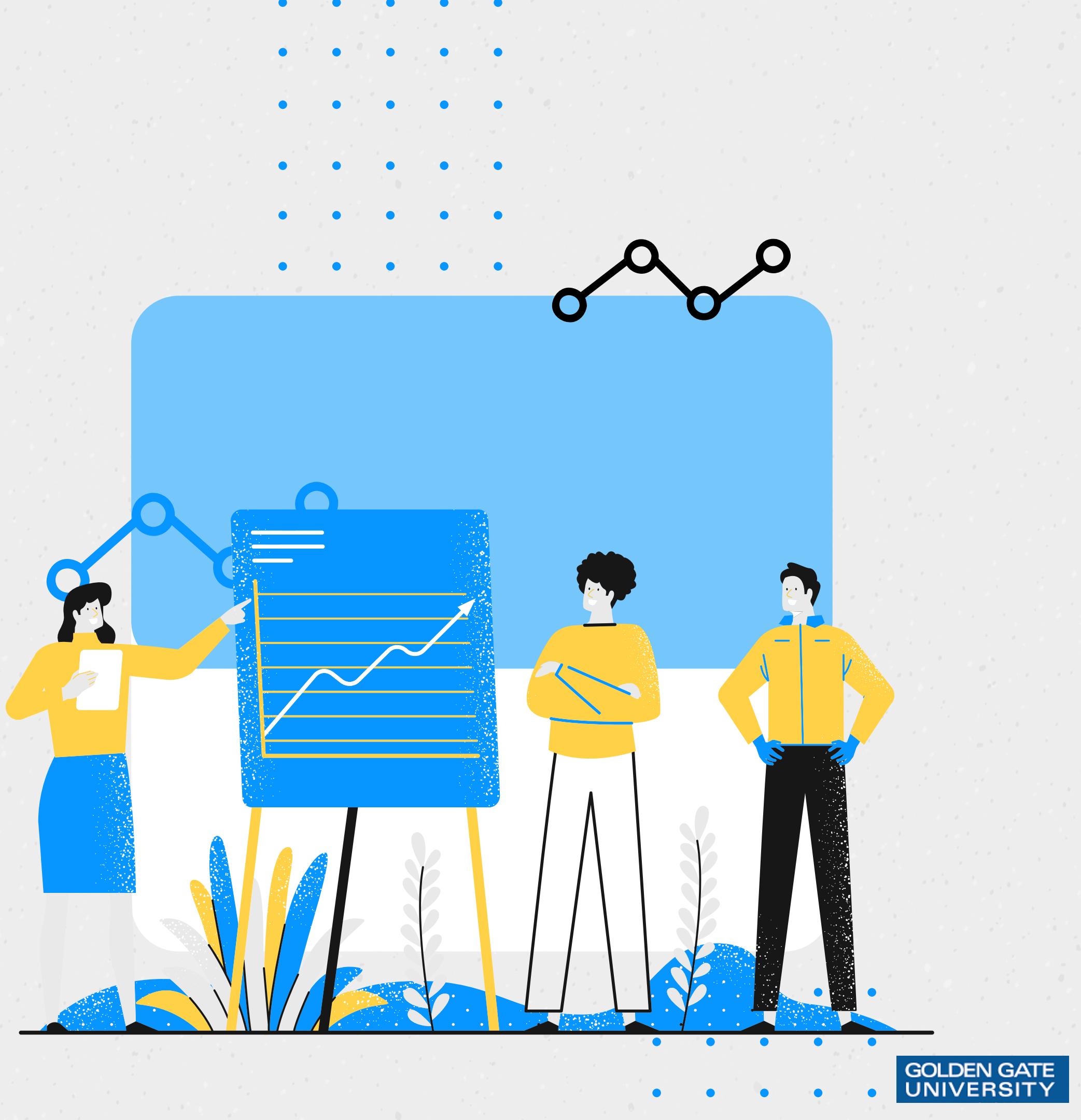


MSBA 326

Emotion Detection

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Agenda

- Introduction
- Use Cases
- Problem Statement
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- Overview of Libraries
- Process
- Convolutional Neural Network
- Model Results
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- Recommendations

