AN INTELLIGENT MOBILE PLATFORM TO ASSIST CUSTOMIZED COSMETIC SELECTION USING ARTIFICIAL INTELLIGENCE AND NATURAL LANGUAGE PROCESSING

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ABSTRACT

Most teenagers have some types of skin blemishes and allergies that often go undiagnosed [4][5]. This can lead to many unnecessary skin ailments and treatments that do not address the root of the problems [6]. This is especially true for young women who are beginning to use makeup. This can lead to embarrassments and even isolation and depression. But with this Intelligent Mobile Platform app, teenagers, parents, and dermatologists can all be assisted in identifying specific skin conditions such as oily or dry skin, skin prone to breakouts and rashes, acne, or even more severe conditions such as eczema and psoriasis [7]. Once this app has made a proper diagnosis, it will recommend and prescribe proper skin treatments intended to avoid or solve potentially major physical and emotional problems. This paper is designed to discuss the ways that this app evolved into a productive and reputable device capable of improving the lives of millions of young teenagers as well as those of older ages who continue to struggle with skin problems.

KEYWORDS

Natural Language Processing, Artificial Intelligence, Mobile Platform.

1. INTRODUCTION

Teenage years are some of the most difficult years of a person's life as they adjust from childhood, to adolescence, to adulthood [8][9]. It is during these challenging times that puberty begins to develop and most are faced with some type of skin difficulties. During these sensitive years, teens, especially young females, are also introduced to many skin care products. But this can be quite dangerous as most are not compatible with the particular problems and therefore can irritate the skin and even exacerbate the problems. This can cause damage that takes months to clear up. In the meantime, young teens, who are already overly self-conscious, are afraid to be seen in public. Imagine the unnecessary embarrassment, all because the skin irritations were not properly diagnosed and treated. Researchers, however, began working on an intelligent mobile platform app to assist in diagnosing and then selecting the perfect customized cosmetic solution. Now, with the invention of this app designed to mitigate such problems, teens will at least have a better chance to anticipate potential difficulties and apply the safest products for skin care. Now,

teens will have more enjoyable days and evenings as they no longer worry about their skin problems.

Currently, teenagers engage in "trial and error" methods for determining if products are safe for the skin. They also rely on the "word of mouth" system, whereby friends or family members suggest different skin-care products based on commercials they hear or advice they might receive from neighbors and associates. These methods are dangerous, however, because they do not take into consideration the fact that all skin types are slightly different and each skin has unique sensitivities that react differently to similar products. Dermatologists are also fairly new to the subject of skin ailments and treatments as the medical profession continues to evolve. Their medical training is also limited and they often overlook the nuanced differences that are now detected by this simple app.

There are some products being developed and found online or in medical device centers that diagnose skin disorders, but most are either costly or unreliable. The Skin Analysis System with its corresponding laptop, for instance, retails for $1,490. The Skin Analysis Scope created by The Garfield Company retails for $970. Other, less-expensive diagnostic machines such as the Bio-Therapeutic bt-analyze Skin Identification Device or the Fantexy Portable Skin Analyzer retail for less than $150, but they are notoriously unreliable [10]. Perhaps the best device on the market today is the Dermatoscope Diagnostic Skin Analyzer Handheld Skin Tester that sells for just under $2,000 [11]. Dermatologists often use this machine, however, the new app we are describing today has far more advantages. It is portable, more reliable in terms of diagnostics, results are supplied far more quickly, and all of these benefits are much less expensive than the Dermatoscope Diagnostic Skin Analyzer.

