

# **Skin Disease Detection Application**



**Computer Engineering - Senior Project Report**

**Rozerin Yıldız**

**Advisor: Tuğba SÜZEK, Ph.D.**

**Date: 05/01/2023**

# ***Skin Disease Detection Application***

Rozerin Yıldız

Computer Engineer

Muğla Sıtkı Koçman University

05/01/2023

## **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.

## Table of Contents

1.	Introduction	3
2.	Methods	3
2.1.	Collecting Data	3
2.2.	Classification of Data	3
2.3.	Development of Mobile Application	4
2.4.	Testing Application	6
3.	Results	6
4.	Conclusion	7
5.	Dataset	7
6.	References	10

## **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. Methods**

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 various skin diseases such as melanoma, eczema, rosacea, and keratosis pilaris.

### ***2.2 Classification of Data***

In the detection of skin diseases, it is a problem to classify photographs according to different types of skin diseases. To solve this problem, in this work package, CNN (Convolutional neural networks) will be applied to data that has undergone data preprocessing using the Python programming language.

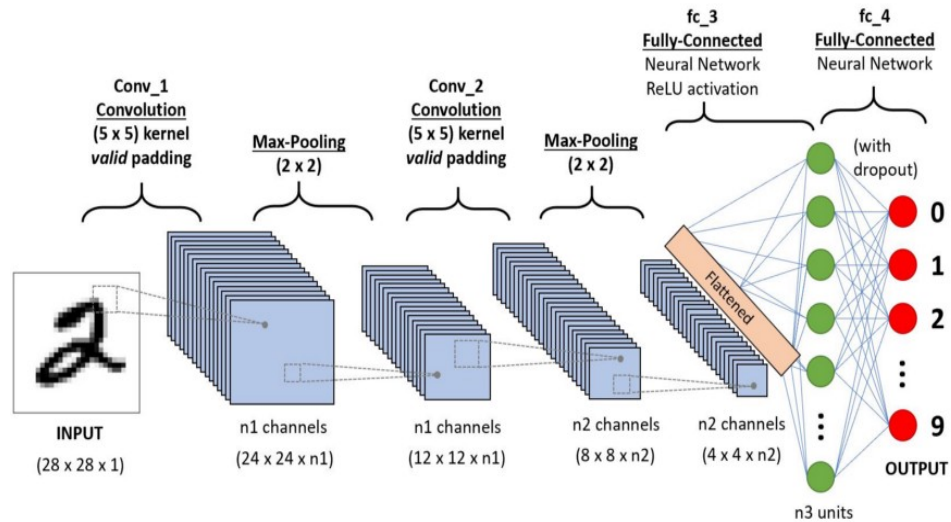


image 1

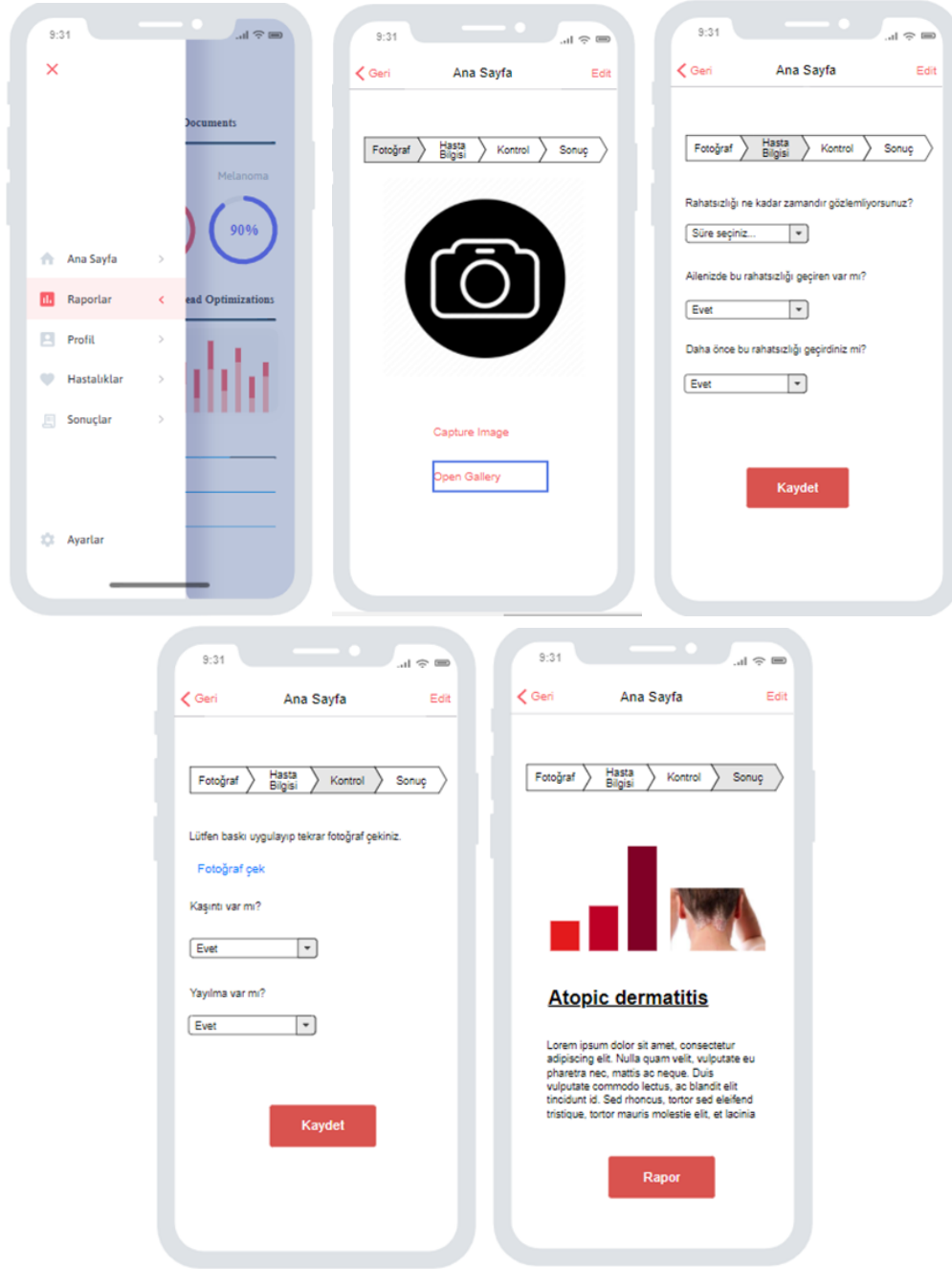
In deep learning, a convolutional neural network (CNN/ConvNet) is a class of deep neural networks, most commonly applied to analyze visual imagery. When we think of a neural network we think about matrix multiplications but that is not the case with ConvNet. It uses a special technique called Convolution. In mathematics, convolution is a mathematical operation on two functions that produces a third function that expresses how the shape of one is modified by the other.[8]

### 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 (or, if necessary, applying light pressure to the area and retaking the photo). 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].

When the application is ready, the user interface flows will resemble the interface examples that we have pre-designed in picture 5.



## 2.4 Testing Application

The mobile application will be tested on classified data. The final stage of the project is the final checks of the mobile application (submission to expert opinion, testing of the application, etc.), making it ready for publication on Google Play.

## 3. Results

This semester I collected datasets for each skin disease (eczema, keratosis pilaris, melanoma, rosacea). Eczema, melanoma, and rosacea were found on Kaggle, but there is no dataset for keratosis pilaris so I had to gather image data from published articles on Google.

Then I created a model with the data I gathered using CNN, but the overfitting problem occurred due to high accuracy. I will work on it.

I created the user interface for the mobile application (mockup).

