



## Lip Print Scanner

Jayakaran P.<sup>1,\*</sup>, Jeffery matthew S.<sup>1</sup>, Litheeswaran S.<sup>1</sup>, Mohamed Arshad<sup>1</sup>, Mahajan S.<sup>1</sup>, R. Priya<sup>1</sup>

<sup>1</sup>UG Student, Department of Artificial Intelligence and Data science  
Panimalar Engineering College, Chennai, India

Emails: [jayakaranvicky56@gmail.com](mailto:jayakaranvicky56@gmail.com); [jefferymatthew77@gmail.com](mailto:jefferymatthew77@gmail.com), [litheez10@gmail.com](mailto:litheez10@gmail.com);  
[arshad134309@gmail.com](mailto:arshad134309@gmail.com); [mahajansekar950@gmail.com](mailto:mahajansekar950@gmail.com); [priyasrp@gmail.com](mailto:priyasrp@gmail.com)

### Abstract

This paper presents advancement in lip print perception and a advancement of biometric system by scanning the lips and getting the lip prints of the individual for security purposes to safeguard confidential data and information. The method used here to identify the lip prints is Cheiloscopy and which scans the lips with the help of camera with a micro lens to get lip prints. This security system was developed using machine learning in python and IoT system. This security system is an alternative for fingerprint and footprint. The security system here differentiates lips based on lip pigment, texture, and prints presented on the lips and check the database for a match. The security systems are fully developed with IoT systems and machine learning in python. The R-CNN in machine learning is used for lip analysis and supervised learning in machine learning is used to find a perfect match.

**Keywords:** Lip print; Biometric system; IoT; Fingerprint

### 1. Introduction

As technical advancements continue to increase in the modern world, data has become the main part of its success. Handling and securing data now plays a vital role in keeping the data of the user safe and secure. The capacity of an individual to choose for themselves how, when, and how much personal information about them is shared with others seeing it is called data privacy. Personal information can be exploited in a variety of ways when privacy and regulated access are absent. People are denied the freedom to declare their identity by repressive governments. The primary goal of data privacy has expanded even more with the implementation of the General Data Protection Regulation (GDPR).one of the methods of data security is through biometric sensors. To accomplish automated person identification, biometric recognition algorithms are utilized in conjunction with biometric sensors to gather measurable biological traits (biometric signals) from a human. The lip prints sensor is like fingerprint sensor and all lip prints are unique. All lip prints are considered as biometrics dupe as fingerprints. The lips have been analyzed through image segmentation where the lips and their prints are examined to conduct a perfect security function protocol. The primary function is to detect the lip which is conducted by monochrome camera which is connected to IoT system. The IoT plays a major role in giving commands to the monochrome camera and accessing the monochrome camera at the right time. The monochrome camera which detects the lip and takes photo and transfers it to the computer as per the instructions.



Figure 1: Monochrome camera

The primary process is image segmentation in image processing which helps in analysis of the lip print image. R- CNN is a machine learning algorithm which is used to classify an image's part by part. After the classification of the lip print image and analysis of it, the next process is the extraction of lip prints. The lip prints are extracted by converting the lip images to negative. This process is done by the software where the commands are given, and the image of the lip has been converted to negative from black and white.

The black and white image is a default image which is taken by monochrome camera and the picture shows perfect details about the lip and when the picture which is been converted to negative image it shows perfect details of the lip prints all this process has been carried out by R-CNN algorithm this take cares about the picture quality and details. As the monochrome camera only comes up with black and white images the computer then covert the image to negative images to extract the lip prints. After extracting the lip prints the computer compares the lip print which is present in the database and lip print which is been extracted.



Figure 2: perfectly scanned image of person 1

The perfectly scanned image is taken for extraction as given in figure 2 and figure 3 whereas if the pictures are not looking perfect then it is not taken for extraction. Picture like figures 4 and 5 are not good for extracting the lip so it is taken care of by the computer.

Figure 3: perfectly scanned Image of person 2



Figure 3: Not a clear lip picture of person1



Figure 4: Not a clear lip picture of person2

This process of matching the lip prints is being conducted by supervised learning with random forest classification in machine learning is used to compare the lip prints and find a perfect match if the lip print patched with database. The database can store up to 10 lip prints. If the scanned lip print matches with the database, then the safe will be unlocked. If not, then it asks the user to retry the scanning process. The random forest algorithm helps in dataset classification and matching the lip print which matches with it. The random forest algorithm forms a decision tree to find a perfect lip print matches. It might fail when the print is not properly recorded or not present in the database. This is to improve the biometrics safety system and to create a perfect working lip print scanner to help people with biometric safety.