Because this is a mobile app device, the benefits become apparent instantly when compared to the archaic alternatives. This device does not require indoor settings with heavy machine equipment plugged into electrical outlets. Instead, to properly use this app, the user need only take several screenshots of the facial skin from a variety of angles [12]. This allows the hand-held app to properly diagnose all details of the skin ranging from dryness or moisture, to potential skin allergies or diseases, to possible issues involving overexposure to the sun or from wet or bitterly cold weather. Then, the app will make appropriate diagnoses and recommendations regarding appropriate and inappropriate skin care products. In instances where skin care products are new to the market or are virtually untested, this app will determine the chemical compositions of the components and analyze them according to the possible applications for the skin in question. In this way, the app is revolutionary. It is able to anticipate potential problems and cures based on its sophisticated bank of information that is growing daily.

This paper is structured to first provide an overview of the issue and the necessity for this more modern, easier to use, more effective device. Next, we discuss the difficulties that occurred throughout the developing process. Finally, we explain the mechanics involved with this app to give confidence to those interested in supporting its use either professionally or personally. As the pertinent details are explained, every member of the audience can see the work and the benefits for all involved.

2. CHALLENGES

In order to build the project, a few challenges have been identified as follows.

2.1. Laptop Issue

Because this was the first time coding and working in an android studio, I made numerous mistakes. This made the entire experience nearly overwhelming. Additionally, the original laptop did not adapt properly, so I purchased a new laptop, which, after much experimentation, was finally resolved by going to a particular Starbucks in Irvine to do most of the coding on their premises.

2.2. App recognize issue

Another challenge we faced was that our app did not recognize some of the skin conditions such as burns to the skin and uncommon types of rashes. Therefore, we needed to conduct far more research on unusual and rare types of skin conditions and store that data into our information bank. Additionally, we secured previously unpublished data from numerous dermatological facilities as well as from the CDC in Atlanta. Georgia [13]. As additional data was collected, our app became more sophisticated and adept in identifying, diagnosing, and determining proper care for each patient. This is and will be a continuing process.

2.3. Prepare App in a presentable way

A third challenge was to prepare our app in a presentable way that attracted investors. We did not need a perfectly functioning system in place, but we needed a prototype available, complete with accompanying presentations by our engineering team and the artificial intelligence designers who were qualified to showcase our product and explain exactly how it functioned. We also needed to have many of the skin diagnoses functioning as test examples so that investors could see exactly how it worked and how our future plans were realistically calculated.

3. SOLUTION

Information is accumulated and stored in two ways. Initially, we measure the subject's facial features by rubbing the test module across the cheeks and forehead. This provides the app the skin cells to react with the components buried inside the app to deliver an initial diagnosis regarding skin types and possible future issues recognized by the app. Then an in-depth interview to determine physical characteristics including diet, activity schedule, physical locations throughout the day, atmospheric conditions, genetic details, and other data are accumulated and compiled and input in the mobile app. All data is then downloaded and stored in the central storage unit and interpreted through artificial intelligence where determinations are made and sent back to the mobile app where each patient is given a unique diagnosis and an individualized treatment plan. Once the personalized data is initially input into the system, weekly or bi-weekly tests and diagnoses are given by the app in the same way to monitor progress and prognosis. It is further recommended that a qualified dermatologist give intermittent reviews of the patient's progress as a way to ensure that the treatment plan is the very best possible. Continual updates to the information bank in addition to the accumulation of patient results will make this app increasingly accurate with every new day, because of its artificial component.
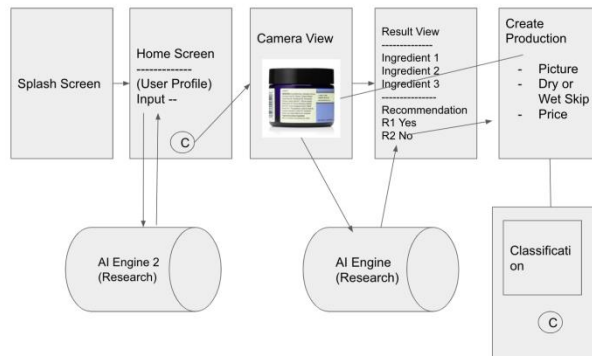
Figure 1. Overview of the solution
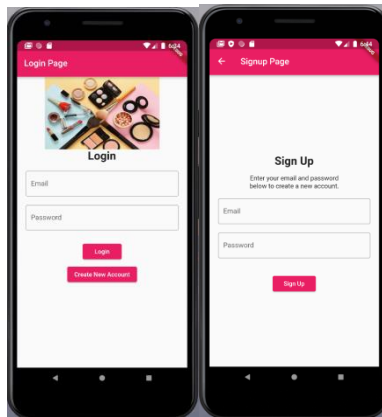
1. Login/Create new Account