In the second semester, I will solve the overfitting problem of the other semester, develop the model and save it. Later I will develop a mobile application for users.

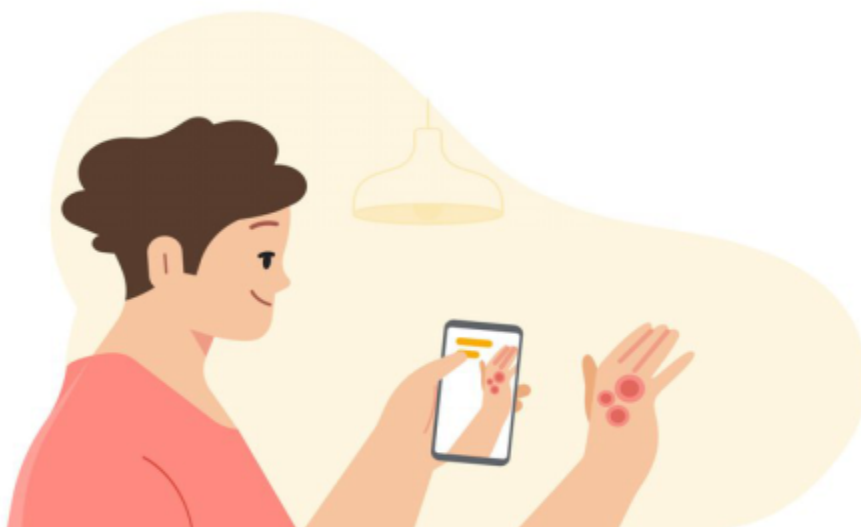


image 2

## 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>

[https://onlinelibrary.wiley.com/doi/full/10.1111/j.0736-8046.2004.21103.x?casa\\_token=6C-p8TjwbtlAAAAA%3ABwiEC8gk33S9z1AsIKW6kQblirCU2pl7QLWdZwhFG77zARSfFLhr0sxOS4TZIKsl9yfuVxtleLKiHQ](https://onlinelibrary.wiley.com/doi/full/10.1111/j.0736-8046.2004.21103.x?casa_token=6C-p8TjwbtlAAAAA%3ABwiEC8gk33S9z1AsIKW6kQblirCU2pl7QLWdZwhFG77zARSfFLhr0sxOS4TZIKsl9yfuVxtleLKiHQ)

[https://onlinelibrary.wiley.com/doi/full/10.1111/j.1610-0387.2006.05933.x?casa\\_token=\\_7kIQ0IWdZoAAAAA%3AAFrG9FA5mf5d5EnfZNIKcetEVnk6x8awaXOU0m3S7rZ8CRK32mQv8wX2HZJmg0kH\\_XNb-n8d\\_WN-8Q](https://onlinelibrary.wiley.com/doi/full/10.1111/j.1610-0387.2006.05933.x?casa_token=_7kIQ0IWdZoAAAAA%3AAFrG9FA5mf5d5EnfZNIKcetEVnk6x8awaXOU0m3S7rZ8CRK32mQv8wX2HZJmg0kH_XNb-n8d_WN-8Q)



<https://jamanetwork.com/journals/jamadermatology/article-abstract/410006>

[https://onlinelibrary.wiley.com/doi/full/10.1111/j.1468-3083.2010.03772.x?casa\\_token=-AcVn4o2ZmkAAAAA%3AiBDhikYX\\_hS0sbxgtyva165R8h-Lt-sdfDWyWOsTTyjPUPdIhSu86IS03u539beAZ0rYQOgSLmtkg](https://onlinelibrary.wiley.com/doi/full/10.1111/j.1468-3083.2010.03772.x?casa_token=-AcVn4o2ZmkAAAAA%3AiBDhikYX_hS0sbxgtyva165R8h-Lt-sdfDWyWOsTTyjPUPdIhSu86IS03u539beAZ0rYQOgSLmtkg)

