

# **Skin Disease Detection Application**



**Computer Engineering - Senior Project Report**

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# Skin Disease Detection Application

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## Summary

Skin diseases are one of the most common health problems in our country and the world. With the developing technology, people have started to research health problems via the internet, as in everything else. Google says that every year about 10 billion searches are done on the search engine for skin, hair, and nail problems[1].

Artificial intelligence, which is a product of developing technology, is a sub-field of computer science that includes creating programs that aim to reproduce human cognition and processes involved in the analysis of complex data[2]. Scientists say that artificial intelligence can identify skin cancer in photographs with relative accuracy to trained doctors[3]. Therefore, it increases the belief that using artificial intelligence can revolutionize healthcare by turning anyone's smartphone into a disease scanner. This is a sign that the mobile application we will develop can be beneficial for both doctors and users. Early detection of melanoma[4], which is responsible for three-quarters of deaths due to skin cancer in particular, can save many lives.

At the end of the project, users will be able to use the app by taking a picture of the diseased area of their skin.

The aim of this project is to provide the user with a realistic pre-diagnosis process and to provide a fast and reliable service. Users sharing this preliminary diagnosis with their physician will contribute to the physician who has limited time and will alleviate the workload. This field of use of artificial intelligence will reduce the burden of treatment on both the clinician and the patient, by enabling patients to reach doctors earlier.

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## 1. Introduction

Increasing urbanization and population growth day by day cause some problems in the field of health as well as in many other issues. Although these disruptions are multiplied by the increase in the population, various diseases have been pushed into the background by the authorities, especially in extreme situations such as pandemics. As such, the patients had difficulty getting their hospital appointments. This has forced people to seek remote diagnosis and treatments (Telehealth). The proportion of people using the internet due to single telehealth is increasing. For example, according to TUIK data, while the rate of people who searched for health-related information (injury, illness, nutrition, etc.) was 59.6% in 2013 [6], this rate reached 69.6% in 2021[7].

## 2. Method

The project method consists of four basic subsystems: "Collecting data", "Classification of Data", "Development of Mobile Application", and "Testing Application".

### 2.1 Collecting Data

The data to be used in this research to test the success of the application consists of photographs of diseased areas taken from various parts of the body. These photos consist of open-source datasets (from Kaggle and published articles) and include a variety of skin conditions such as melanoma, eczema, rosacea, and keratosis pilaris. In addition, a healthy class was added as it was thought to be more useful.

## 2.2 Classification of Data

Classification of photographs according to different types of skin diseases creates a problem in the detection of skin diseases. To solve this problem, in this work package, CNN (Convolutional neural networks) and ANN are applied to data preprocessed using Python programming language.

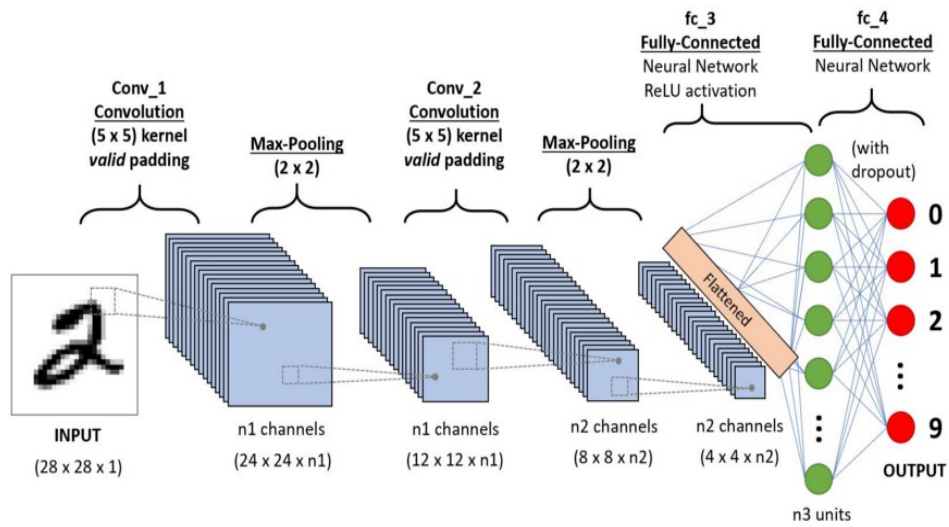
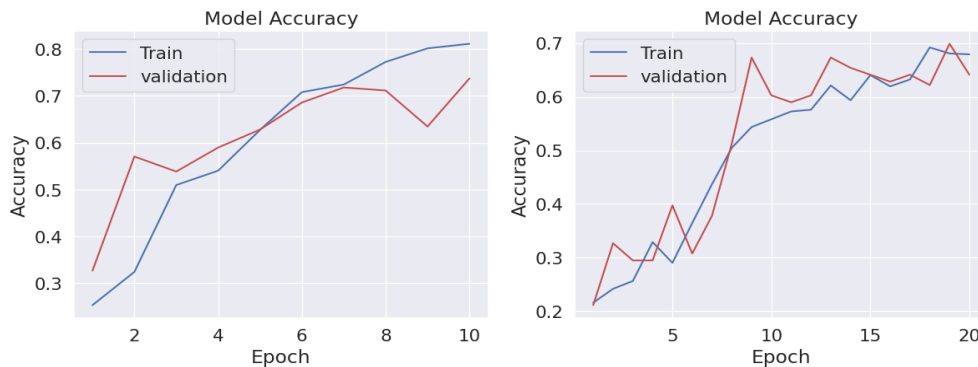


