



[Date]

Git Push Sleep Repeat

Smart India Hackathon 2020



- **Team Name:** Git Push Sleep Repeat
- **Organization:** NCR Corporation (India) Pvt. Ltd.
- **Problem Statement:** Authenticating User while performing transaction at ATM/POS Terminal Securely
- **College Code:** U-0497

IDEA DESCRIPTION:

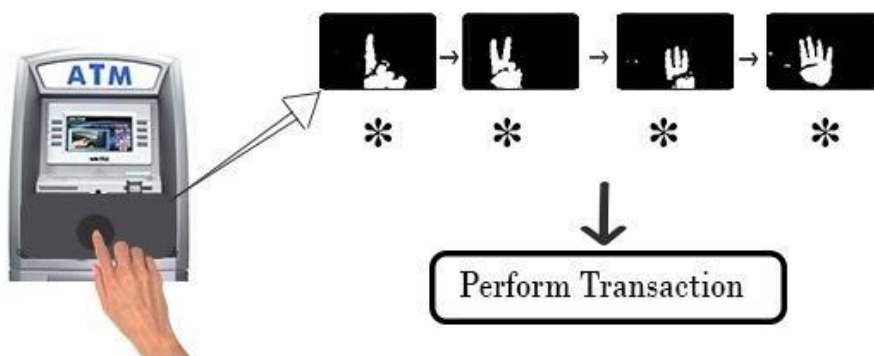
All aspects of security of ATMs has been of high concern since its invention. ATMs were primarily used only for cash withdrawal, in their early life. However, as the function domain of ATMs has expanded, so has the threat to their integrity. Security measures have been continually evolved with technological advancements. People can now use the ATM for Payment of Bills, opening fixed deposits, transfer money et cetera too. All of these services can only be availed to an authentic user, and for this authentication, the ATM needs to take some measures. Similarly in the POS terminals, the transaction environment is not secure, hence measures need to be taken. Some Authentication Measures that are used today are PIN, biometric authentication which includes fingerprints, facial recognition etc. Unfortunately, none of these measures are 100% secure. Breaches can happen in all of these authentication measures. Therefore, a system has to be devised which helps the users to operate the ATM in a fully secure environment.

This is the challenge by NCR Corporation (India) Pvt. Ltd. that we have taken up for Smart India Hackathon, 2020.

The proposed idea for an Authentication Mechanism which is more secure than the previously used and even existing systems works in the following as described:

The mechanism makes use of an under display camera touchpad screen instead of a keypad. This camera is sheltered inside a small dedicated chamber with a small hole for a single hand, that would be installed in the ATM. This hardware requirement was mentioned in the problem statement itself. The user would need to put his hand into the chamber and enter his PIN through hand gestures symbolising each digit. The following diagram would better describe the working of this system.

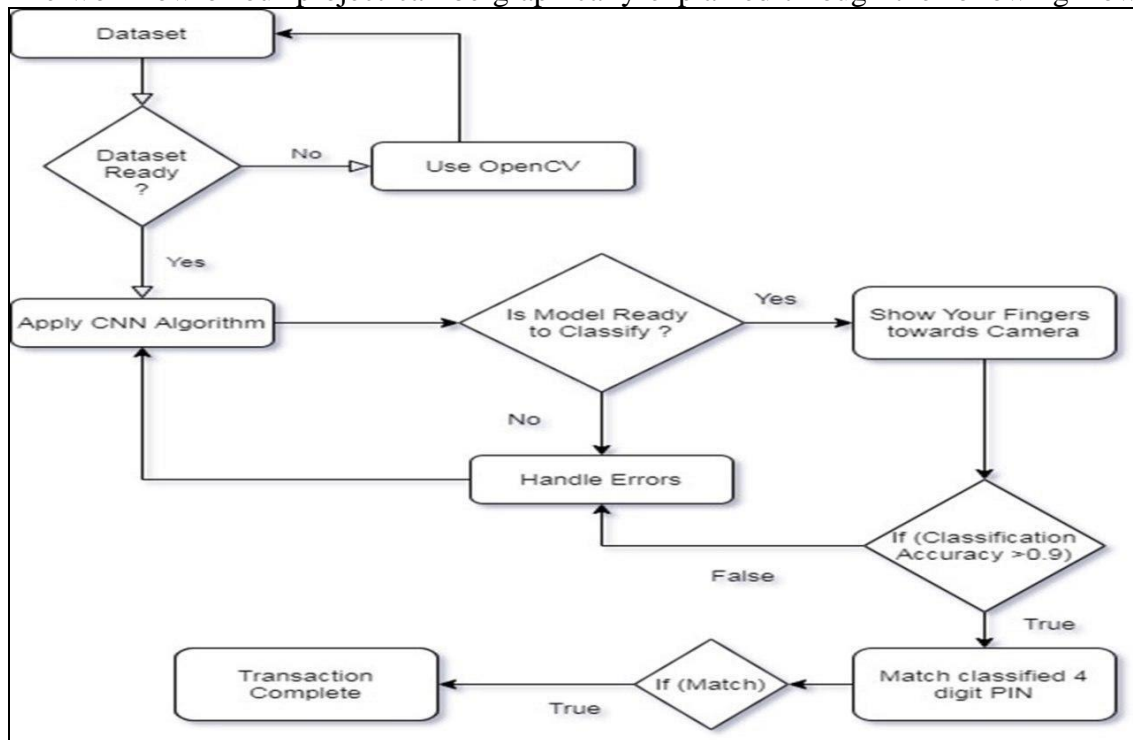
The system would then identify the digits symbolised by the hand gestures and hence complete the transaction.