Figure 2. Screenshot of Login page

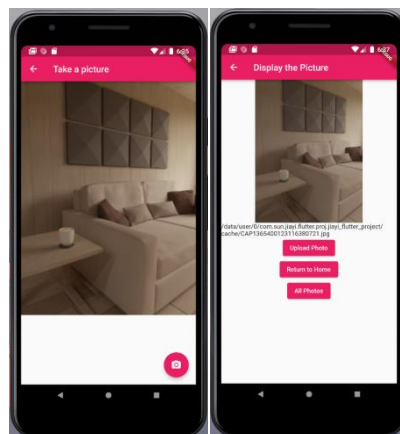2. Take a picture and upload to Firebase

Figure 3. Screenshot of upload page

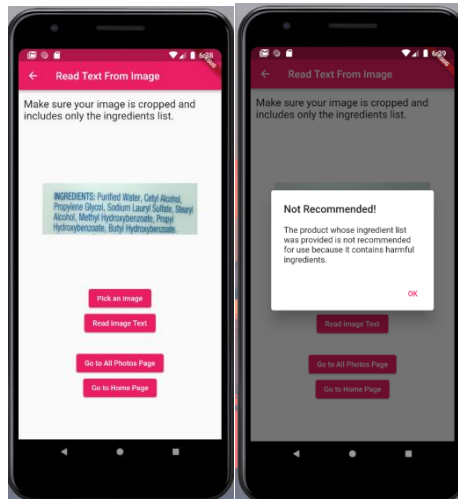3. Scan a photo, read the text, and recommend or not recommend

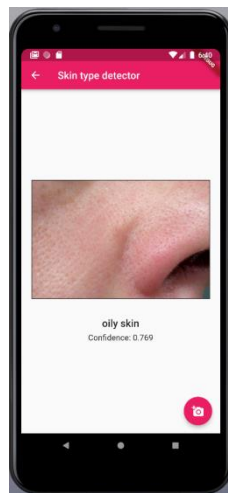Figure 4. Screenshot of reading text

4.   Skin type detector

Figure 5. Screenshot of skin

4. EXPERIMENT

4.1. Experiment 1

In order to verify that our solution can effectively solve problems at different levels and have good user feedback, we decided to select multiple experimental groups and comparison groups for several experiments. For the first experiment, we want to prove that our solution works stable and continuously, so we choose a group size of 40 different trials in 2 different kinds of skin. The 2 different types of skin are dry and wet. The goal of the first experiment is to verify if the AI algorithm works good for different types of skin. Through sampling 2 groups of skin problems. Result is collected by statistics if the app tests the skin type correctly. Experiments have shown that all skin in different types tested the right result. Dry Skin has the most correct rates, which means our user are works more better in dry skin. This experiment could explain that the skin