image 1



(ANN and CNN models)

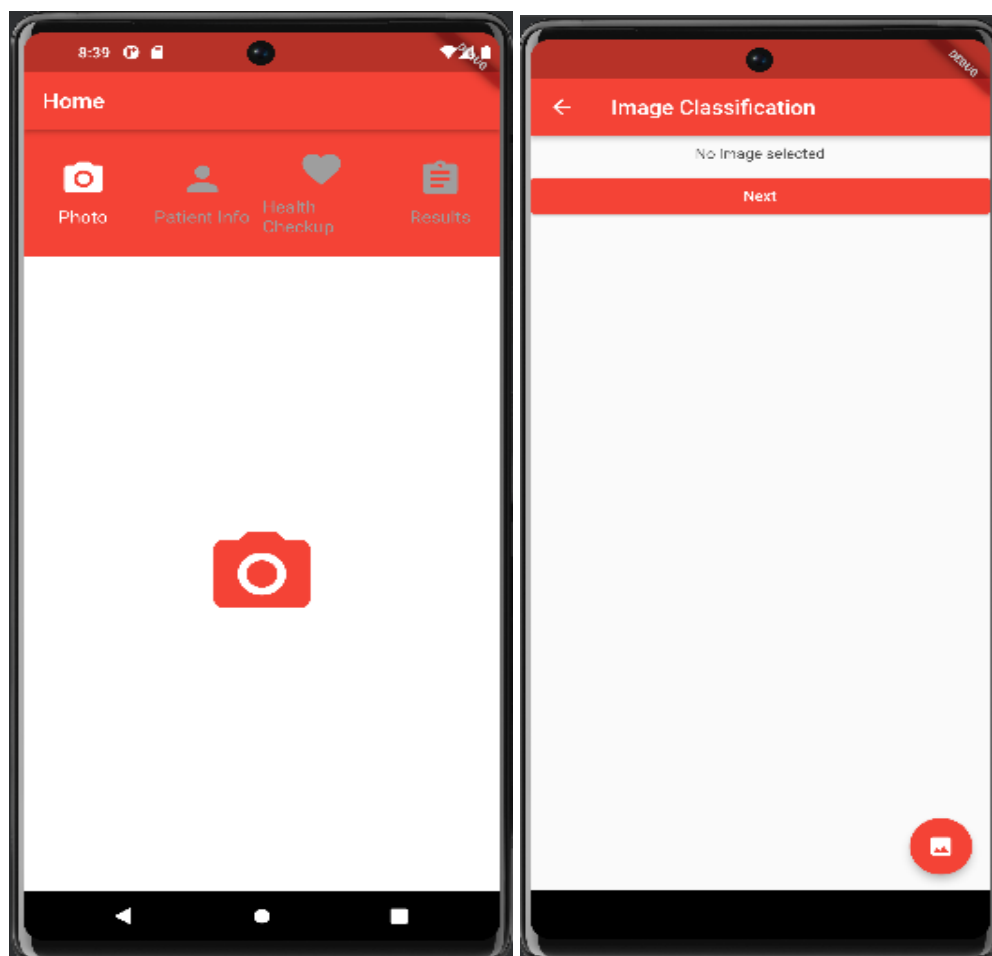
Then, an ensemble model was created from these two models. Stacking Ensemble, an ensemble model type, has been implemented. Thus, a meta-model was obtained.