SOLUTION:

The solution that our team has come up with includes Convolution Neural Networks, to train the model with the dataset of images showing all the 10 digits.

The workflow of our project can be graphically explained through the following flowchart.



Since every Machine Learning algorithm requires a dataset to train a model, our first challenge was to create one, since it was not already available. Therefore, we created a dataset for our problem statement all on our own by collecting images of hand gestures from different people. We used Open Source Computer Vision, or OpenCV Library in Python to make use of the webcam in our laptop and capture images.

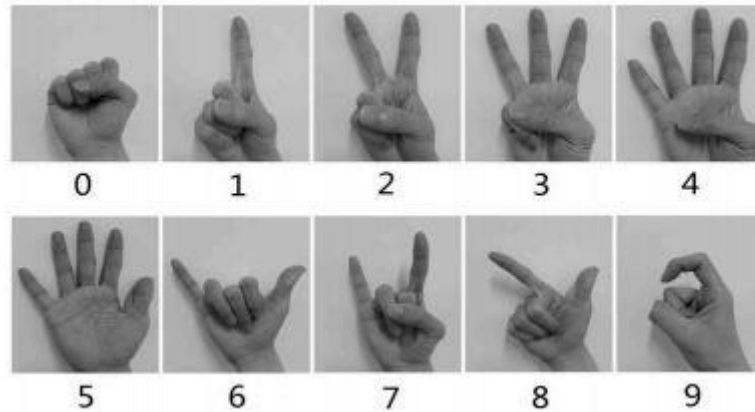
OpenCV is mainly aimed at real-time computer vision. We needed to capture 1500 images of each of the 10 digits, thus OpenCV became our first choice.

While creating our dataset we chose our images to be in binary format so that our efficiency could be improved and there would also be reduction in the size of the dataset, which could otherwise have been an issue for the systems.

Converting the images in binary format helped us increase the training accuracy by decreasing the features without affecting the overall performance of the training model, rather increasing it.

We made sure that the user would require to use only one hand to enter the pin, hence we used these gestures for all digits. These would be shown on the ATM monitor as a reference for the user.

Also, our prototype is designed for a dim light environment since the camera would be enclosed in a small dedicated chamber as mentioned in the problem statement. There would be a light source in the chamber to provide a clear image while digits are being recognised.



After creating the entire dataset of 30000 images, we trained our model using the CNN (Convolution Neural Network) algorithm. Once the model is trained, we tested the system by showing hand gestures at the camera. For example: if a hand gesture of the number 5 is signalled to the camera, 5 is stored as one of the digits of the PIN number.

