Face Detection based Attendance System

Team Number: 10

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Problem Statement and Introduction

"Face is used as a clue for identifying who a person is." Facial recognition is a biometric software application capable of uniquely identifying or verifying a person by comparing and analyzing patterns based on the person's facial contours. Facial recognition is mostly used for security purposes, though there is increasing interest in other areas of use.

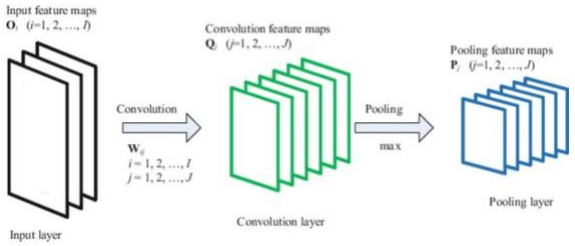
Attendance is an important part of daily classroom evaluation. At the beginning and ending of class, it is usually checked by the teacher, but it may appear that a teacher may miss someone, or some students answer multiple times. Face recognition-based attendance system is a problem of recognizing face for taking attendance by using face recognition technology based on high-definition monitor video and other information technology.

Objective: To build a system that can automatically punch registry of a person's presence in a classroom. The wait time is reduced as the camera detects the face(s) of a person automatically from a group of people.

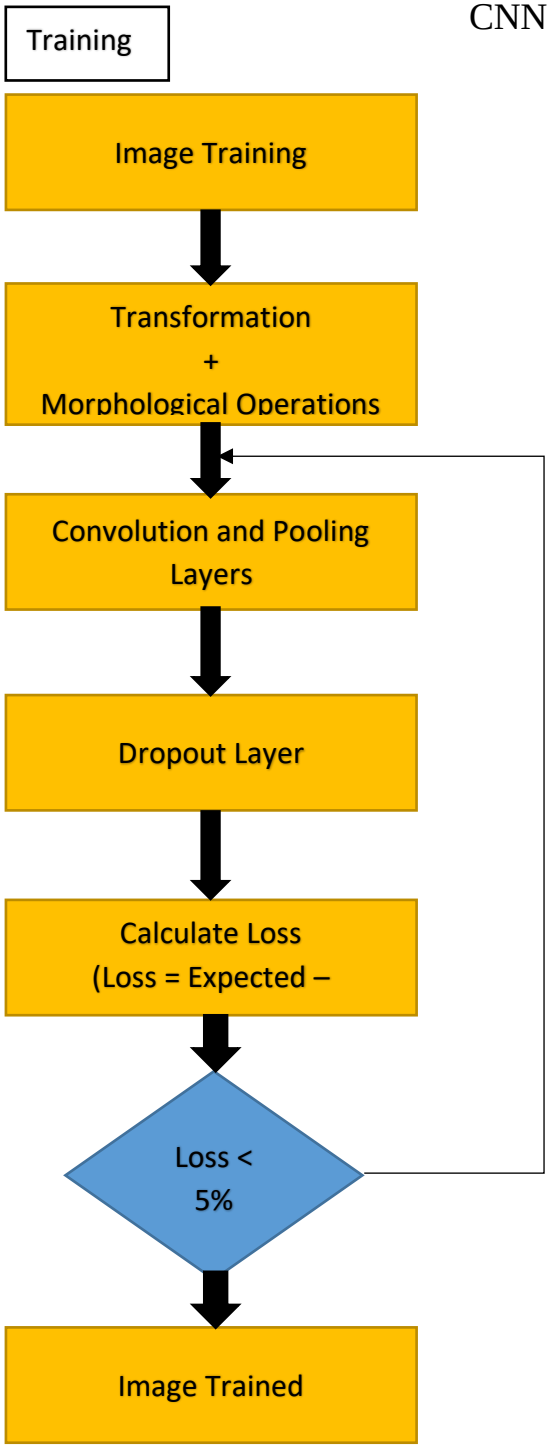
Implementation Details

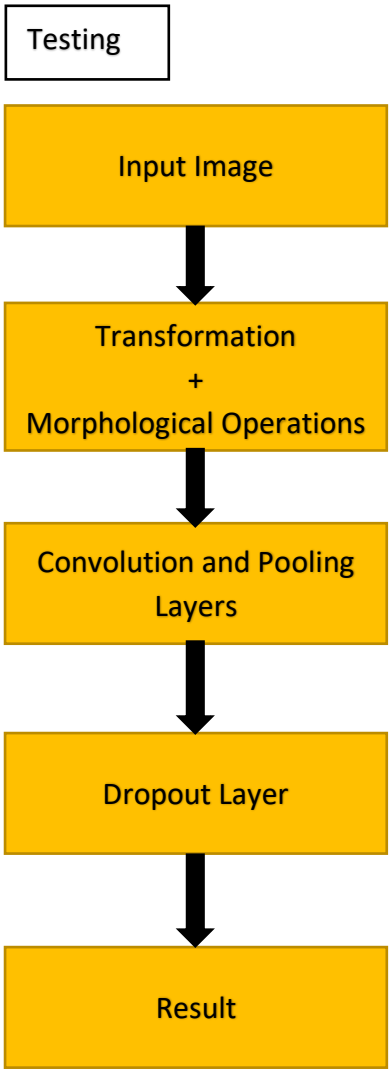
Programming Language: MATLAB
Open source libraries and built-in functions: Computer Vision Toolbox, Image Processing Toolbox

Face recognition system is implemented using CNN (Convolution Neural Networks)



CNN architecture





Algorithms

- Create training and testing datasets.
- Load images and resize.
- Build a convolutional neural network comprising three convolution layers, pooling layers and a fully connected layer (convolution layer to convert the images to feature maps and pooling layer to reduce the dimensionality; connected layer has a dropout layer to prevent overfitting)
- Implement a loss function to compare the result and the expected output
- Back propagate to update parameters.
- Repeat till we get accurate results.
- Test the system on individual images.