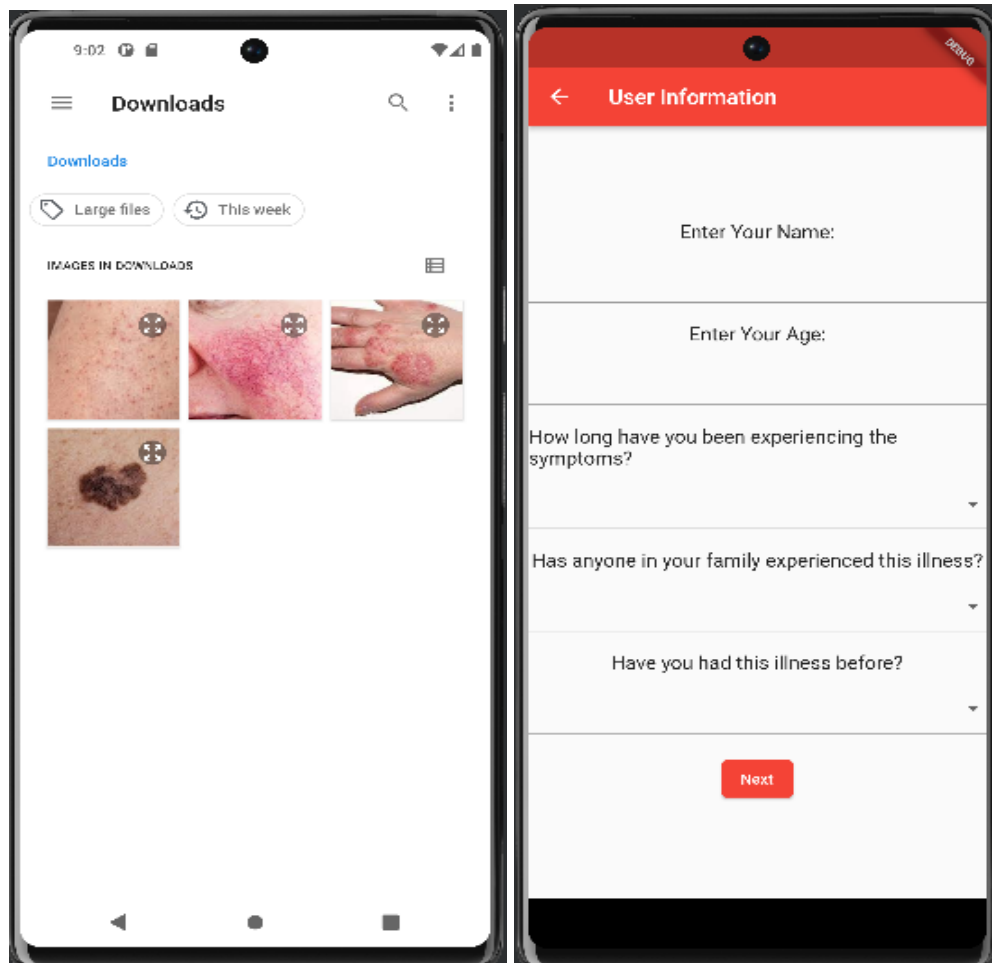
## 2.3 Development of Mobile Application