[https://onlinelibrary.wiley.com/doi/full/10.1111/j.1468-3083.2010.03772.x?casa\\_token=-AcVn4o2ZmkAAAAA%3AiBDhikYX\\_hS0sbxgtyva165R8h-Lt-sdfDWyWOsTTyjPUPdIhSu86IS03u539beAZ0rYQOgSLmtkg](https://onlinelibrary.wiley.com/doi/full/10.1111/j.1468-3083.2010.03772.x?casa_token=-AcVn4o2ZmkAAAAA%3AiBDhikYX_hS0sbxgtyva165R8h-Lt-sdfDWyWOsTTyjPUPdIhSu86IS03u539beAZ0rYQOgSLmtkg)

[https://www.sciencedirect.com/science/article/pii/S0190962205004251?casa\\_token=Ih9V0wnixS4AAAAA:RDPDwLtlRb9nL8R8tpglPIT55R0FRU1ZwBia3NPPtT88LhJo1AnvxGlv3sD9jPcJsAXpfl4LfA](https://www.sciencedirect.com/science/article/pii/S0190962205004251?casa_token=Ih9V0wnixS4AAAAA:RDPDwLtlRb9nL8R8tpglPIT55R0FRU1ZwBia3NPPtT88LhJo1AnvxGlv3sD9jPcJsAXpfl4LfA)

<https://cdn.mdedge.com/files/s3fs-public/Document/September-2017/083020083.pdf>

[https://www.tandfonline.com/doi/full/10.3109/14764172.2010.502456?casa\\_token=SnDCJACfsOIAAAAA%3AyYrQI-sQSWAKQOaif2XJpN46vp83TWH2QYaUqCp8V6S88gS8jRGdd0WPUP1QUC8ucFL7rTtBigvc](https://www.tandfonline.com/doi/full/10.3109/14764172.2010.502456?casa_token=SnDCJACfsOIAAAAA%3AyYrQI-sQSWAKQOaif2XJpN46vp83TWH2QYaUqCp8V6S88gS8jRGdd0WPUP1QUC8ucFL7rTtBigvc)

[https://journals.lww.com/dermatologicsurgery/Fulltext/2009/10000/Successful\\_Treatment\\_of\\_Severe\\_Keratosis\\_Pilaris.24.aspx?casa\\_token=iyTDS2OgHxwAAAAA:0CCZvMmLbFhO5qHiIvy9s1tOuMbSFNUK7Rt5UWBtvj-FQyZse8ZsYQGQHbnBBYPLuKhsWxjF52kxbWnqEGsM](https://journals.lww.com/dermatologicsurgery/Fulltext/2009/10000/Successful_Treatment_of_Severe_Keratosis_Pilaris.24.aspx?casa_token=iyTDS2OgHxwAAAAA:0CCZvMmLbFhO5qHiIvy9s1tOuMbSFNUK7Rt5UWBtvj-FQyZse8ZsYQGQHbnBBYPLuKhsWxjF52kxbWnqEGsM)

<https://escholarship.org/uc/item/8w90x9zb>

[https://onlinelibrary.wiley.com/doi/full/10.1046/j.1468-3083.2002.00472.x?casa\\_token=YpTQbggTphQAAAAA%3Av1ZyUb\\_US\\_gdGYyFP9pSxSLb1qQP7\\_IGx7YhMUKtexmd1PLtVySQOEgPCubkND0SMSzUAKIM3NnFUg](https://onlinelibrary.wiley.com/doi/full/10.1046/j.1468-3083.2002.00472.x?casa_token=YpTQbggTphQAAAAA%3Av1ZyUb_US_gdGYyFP9pSxSLb1qQP7_IGx7YhMUKtexmd1PLtVySQOEgPCubkND0SMSzUAKIM3NnFUg)