types do have a obvious impact on the arrange results. The average correct rate of 2 different types of the skins shows below:
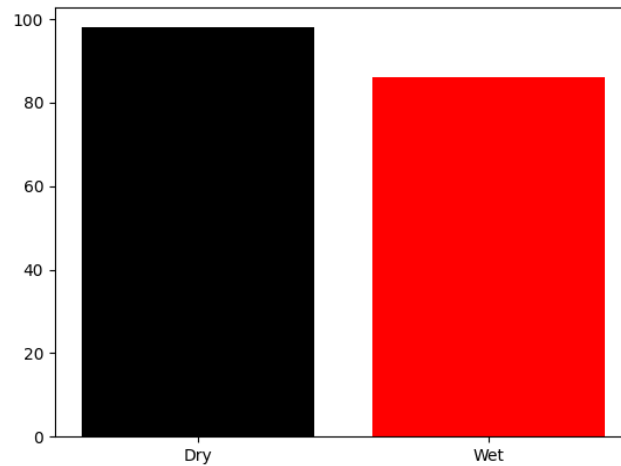

Figure 6. Data of dry and wet

A good user experience is as important as a good product. So a perfect solution should have excellent user experience feedback.In order to prove that our solution has the best user feedback, we specially designed a user experience questionnaire base on the US system usability questionnaire rules。We statistics the feedback result from 100 users, Track the user's data for 5 days, let them explore freely on the functionality. We divide those users into Five different groups. The first group of users ages from 10 - 20, the second group of users ages from 20 - 30, the third group of users ages from 30 - 40, the fourth group of users ages from 40 - 50, the fifth group of users ages from 50 - 60The goal of the first experiment is to verify high feedback scores shows high performance We collect the feedback scores form these 5 different group of users and analyze it.Experiments have shown that users who ages from 30 - 40 give the highest result feedback to our app. Which may because of the age between those range are more likely to use the makeup and need know their skin type more The experiment graph shows below:
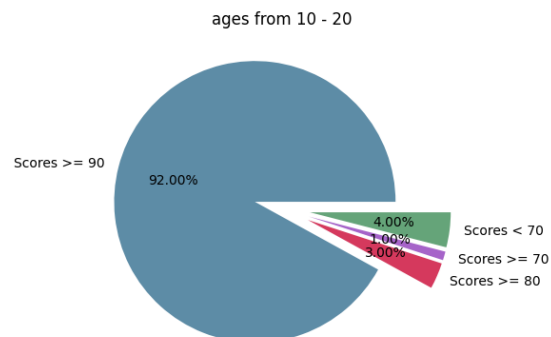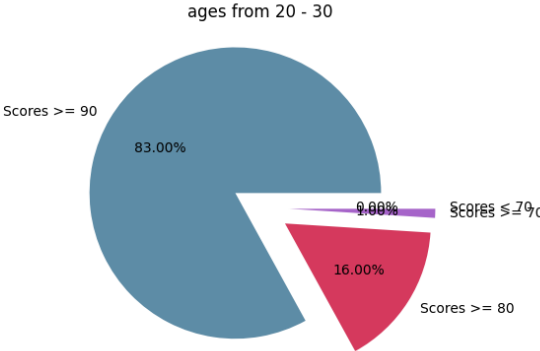

Figure 7. Result of Age 10-20
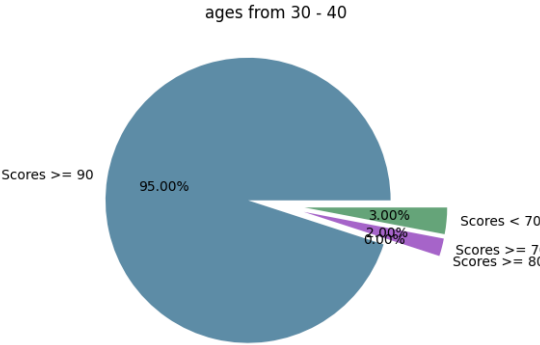
Figure 8. Result of Age 20-30
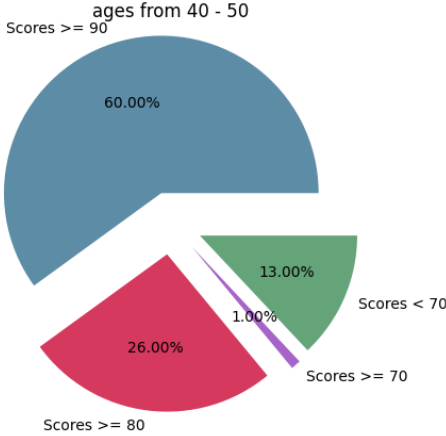