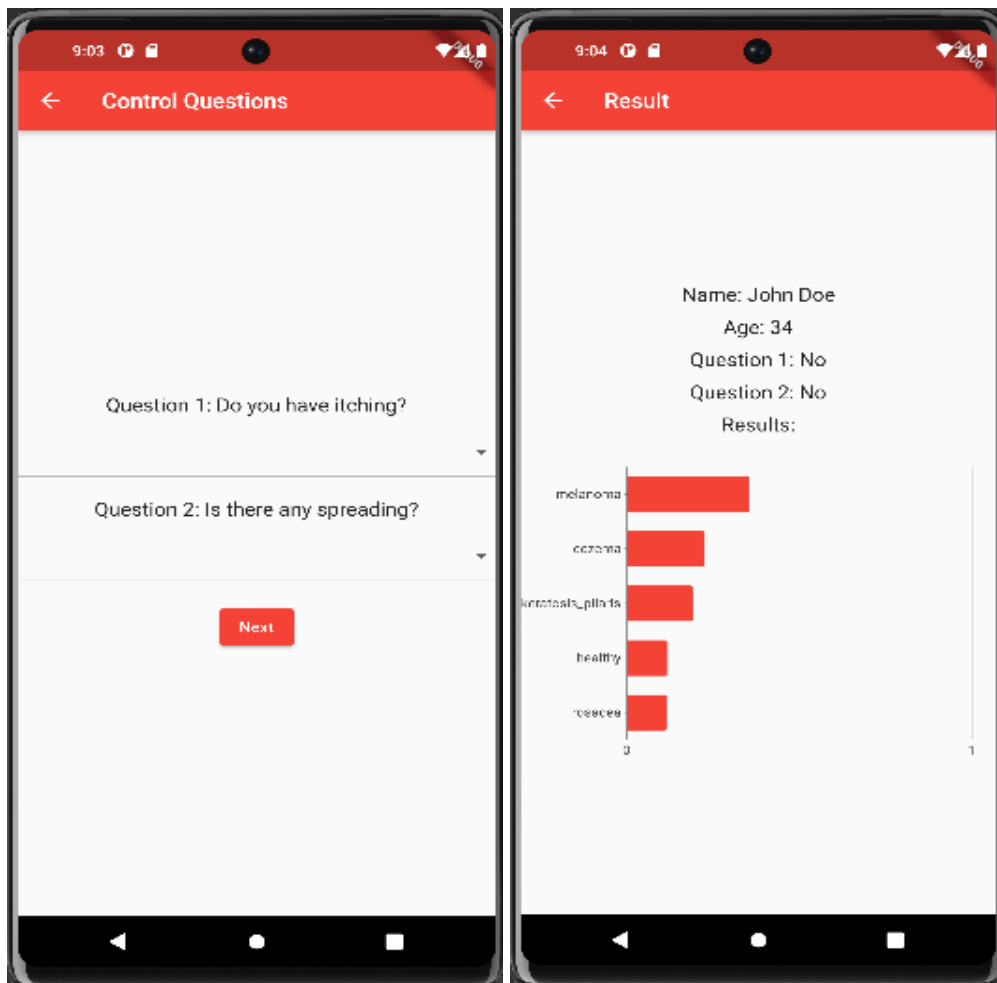
Our mobile application, which we aim to be easy to use and free, asks the logged-in user to take a photo of the diseased area. Then, it shares the most accurate preliminary diagnosis result with the user by asking various questions. It gives information about the disease and its treatment, and it is recommended to see a specialist and share the preliminary diagnosis with the specialist.

Flutter developed by Google will be used for the mobile application. Flutter is an open-source software development kit for building mobile apps. It uses the Dart programming language in it[9].

Our application is as follows:









## 2.4 Testing Application

The mobile application was tested on classified data. The final stage of the project is to make the final controls of the mobile application (submitting to expert opinion, testing the application, etc.) ready for publication on Google Play.

## 3. Results

I collected datasets for each skin disease (eczema, keratosis pilaris, melanoma, rosacea) in the past term. During this period, I collected data for the healthy class. Eczema, melanoma, and rosacea were found on Kaggle, but no datasets for keratosis pilaris and healthy, so I had to collect image data from articles posted on Google.

Then I created an Ensemble model with the data I collected using CNN and ANN.

I created the user interface for the mobile application (mockup). I have created a user-friendly mobile app in Dart language with Flutter in Android Studio.