[https://onlinelibrary.wiley.com/doi/full/10.1111/j.1525-1470.2011.01616.x?casa\\_token=ZoRT6mdQjIAAAAAA%3AgtEA1AB-IBJKMyPV5m6nctjiG5i4sDm4Ujdh1yE2ifYbm4qYkv4Rf6ZQ7BoGuOlkvi3O2w7GENrQgQ](https://onlinelibrary.wiley.com/doi/full/10.1111/j.1525-1470.2011.01616.x?casa_token=ZoRT6mdQjIAAAAAA%3AgtEA1AB-IBJKMyPV5m6nctjiG5i4sDm4Ujdh1yE2ifYbm4qYkv4Rf6ZQ7BoGuOlkvi3O2w7GENrQgQ)

<https://downloads.hindawi.com/journals/specialissues/795326.pdf#page=27>

<https://www.hindawi.com/journals/drj/2015/205012/>

[https://onlinelibrary.wiley.com/doi/full/10.1111/j.1525-1470.2006.00166.x?casa\\_token=8sLxO3cvxi8AAAAA%3AsypW7HMIlt6U7G8aKUijE3mfVuiJ\\_dFPB7isjGPGGaF93jd4r0T\\_fFaEPIRCj8kOzCg3CMWOldcoiA](https://onlinelibrary.wiley.com/doi/full/10.1111/j.1525-1470.2006.00166.x?casa_token=8sLxO3cvxi8AAAAA%3AsypW7HMIlt6U7G8aKUijE3mfVuiJ_dFPB7isjGPGGaF93jd4r0T_fFaEPIRCj8kOzCg3CMWOldcoiA)

[https://onlinelibrary.wiley.com/doi/full/10.1111/1346-8138.12442?casa\\_token=XBvoWaAbh8EAAAAA%3A\\_kiNFL5KpWuN4jD9gbEUDJIXCQsm5mZIX1NARvLTZyhb51sT7N\\_0n321qhy5x6VmGhll\\_Lq\\_usrg](https://onlinelibrary.wiley.com/doi/full/10.1111/1346-8138.12442?casa_token=XBvoWaAbh8EAAAAA%3A_kiNFL5KpWuN4jD9gbEUDJIXCQsm5mZIX1NARvLTZyhb51sT7N_0n321qhy5x6VmGhll_Lq_usrg)

[https://onlinelibrary.wiley.com/doi/full/10.1111/pde.14267?casa\\_token=n8UAbj7ek4gAAAAA%3AtMBZs7kSdNhOcp9lLxW4XSLYh38-bkugrLuPx4sn53pKm7YIEdSMY-mBJZ4Aj7CKXQpdInflPOAg8w](https://onlinelibrary.wiley.com/doi/full/10.1111/pde.14267?casa_token=n8UAbj7ek4gAAAAA%3AtMBZs7kSdNhOcp9lLxW4XSLYh38-bkugrLuPx4sn53pKm7YIEdSMY-mBJZ4Aj7CKXQpdInflPOAg8w)

<https://synapse.koreamed.org/articles/1045338>

[https://www.tandfonline.com/doi/full/10.3109/09546634.2012.660518?casa\\_token=JFy12f9KhlQAAAAA%3A-m1OF-CSniGZGjMetmlUQqnF6tDm5D-F4JHva3-ai8dgtW27tGA1g1liLRTIOqXoEy0m8qWyTEf](https://www.tandfonline.com/doi/full/10.3109/09546634.2012.660518?casa_token=JFy12f9KhlQAAAAA%3A-m1OF-CSniGZGjMetmlUQqnF6tDm5D-F4JHva3-ai8dgtW27tGA1g1liLRTIOqXoEy0m8qWyTEf)

[https://www.tandfonline.com/doi/full/10.3109/14764172.2011.581290?casa\\_token=UMiV\\_](https://www.tandfonline.com/doi/full/10.3109/14764172.2011.581290?casa_token=UMiV_)

wapY4sAAAAA%3Aj3zyQWJlnMPKlx4Bhj3h8G\_7Q-kyu4eYpXarp6Qxg-4R8TltghJWY4zjZgUIFc  
EnEpNXneZFwv6H

