# SPOT

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## Introduction

Said, a 10-year-old boy in a developing country, noticed a small mole on his mom's arm that had grown significantly in a short time. He learned about SPOT, an AI-powered medical diary that could identify potential skin cancers or diseases, and uploaded a picture of the mole to the app. SPOT's algorithms analyzed the image and identified the mole as a potential skin cancer. Said was grateful for SPOT, which helped him to detect his mom's skin cancer in its early stages, and hoped that others in his community could benefit from similar advancements in healthcare technology.

## Objectives

SPOT's objectives:
- To help catch on early stages of skin cancer/ diseases
- Not to give a full diagnosis but to inform of certain possibilities
- To act as a diary that records the results for future doctor appointments

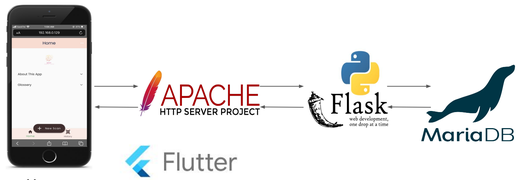
## Why we are doing this?

- Getting a medical evaluation for every minor skin blemish can be a costly and time-consuming hassle that most individuals simply cannot afford
- To solve 1 of UN's 17 sustainable development goals: Health and Well-Being
  - the goal is to tackle the leading causes of death and disease in our world today
  - how our project achieves this is by giving users a little more insight into what the spots and blemishes on their skin may mean. A professional opinion is absolute as the solution but when a solution like that is not viable, any insight is better than no insight


- We as a group value everyone's lives especially our loved ones. That is why we built this app to help everyone become more informed about their skin health and also as a call to action for people to make informed decisions

## Methods

Our app implementation uses the following:
- **Flutter**
  - this coding framework allows us to code our front end once and potentially deploy on multiple kind of devices
- **Apache Server**
  - this server acts as a mailbox, receiving requests from users to pass to our main WSGI server and pass all responses back to the user
- **WSGI/Flask Server**
  - this our main workhorse server, coded in python and using a package called Flask, this server is responsible for tasks such as user sign up, log in, and using our AI model to create predictions from user pictures as well as interaction with user data
- **MariaDB**
  - our database that stores a majority of user data for our users to later recall




User

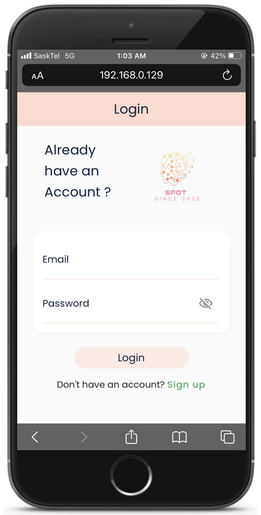
## Results

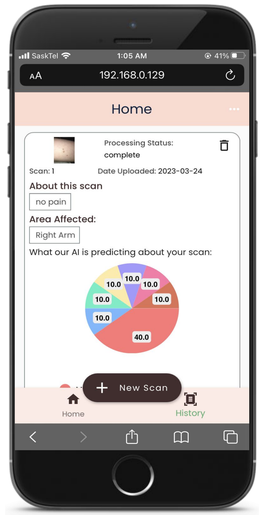
After training and testing our AI models, we have developed 2 models. The first one is engineered to focus on distinguishing Malignant/Benign Melanoma and the second model covers 6 common skin diseases/conditions including healthy nevi


Model 1


Model 2

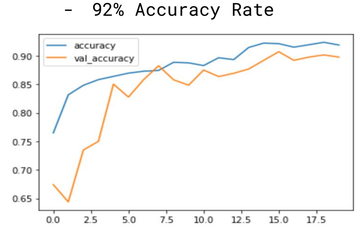
We developed our AI model using the following:
- **Convolutional neural networks (CNNs)** is a type of artificial intelligence that can "see" images and recognize patterns within them. They work by breaking down images into smaller pieces, analyzing them, and then combining the results to make predictions about what is in the image.
- **ResNet 50** is a specific type of CNN that is used for image classification tasks. It has 50 layers and is able to recognize a wide variety of objects within images.
- **MobileNet** is another type of CNN that is designed to work well on mobile devices with limited processing power. It is a more lightweight and efficient version of a CNN, making it ideal for applications that require real-time image processing on mobile devices.
- **Offline Augmentation** is a technique used in machine learning where new training data is generated by making small modifications to existing data. This is done in order to increase the size of the training dataset and improve the accuracy of the model. Offline augmentation is performed before the training phase of a model, and the resulting augmented data is stored and used during the actual training phase.



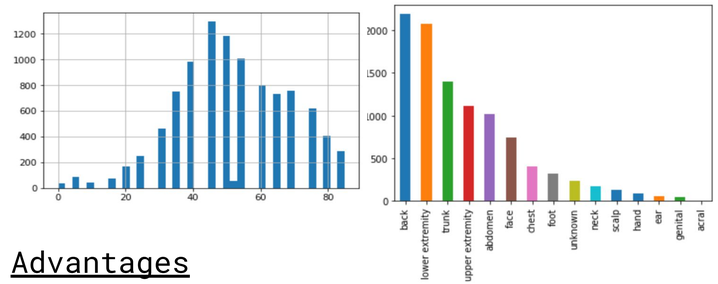




## Results Visualization

- **Model 1:**
  - Specialized on Melanoma Detection
  - Trained with ResNet 50
  - 92% Accuracy Rate




- **Model 2:**
  - For general detection purpose
  - Trained using diversified datasets
    - Skin tones, parts of the body, age group etc.
  - Augmented with Offline Augmentation




## Advantages

- **Convenient:** SPOT offers a quick and easy way to monitor skin health, without the need to visit a medical facility. Users can take pictures of skin blemishes or areas of concern and receive a comprehensive and accurate assessment of their skin's health status.
- **Affordable:** Traditional medical evaluations can be costly, and many individuals cannot afford them. SPOT provides an affordable alternative to traditional medical evaluations, making it accessible to everyone.
- **Accessible:** Some individuals may have limited access to medical facilities or live in remote areas. SPOT's AI-powered technology makes it possible to monitor skin health from anywhere, as long as there is an internet connection.
- **Empowering:** SPOT empowers individuals to take control of their skin health and overall well-being. By monitoring skin health with SPOT, users can take proactive steps towards maintaining their health and well-being.
- **Confidential:** SPOT's assessment is confidential, which can be important for individuals who may be hesitant to seek medical attention or share their skin concerns with others. They can receive accurate and reliable evaluations in the privacy of their own home, without any social stigma or judgment.

## Contacts

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Scan to check our GitHub Repository