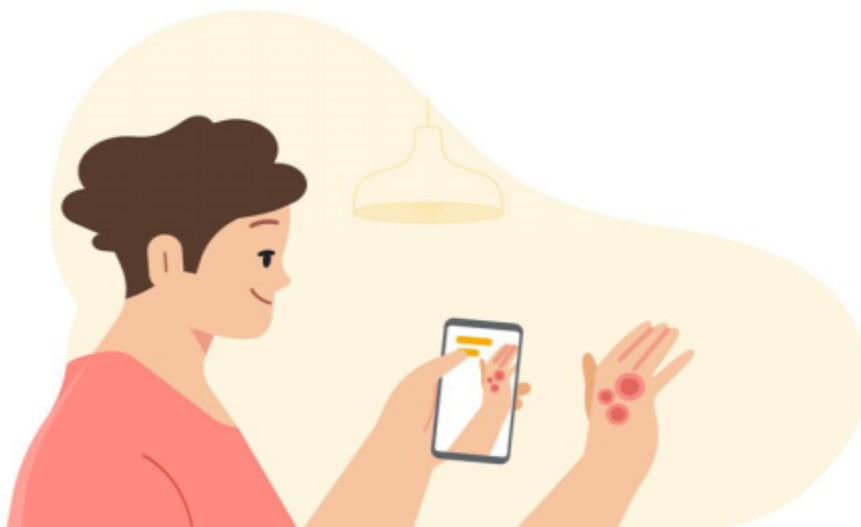


image 2

#### 4. Conclusion

Almost 10 billion Google searches are made each year for skin, nail, hair problems, and the like[12]. Worldwide, almost 2 billion people suffer from dermatological problems[13] but there is a global shortage of specialists. On this subject, Dr. Andrew Miller said that there are approximately 100,000 dermatologists worldwide and this is an incredible shortcoming, considering that there are almost 8 billion people in the world[14]. Although this situation causes people to search for their problems on the internet, just expressing this with words may not be enough to solve the problem and prolong the process. For this reason, with our application, which we aim to make things much easier, the preliminary diagnosis will be shared with the patient by interacting with the patient by using the phone camera and asking various questions (for how long the problem has existed, etc.). It will be warned that for the correct diagnosis, it is necessary to go to a clinician without wasting time. We aim to help our physicians who have limited time for real diagnosis by sharing this preliminary diagnosis obtained by the patient with the physician and to contribute to the solution of the problem in a short time and effectively.

## 5. Dataset

### ***Eczema***

<https://www.kaggle.com/datasets/shubhamgoel27/dermneteczema-atopic-dermatitis>

<https://www.kaggle.com/datasets/shubhamgoel27/dermnet>

<https://www.kaggle.com/datasets/ismailpromus/skin-diseases-image-dataset>

### ***Keratosis Pilaris***

<https://cdn.mdedge.com/files/s3fs-public/Document/September-2017/082030177.pdf>

<https://cdn.mdedge.com/files/s3fs-public/Document/September-2017/082030177.pdf>

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[https://onlinelibrary.wiley.com/doi/full/10.1111/j.1525-1470.2006.00166.x?casa\\_token=8sLxO3cvxi8AAAAA%3AAsypW7HMILT6U7G8aKUijE3mfVuiJ\\_dFPB7isjGPGGaF93jd4r0T\\_fFaEPIRCj8kOzCg3CMWOldcoiA](https://onlinelibrary.wiley.com/doi/full/10.1111/j.1525-1470.2006.00166.x?casa_token=8sLxO3cvxi8AAAAA%3AAsypW7HMILT6U7G8aKUijE3mfVuiJ_dFPB7isjGPGGaF93jd4r0T_fFaEPIRCj8kOzCg3CMWOldcoiA)

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## ***Rosacea***

<https://www.kaggle.com/datasets/amellia/face-skin-disease>

<https://www.kaggle.com/datasets/amrragababdelaziz/dermnet-and-skin-disease>

## ***Melanoma***

<https://www.kaggle.com/c/siim-isic-melanoma-classification/data?select=jpeg>

## ***Healthy***

<https://www.usmagazine.com/shop-with-us/news/a-lifestyle-guide-to-nourish-your-body-and-complexion/>

<https://www.aveeno.com/learn/healthy-microbiome-with-oat-skincare>

<https://www.apskincare.co.uk/blog/how-to-tell-if-you-have-healthy-skin/>

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image 1:

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image 2:

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