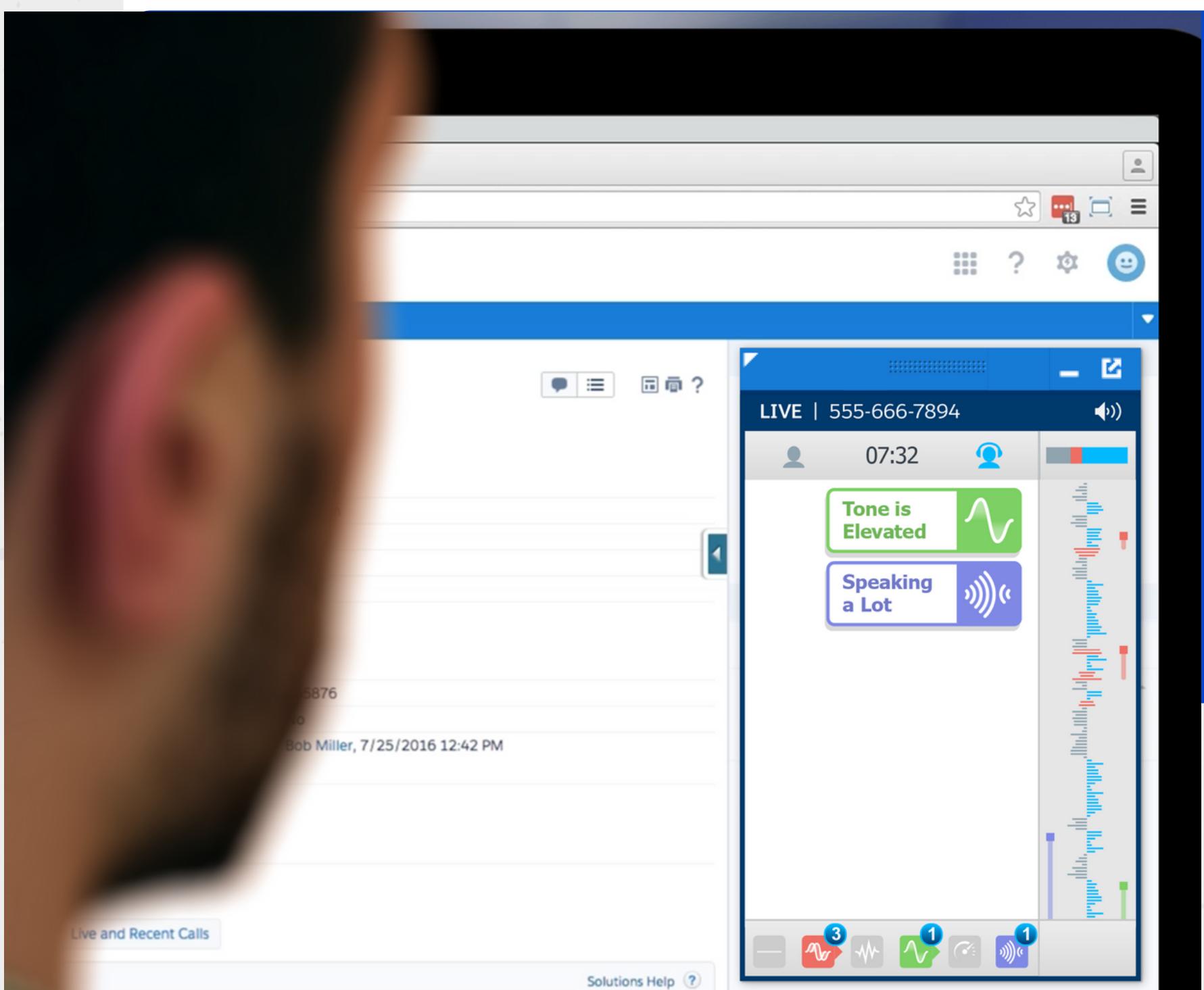
Emotion Detection Program

Emotion detection is the scanning of a human's face in order to determine their emotional state based on their facial features. Understanding a human's emotional state will provide insights into their sincerity when subjected to standardized questions