Inputs

Capture images using a camera with different orientation, props, group pictures.
These images are fed to the system for training and testing.

Testing and Performance Measurements

Testing:

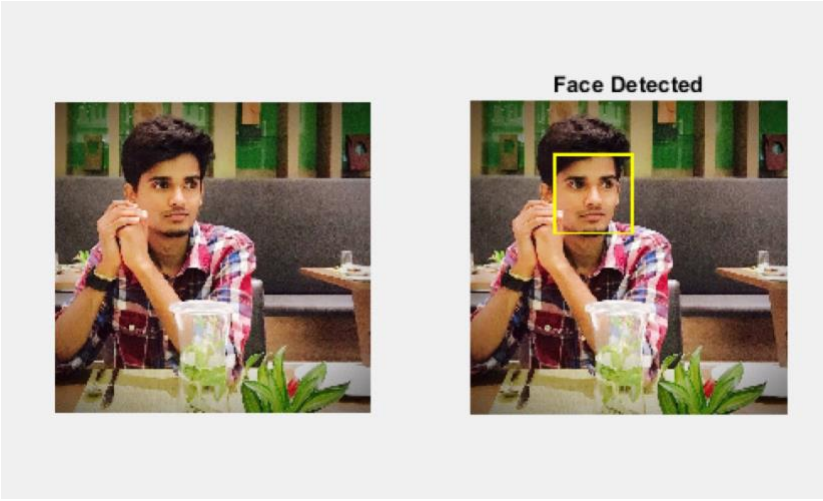
To test if the algorithm predicts accurately when images of the same person is fed in different conditions (blurred, change in angle, change in intensity of light, etc.)

Performance Measurements:

Face Detection: Accuracy (the algorithm detects faces of individuals and separate faces proportional to number of people present in a group picture).
Face Recognition (to be implemented): Check accuracy, loss(mispredictions)

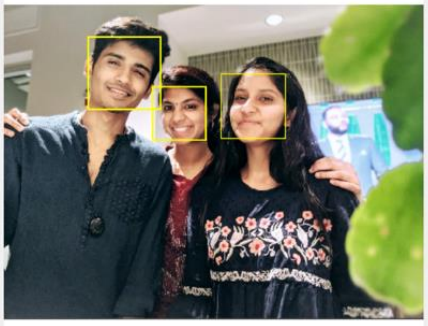
Results

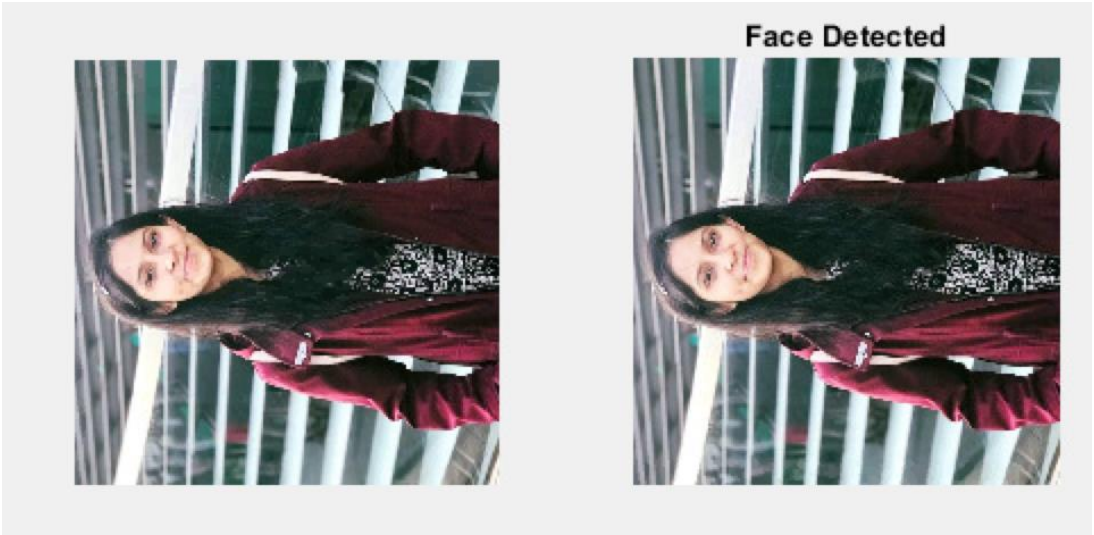
Face Detection:




Face Detected


Face Detected


Face Detected



Change in Orientation (Rotation by 90 degrees)

Face crop:

Multiple faces in a group picture

Individual faces detected and cropped

Challenges

- No face detected when the orientation of the image is changed.
- Face Recognition needs to be implemented using CNN (Convolutional Neural Network)

Conclusion

The images have been detected accurately with no false detection. In a group picture the algorithm detects multiple faces and crops individual images accurately as shown. The change in orientation needs to be implemented as the algorithm is unable to detect faces.

References

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