The model was developed using a *Transfer learning* approach by utilizing the initial weights of ImageNet and integrated into a web-based application using FastAPI as the backend. The results of the implementation show that the model is able to perform the image classification process automatically and generate predictions of skin disease classes based on images uploaded by users.

The treatment recommendation system was successfully built using a *knowledge-based approach* that refers to the PERDOSKI Clinical Practice Guidelines (PPK). The system is able to map the results of class predictions generated by the classification model into initial treatment recommendations that are appropriate to each skin disease. The integration between the classification model and the recommendation system allows users to obtain early information about detected skin diseases along with relevant treatment recommendations based on accountable sources.

Based on the results of the evaluation, the best model was obtained in a split data configuration of 80:20, a *learning rate* of 0.0001, a *batch size* of 32, and a 100 epoch. The model produces an *accuracy* value of 92.27%, *weighted precision* of 92.25%, *weighted recall* of 92.27%, and a *weighted F1-score* of 92.25%. In addition, the model also obtained an F1-score macro score of 92.22%, which indicates that the classification performance in each class is relatively balanced. These results show that Swin Transformer has excellent performance in performing multi-class skin disease classification. The *Melanoma* class had the best performance with an F1-score of 96.52%, while the *Verruca/Warts* class was the most challenging class to be classified with an F1-score of 87.50%.

Overall, this study shows that the use of Swin Transformer with *a Transfer learning approach* is able to produce high classification performance in multi-grade skin disease images. In addition to improving the efficiency of the training process compared to *the training* from scratch method, the resulting model is also able to support the implementation of *a knowledge-based* skin disease management recommendation system effectively and can be used as a tool in providing initial information to users about the detected skin disease condition.

5.2 Suggestions

Based on the results of the research that has been conducted, there are several suggestions for the development of further research as follows:

1. Adding the number and variety of skin disease datasets so that the model can learn more diverse lesion characteristics, improving generalization capabilities on data that has never been seen before.
2. Adding more skin disease categories to the model training process so that the system can be used on a wider scope of dermatology cases and reduces the likelihood of diseases outside the research class being classified into one of the available classes.
3. Exploring a wider range of hyperparameters, such as *learning rate variations*, *batch* sizes, optimizers, number of epochs, and regularization techniques to obtain the best performing model configuration.
4. Develop an out-of-distribution detection mechanism so that the system can identify possible images that do not belong to the class of diseases studied and provide warnings to users.