Figure 9. Result of Age 30-40
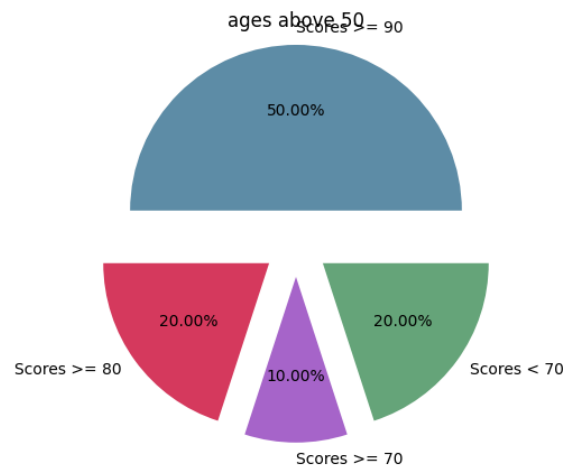

Figure 10. Result of Age 40-50

Figure 11. Result of Age above 50

5. RELATED WORK

This article by doctors from the University of Hull in the UK explores the viability and the practicality of collecting medical data and using it to diagnose and treat patients [1]. This is important because it shows that my research does have merit. This, however lays the background for my work which validates what they are saying. My research goes beyond what these doctors discovered about artificial intelligence in the medical field.

This short article adds to an earlier study by these doctors [2]. They state that there are some types of skin disorders that require less severe treatments than originally thought. This is useful to this project, because it shows that diagnosing skin disorders is part of the usual process of a dermatologist. Our research will be able to bypass some of the work of dermatologists because the app can do this much easier.

This article by a Turkish doctor from Akdeniz University in Antalya, Turkey endorses the use of smartphone apps for diagnosing skin disorders [3]. Age and distance limitations can interfere with diagnostic and treatment plans, so this doctor sees apps as a possible solution. This is useful for our research and app, because it gives our app credibility. Our app, however, is more sophisticated than what this doctor is recommending, but this is a good start. Our app not only gives diagnoses but also offers treatment plans.

6. CONCLUSIONS

The Intelligent Mobile Platform is the most versatile and accurate app available for teenagers, parents, and even dermatologists to identify specific skin conditions that range from oily or dry skin, to blemishes and acne, to severe conditions such as eczema and psoriasis. It is a hand-held device that requires just a quick rub across the cheeks and forehead to accumulate cells and forward the information to a central database to determine chemical compositions of the skin followed by a tentative diagnosis and treatment plan [14]. An in-depth interview with the subject is then conducted to learn the daily activities as well as diet and other necessary information on the subject. This is necessary for the Platform to gather and present a comprehensive diagnosis, treatment plan, and prognosis. The Intelligent Mobile Platform is inexpensive and mobile which

allows its use in almost any setting. This is especially important for young teenagers who are shy about confronting skin problems such as acne but desire a quick, reliable diagnosis and treatment plan before the acne worsens [15]. Parents will appreciate this device, not just for its privacy and accuracy, but because they want to know definitively if there are any other skin disorders their teens are suffering from. The Intelligent Mobile Platform can deliver on all of these demands, quickly, accurately, and inexpensively.

This app will only be as good as the latest information on skin disorders is available. As the dermatological field advances with improved diagnoses and treatments of various skin disorders, this app will often be in need of updates. Additionally, as the AI feature in the database is updated, the app will need to be recalibrated periodically.

Future work should focus on the size and versatility of this app. Ideally, it should be smaller and easier to use, with a smoother surface. The results should also be downloaded easier and results returned more quickly.

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