Figure 5: normal picture of a person lip



Figure 6: Extracted image of lip print

## 2. Realted Works

- [1] This paper describes the unique identification of a person using his or her lip print. This is done using a technique called Cheiloscopy which identifies uniqueness of a person using their lip traces. This is a forensic investigation technique which traces the lip using a camera and then identifies its uniqueness by converting the image into its negative form and picking the traces. Thus, by this paper it is clearly identified that everyone has their own unique lip print and hence can be used to uniquely identify a person
- [2] This paper describes about the articulatory phonetics in the lips, with the research it was found that with different lip structures the pronunciation of different person saying the same word differed, also the movement of the lip physiological features of the person is random to some extent, but when 2 different people speak they often tend to have a consistency of changing trend of the lip shape
- [3] This paper describes biometric identification using the lip traces. This paper also talks about how there are already various biometric identification systems such as fingerprint, iris, and so on but when any of these biometrics is unavailable the lip print of an individual can be used as an alternative to the traditional biometrics.

This lip traces are identified and compared using Deep learning computer vision methods and this method has an accuracy of 93 percent.

[4] This essay discusses how distinctive human lip prints are. This study used scotch tape to acquire 100 students lip prints for computer analysis. Also, a weighted value ranking method is being used to determine whether the lip prints are truly unique. In this study, it was determined that there are four quadrants on our lips where two lips will not exactly match this score in all quadrants. There is also no discernible difference between the lip prints of the same person taken before and after a year. Using digital analysis, we were able to trace 15 lines in 60% of all quadrants, including 1, 2, 3 and 4.

[5] In this essay, the research of lip prints for sex recognition is discussed. Also, it discusses how distinct fingerprints and lip prints are persuasive evidence in court. Lip prints, fingerprints, and DNA fingerprinting have all been utilized in the forensic sector for personal identification. Lip prints can be utilized to confirm whether or not there were people at the crime scene. Bond paper, cellophane tape, and a magnifying glass are the supplies used to capture the lip prints. In this study, lip prints are used to determine a person's sex identification.

[6] In this work, gender determination by Cheiloscopy is described. In this study, lip prints are used to assess each person's individuality and identify their gender. This article obtained the translucent lip impressions of 234 individuals, transferred them to bond paper, and photographed the result with a digital camera to enhance the image quality. Lip prints were later examined. The identification of gender relied on dots, reticular patterns, and intricate designs. The fact that no two lip prints were the same in this investigation supports the use of lip prints for the identification of specific people.

[7] This essay discusses fingerprint comparison. It is utilized to identify the management and access control in this investigation. Additionally, it is used to locate the fragments of prints left at the crime scene. The automatic fingerprint system used to identify users' fingerprint is described.

[8] in this paper, the problem faced while detecting the face in environment. Face detection such as Image algorithm, head tracking and finally face detection mostly fails in the environment. So, to solve this, Recurrent Neural Network (RCNN) has been introduced. This method identifies the geometric facial information and recurrent neural network of a person. This method will detect the facial recognition of a person in any constraints of the environment.

[9] This paper delivers the important of an image rate. Where image quality plays a vital role. Robust Real Time Face Detection is used to process the image while achieving high detection rates. They use three key contributions to implement this process. One is the Integral Image which allows the features by the detector to compute quickly. The second one is the Ada Boost learning algorithm which selects the smaller number of critical visuals from a very large set of potential features. The last feature is the combining classifier in a cascade which allows to discard the image as soon as possible[10] The examination of fingerprint matching is described in this publication. In this study, high-end protection is provided using the fingerprint verification mechanism. Identification of criminal suspects based on latent fingerprints collected at crime scenes is one of the most common needs that ask for exceptional accuracy to prevent the possibility of false recognition. The current research work presents the systematic analysis of fingerprint matching methodologies.[10][11]

### 3. Proposed System

The proposed system of the lip print sensor explains about how the lip print of a person can be used as a mode of biometric to uniquely identify a person.