[https://onlinelibrary.wiley.com/doi/full/10.1002/ajmg.a.40478?casa\\_token=gnlMcnn5VjIAA  
AAA%3AVV-0uDpzRTWK8VblAb1OchwJ5qnsHwtf13A9FOZISRyCOILfTMBocN-ISMkiSsYFqu5V  
WDcyCaKX3A](https://onlinelibrary.wiley.com/doi/full/10.1002/ajmg.a.40478?casa_token=gnlMcnn5VjIAA AAA%3AVV-0uDpzRTWK8VblAb1OchwJ5qnsHwtf13A9FOZISRyCOILfTMBocN-ISMkiSsYFqu5VWDcyCaKX3A)

[https://www.jaadcasereports.org/article/S2352-5126\(19\)30049-9/fulltext](https://www.jaadcasereports.org/article/S2352-5126(19)30049-9/fulltext)

<https://www.spandidos-publications.com/10.3892/mmr.2018.9342>

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5551315/>

### ***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>

## 6. References

- [1] M J Baheti, N Toshniwal. "Orthodontic apps at fingertips" Prog Orthod. 2014; 15: 36. Published online 2014 May 30. doi: 10.1186/s40510-014-0036-y
- [2] Gupta G, Vaid NR. The World of Orthodontic apps. APOS Trends Orthod 2017;7:73-9.
- [3] Demircan, G.S., Kılıç, B., Önal-Süzek, T. (2021). Early Diagnosis and Prediction of Skeletal Class III Malocclusion from Profile Photos Using Artificial Intelligence. In: Jarm, T., Cvetkoska, A., Mahnič-Kalamiza, S., Miklavcic, D. (eds) 8th European Medical and Biological Engineering Conference. EMBEC 2020. IFMBE Proceedings, vol 80. Springer, Cham. [https://doi.org/10.1007/978-3-030-64610-3\\_50](https://doi.org/10.1007/978-3-030-64610-3_50)
- [4] Prabhakar, R. Ramachandhra, et al. "Prevalence of malocclusion and need for early orthodontic treatment in children." *Journal of clinical and diagnostic research: JCDR* 8.5 (2014): ZC60.
- [6] Hägg, Urban, et al. "Long-term follow-up of early treatment with reverse headgear." *The European Journal of Orthodontics* 25.1 (2003): 95-102.
- [7] [https://google.github.io/mediapipe/solutions/face\\_mesh](https://google.github.io/mediapipe/solutions/face_mesh) Son ulaşım tarihi: 20.12.2021
- [8] <https://www.analyticsvidhya.com/blog/2021/05/convolutional-neural-networks-cnn/>
- [9] E. Karagöz, "Flutter ile mobil uygulama geliştirme — Başlamanız için 5 neden", Jul 13, 2020
- [12] <https://blog.google/technology/health/ai-dermatology-preview-io-2021/>
- [13] <https://blog.google/technology/health/ai-dermatology-preview-io-2021/>
- [14] <https://www.theguardian.com/society/2021/may/21/doctors-fear-google-skin-check-app-will-lead-to-ts-unami-of-overdiagnosis>

image 1:

[https://editor.analyticsvidhya.com/uploads/719641\\_uAeANQIOQPqWZnnuH-VEyw.jpeg](https://editor.analyticsvidhya.com/uploads/719641_uAeANQIOQPqWZnnuH-VEyw.jpeg)

image 2:

[https://storage.googleapis.com/gweb-uniblog-publish-prod/images/derm\\_-\\_hero\\_image\\_2\\_1.max-1000x1000.jpg](https://storage.googleapis.com/gweb-uniblog-publish-prod/images/derm_-_hero_image_2_1.max-1000x1000.jpg)