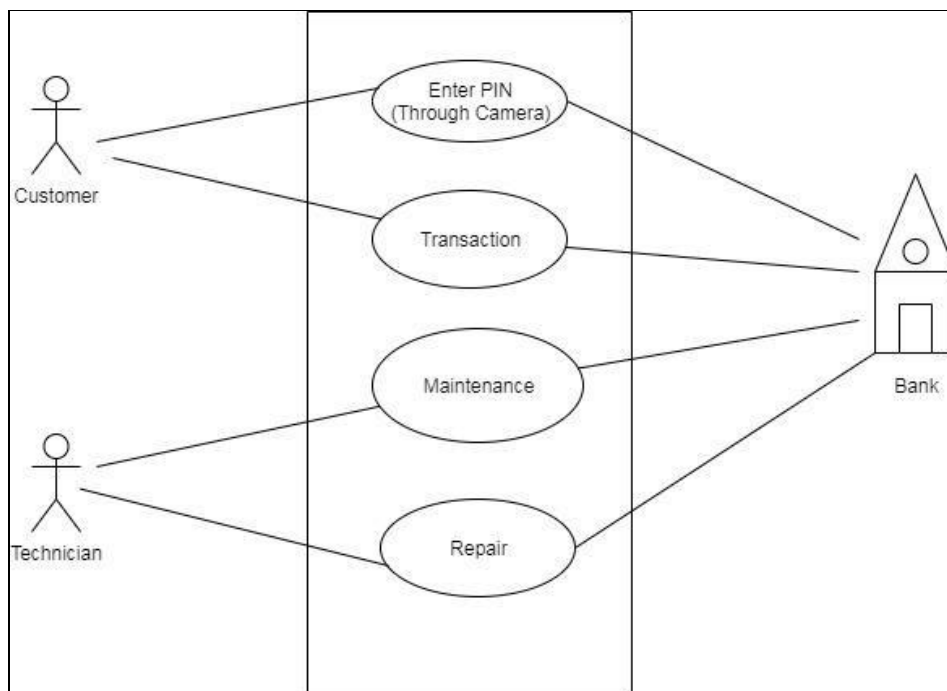
When errors were encountered, we handled them and re-trained the model. Once the system was classifying the digits, we kept updating our model to achieve a score of more than 90%.

After training of that model we integrated this model (.json file and .h5 file) to our ATM system. This system is now ready to match the classified 4-digit PIN with the database and complete the transaction.

TECHNOLOGY STACK:

- Open Source Computer Vision (OpenCV)
 - To Create Dataset for the problem
- Deep Learning(Convolution Neural Network)
 - To train the model for recognition
- Django Framework-To deploy this project through web-app
- Frontend- React Js
- Backend - Python

USE CASE/DEPENDENCIES:



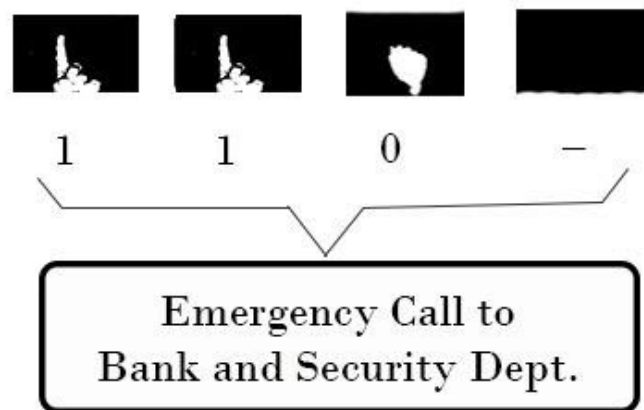
COST ESTIMATION AND UNIQUENESS:

- Cost = 0.35 \$/LOC
- Effort = 6 Person-Month
- Duration = 1 Month

UNIQUENESS:

According to various studies and research, about 314 million people are visually challenged worldwide. So this system could be beneficial for blind people as well proving it as a great advantage.

Apart from the basic working of this Authentication Mechanism, we have improvised the system with an idea that would help in securing the customer and his account from fraud and robbery. There would be a 3 digit Key for initiating Emergency Services. Consider a scenario where a robber has held you at gunpoint and is forcing you to enter your pin so that he can withdraw money from your account. You could simply enter the 3 digit Key and it would immediately alert the bank and the security services so that you can be saved from the situation. Furthermore, this is an added advantage as it would work even in areas with low signal strength or no telephone network to contact the emergency services.



Another advantage of this system is that when we use this at POS terminals, it will provide a better and more secure environment for transaction. POS terminals in malls and stores are at high risk since there are so many people around. Your PIN is entered in this non-secure environment. With this system, you can enter your PIN inside the chamber so that no one can see. Moreover, fraud that is being done using ATM skimmers these days can be easily avoided since there is no keypad through which the PIN is being entered.