#### (A) Identifying the lip

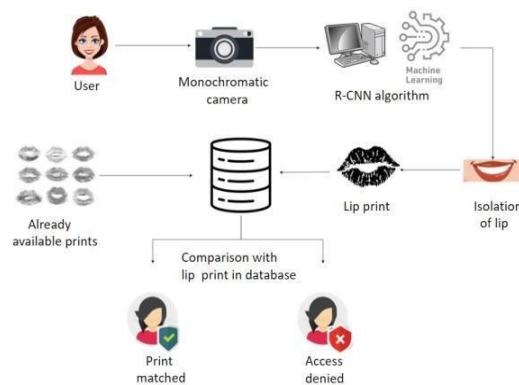


Figure 7: architectural diagram for lip print scanner

### Identifying the lip

The focus of this module is to basically identify the persons lip from the image. This can be done by the following processes:

#### Capturing the image:

The image capturing is done using a monochromatic camera; this type of camera captures all the light through the pixel irrespective of the color. It is basically a black and white camera which can be used in any situation without the need for much light passing through it. It also *provides* hyper spectral imaging which analyzes a wider spectrum and packs more details than a normal color camera. After capturing the image, the image is sent digitally to the computer system to analyze whether a lip is there in the picture or not.

#### Analyzing the image:

Analyzing is done through a machine learning model with the help of a supervised learning algorithm. The supervised learning model used here is R-CNN which is an application of convolutional neural network for object detection. The R-CNN model is done in 3 phases which are:

- 1) Region creation: this process involves the creation of regions inside of the image which are mutually independent of each other.
- 2) Drawing out the features: this process involves extracting details from each region created before using a deep learning method
- 3) Classifier: the classifier is used to now classify the objects using a ml model.

Eg: support vector machine algorithm

Finally, after classifying and identifying whether the image has a lip print or not. The lip print is sent to scanning and analyzing step to uniquely identify a person. If the print is not proper or recognized the image is taken again, and the identifying step is repeated.

#### Algorithm for detection of lip:

Step1: Start

Step2: Initialize the search for lip Step3: Using monochrome detect the lip Step4: send the signals to the ml system

Step5: the ml system analyses the lip Step4: If lip is found “scan the lip” Step5: Else “go to step two”

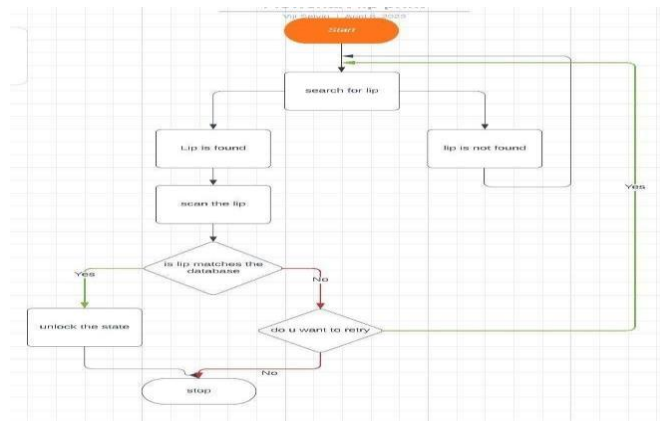


Figure 8: Flowchart of lip print scanning process

#### (B) scanning the lip to analyze:

After detection of lip the computer commands the monochrome camera to scan the lip after scanning the lip it sends the perfect image of lips to the computer if the image of lip is not properly recorded then the camera retake the image and send it to the computer. Then the computer retrieves the lip print in negative. This process is by converting a black and white image to a negative image to extract the lip print. Here we used SVM algorithm in machine learning to get a perfect prediction on lip print analysis and we used iot to give command to monochrome camera.

After extracting lip print the computer compares it with lip print in database if the lip print matches, then unlock the safe. Else again scan the lip and extract the lip prints. The database can store up to 1 to 10. This all process is been controlled by a micro controller which is also called as microcomputer.

Algorithm scanning the lip Step1: start  
Step2: initialize scanning the lips  
Step3: if the photo of the lip is not properly recorded "retake the photo"  
Step4: else go to step5  
Step5: using monochrome camera get the lip print in negative  
Step6: compare the lip print with the lip print in the database Step7: if the lip print match the data base "Unlock the safe" Step8: else go to step 2

#### **4. Result Analysis**

When the monochrome camera finds the lip, it starts to analyze it and then gets the lip prints. Then compare it with the data base if the lip print matches the data base, then unlock the safe

Case (1)

Monochrome cameras detect and analyze the lips and send it to the computer as digital image. Then the computer checks the quality of the image.