Use Case



EMOTION ANALYTICS IN CUSTOMER SERVICE



- Nonverbal components convey two-thirds of human communication
- Cogito's software at Humana, a health insurance company
 - Emotional intelligence solution expert system help customer call center

Bundela, V. (2019, February 7). Next 5 best examples of emotion analytics in the real world. Retrieved from <https://www.softwebsolutions.com/resources/5-examples-of-emotion-analytics.html>

Figure 1: Cogito's Software. Retrieved from <https://techcrunch.com/2016/08/16/cogito-leverages-human-behavior-to-nudge-customer-relationships/>

Use Case

HOSPITALITY: ENHANCING CAPABILITY OF ROBOT UNDERSTANDING TOWARD HUMAN INTERACTIONS

- Japan's Henna na Hotel in Tokyo has lifelike robotic receptionists to meet and greet with guest and proceed the process of checking in via an automated kiosk.
- Benefits
 - Positive returns on investment (ROI) due to labor cost saving
 - The hotel operates with only 7 staffs comparing with similar size hotel with 30 staffs
 - Robots response in certain ways while analyzing customer's facial emotion



Figure 3. Female robots welcome a guest at the reception desk. Retrieved from <https://asia.nikkei.com/Business/Robot-staff-make-Japan-s-Henn-na-Hotels-quirky-and-efficient>

Use Case

HR: FACIAL EMOTION DETECTION IN INTERVIEWS

- Unilever, a giant consumer goods company, incorporated this emotion detecting technology into their recruitment process
- Benefits
 - Save a significant amount of screening time
 - Make interview process bias-free
 - Unilever claimed that this new approach has contributed to greater socioeconomic diversity as there was significant increase in non-white hires (Zetlin, 2018)



Figure 2. Image Detection. Retrieved from <https://medium.com/financial-times/how-ai-helps-recruiters-track-jobseekers-emotions-3dbd85ffeca0>

Problem Statement

- Scope: Examine the process of detecting facial expression through the lens of deep learning networks analyzing visual imagery
- "Facial expressions are one of the main information channels in interpersonal communication." (Ko, 2018)
- Seven basic human emotions: happiness, surprise, anger, sadness, fear, disgust, and neutral
- Training AI to understand our emotions can take human–machine interactions to the next level



Data Description

- 200 data points (Primary data: self-taken images)
- 70-30 rules to split the data into test and train.
- Grayscale and 60*60 pixels

Emotion Category

0-Angry, 1-Disgust, 2-Fear, 3-Happy, 4-Sad, 5-Surprise, 6- Neutral

Libraries

Collection of functions and methods for Emotional Detection

Keras

High-level neural network
Convolutional Neural Network

OpenCV

Real-time computer vision

Tensorflow

Machine learning library

Cascade Classifier

Object detection method

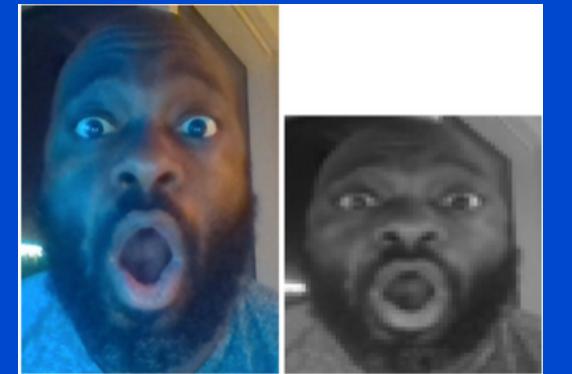
Process

- Take pictures to create dataset
 - OpenCV to take pictures
 - Quick pictures with 7 different emotions
 - All pictures labelled with respective emotion.
- Convert pictures to grayscale and 60*60 scale
 - **for loop** is to search for png files
 - csv file to save all pictures in pixel representation
 - aggregated dataset
- Loading the dataset
 - Split the data in train and test with 70-30 rule
 - num labels = 7, batch size = 25, epochs = 50
- Transformation of the data

Happy



Surprise



Sad



Neutral



Convolutional Neural Network

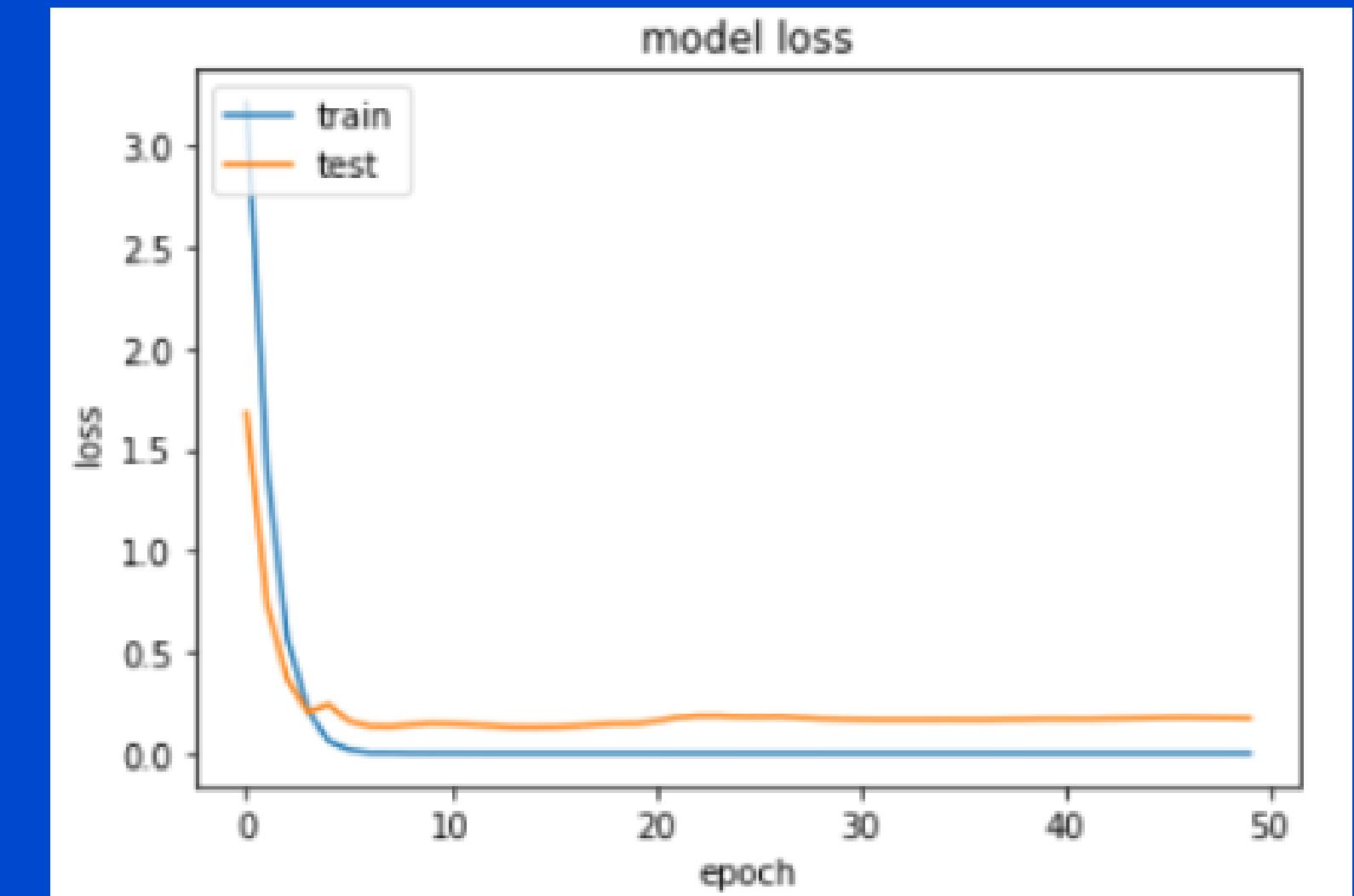
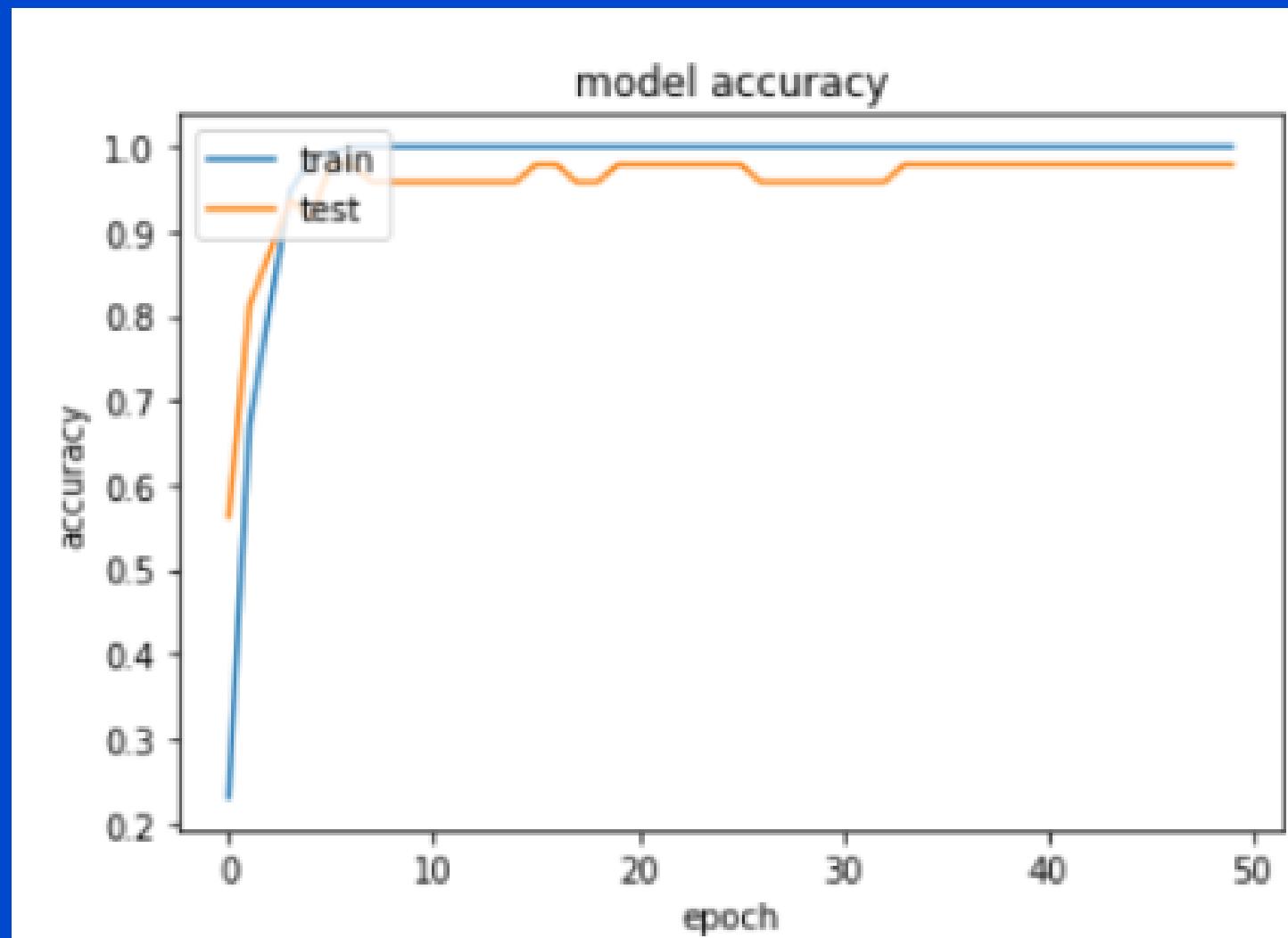
- Create, Train & Test CNN model
 - Keras Sequential model : “linear stack of layers”
 - 1 layers
 - Conv2D, kernel size=(3,3)
 - RELU used for activation
 - To avoid overfitting, added MaxPooling2D & Dropout (0.5)
- Flatten the model
- Softmax activation