Case(2A)

When the photo of the lip is not recorded properly then the camera retakes the photo. Until the clarity of the photo has been recorded properly.

Case(2B)

When the photo of lip has been recorded properly then the process of lip print extraction executes. Then lip print photo has been converted to negative images for extracting lip prints.

Case (2B1)

After extracting lip prints, it matches with the database. If the extracted lip prints match with the database, then the safe has been unlocked. Else the computer again goes for scanning process.

#### **5. Conclusion**

Security plays a vital role in day-to-day life. So, safety and security maintain our privacy. The purpose of our research is to create safety and make people comfortable and maintain harmony and peace in our society. Lip prints are the most unique which lends people to ensure their safety which ensures that they are safe and secure. These lips don't make people discomfort at any point of time. The major thing is that every person has a unique way of lip print, so the people will feel comfort, safe and secure at any point of time.

#### **References**

- [1] Cheiloscopy: An Aid For Personal Identification, Rashmi Venkatesh And Maria Priscilla David 2011 Jul-Dec; 3(2) 67-90 J Forensic Dent Sci 10.4103/0975-1475.92147
- [2] Research On The Dynamic Viseme Of The Lip Shape Based On Facial Motion Capture Technology; Kok-Lim Alvin Yau, Rushdi Noor Rosan; Published 26 September 2022; Doi: 10.3389/Fnbit.2022.922756
- [3] Lip Print-Based Identification Using Traditional And Deep Learning; Wardah Farrukh, Dustin Van Der Haar; Published On 5 May 2022; Doi.Org/10.1049/Bme2.12073
- [4] Digital Method For Lip Print Analysis: A New Approach, Rachana V. Prabhu, Ajit Dinkar Published On 2013 Jul-Dec; J Forensic Dent Sci; 10.4103/0975-1475.1197722
- [5] Cheiloscopy: The Study Of Lip Prints In Sex Identification, Preeti Sharma, Susmita Saxena, Published On January-June 2009; Department Of Oral Pathology And Microbiology, Subharti Dental College, Meerut, Up, India;10.4103/0974-2948.50884
- [6] Gender Determination Using Cheiloscopy , Padmavathi B. N, Ramanpal Singh Makkad Published March 2013; Department Of Oral Medicine And Radiology, Darshan Dental College And Hospital, Loyara, Udaipur, Rajasthan, India; 10.4103/0975-1475.119780
- [7] Fingerprint Matching, A.K. Jain, P. Flynn, and A.A. Ross, Eds., Handbook Of Biometrics, Springer, 2007.
- [8] Nishanthi. G , Yuvashree , A, Jessinda Joseph , Supraja. R,Supraja. R, *Personnel Monitoring System Using Mobile Application during the COVID 19*, Journal of Cognitive Human-Computer Interaction, Vol. 2 , No. 2 , (2022) : 40-49 (Doi : <https://doi.org/10.54216/JCHCI.020201>)
- [9] Recurrent Neural Network Verifier For Face Detection And Tracking, Sung H. Yoon, Gi T. Hur, Department Of Computer Science, North Carolina A&T State University, Nc 274111
- [10] Ramgude AkshayDili , K. Vengatesa , Kunal Joshi , Chaitanya Tekane, *Counterfeit Product Detection System Using One-Time QR code*, Journal of Cognitive Human-Computer Interaction, Vol. 2 , No. 2 , (2022) : 65-71 (Doi : <https://doi.org/10.54216/JCHCI.020205>)
- [9] Robust Real-Time Face Detection, Paul Viola, Michael J. Jones, Published July 11 2003, Microsoft

Research, One Microsoft Way, Redmond, USA

[10] A Systematic Analysis Of Fingerprint Matching Techniques For Fingerprint Recognition System, Mahesh Kumar, Devender Kumar Published On 26 March 2022 Department Of Computer Science And Engineering, Baba Mastnath University, Asthal Bohar, Sector-29, Rohtak, Haryana, India 10.1007/978-981-16-8987-1\_10