Model Training

- Compilation
 - Loss function: categorical crossentropy
 - Optimizer: Adam
 - Metrics: Accuracy
- Model fitting
 - Uses training data set
 - epochs and batch size

Model Result

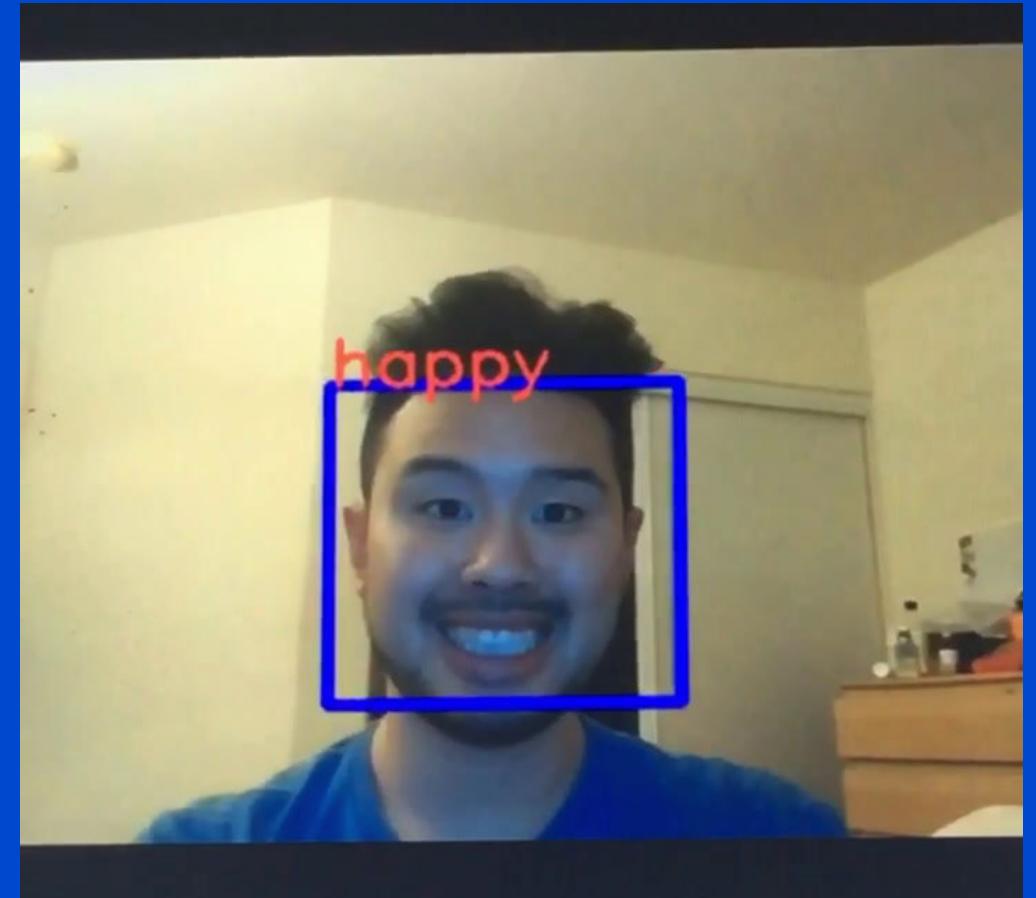
- Accuracy rate of the model=97.92%



The results overall showed that the data suffered slightly from a generalization gap which stems from an unrepresented training dataset.

Live Test

- OpenCV to track live face video
 - cv2.VideoCapture() to capture expression
 - .detectMultiScale() to create list of rectangle
 - .rectangle() to create rectangles around the face.
- Haar feature-based cascade classifiers to train.
- Call the emotions to match correct emotion in real-time video.
- There were some confusions detecting other emotions, such as disgust and anger



Recommendation

Solving unrepresentative issue:

- Increase variety and number of the dataset with different faces
- More data will results more training and test data
- Quality of data can improve the accuracy
 - More standardized and controlled procedure of capturing data
 - Higher image definition (more pixels)

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