

Application of Face recognition to improve Customer Service

Chahat Jain & Shweta Agarwal

Project Overview

The Problem: In many services industry such as retail stores, bank branches, restaurants etc with increased competition the customers are becoming more price sensitive and less brand loyal. In case of a restaurant, competitiveness is significantly dependent on the restaurant's ability to proactively satisfy their customer needs. It is difficult to -

1. Identify the loyal customers from new customers instantly
2. Get holistic view of customer preferences and last orders at one place in real-time
3. Capture customer emotions in real-time to provide personalized service

The solution is designed to develop strong connections with customers by providing restaurant service providers with the information directly suited to the customers' needs and interests. This will lead to faster and open communication with the customers. It well suited for any services industry where customer relationship is important. Also customer data can be shared with partner chains through sign-ups, to provide additional offers from face matching to the registered customers.

The Solution: We aim to develop an intelligent image recognition system as a tool for enhancing personalized customer relationship. Top features of the tool are following-

1. Recognize the customer as New or Existing
2. Recognize emotion of the customer entering the restaurant, allowing receptionist and table attendant to attend the customer accordingly
3. Fetch and generate all information of the customer for whom match has been found
4. Send all customer information to the table attendant assigned, enabling him/her to give food suggestions / services as per customer's preferences

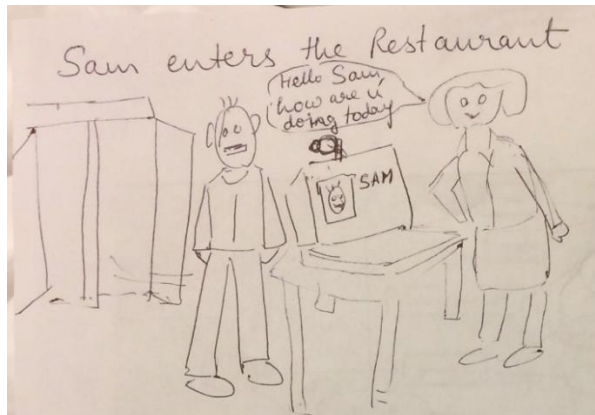
Use case scenario:

- As the customer enters a restaurant he/she meets the receptionist to get the table
- The receptionist will press the button on her dashboard to capture the customer's image and match it with all customers' record in near real-time to identify the customer as NEW or EXISTING (pre tagged as Priority, Frequent or General customer)
- All customer information will be populated on the receptionist's dashboard and the receptionist will accordingly assign the 'table attendant' mapped to the tagged customer
- The receptionist will send all information including the emotion of the customer via link to the table attendant

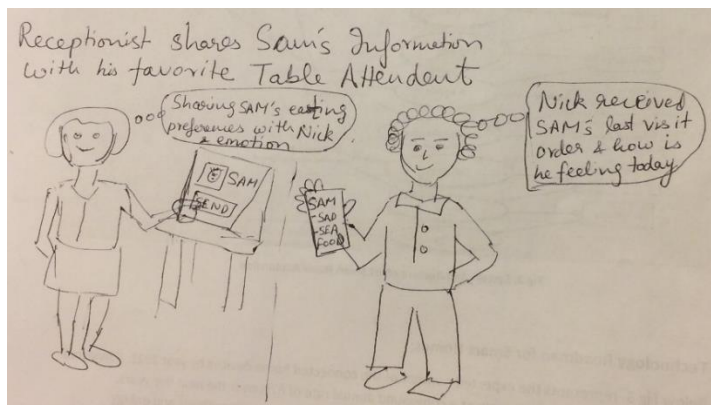
- Table attendant can click the link to view the customer information on his device to engage with the customer

Story board - User journey:

SAM is our customer entering the restaurant. The receptionist takes Sam's picture. The system matches the picture with that stored in the database and display's matching information on receptionist's screen.



The receptionist sends Sam's information including his emotion via SMS to the table attendant. Table attendant can view Sam's information on his device and decides to engage with him accordingly



The table attendant Nick greets the customer and offers him suggestions based on his previous orders. Sam feels happy to receive personalized attention.



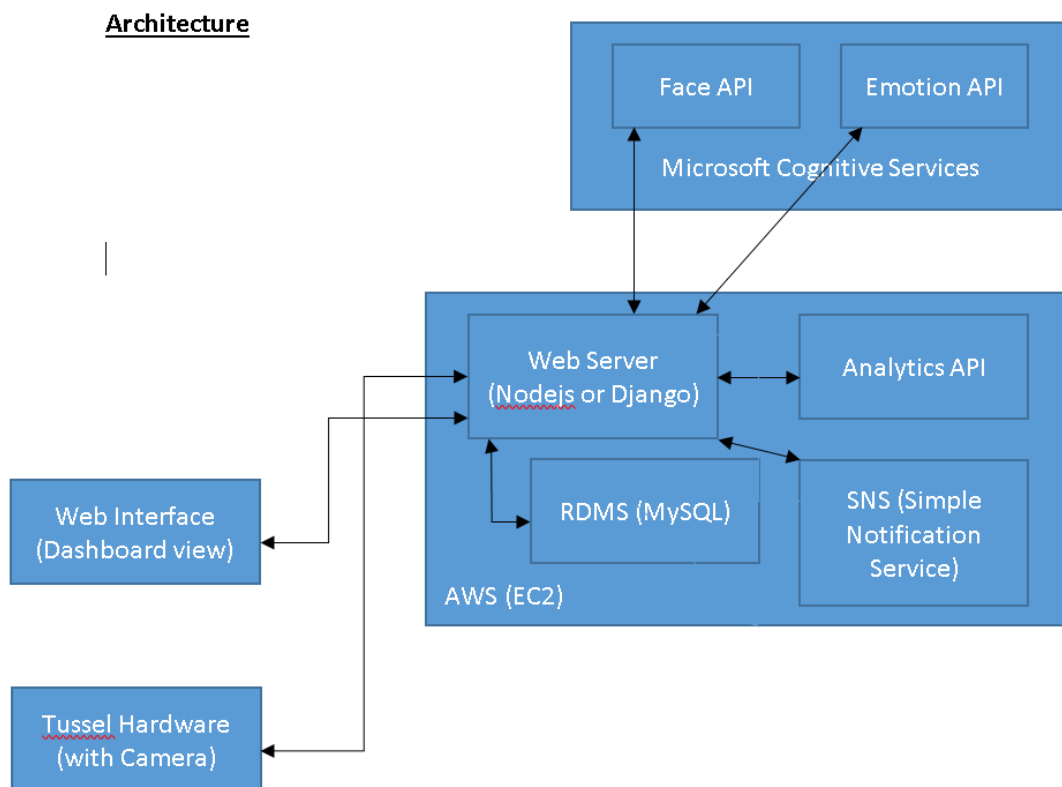
Privacy & Security: To avoid privacy issues it is important to ask the first time customers visiting the restaurants to sign-up /opt-in for face matching services to get personalized services and offers. For security purposes the customer data populated and shared over link should be done only on company internal secured devices.

Why not identifying customer by using RFID or polling Mobile phone using beacon technology?

The reason being with photo matching we can eliminate the dependency of identifying the customer from physical devices. We believe that the face recognition is one of the most reliable ways to identify the high priority customers.

Project Architecture

Following is the architecture of our **MatchNow – Customer Service System**



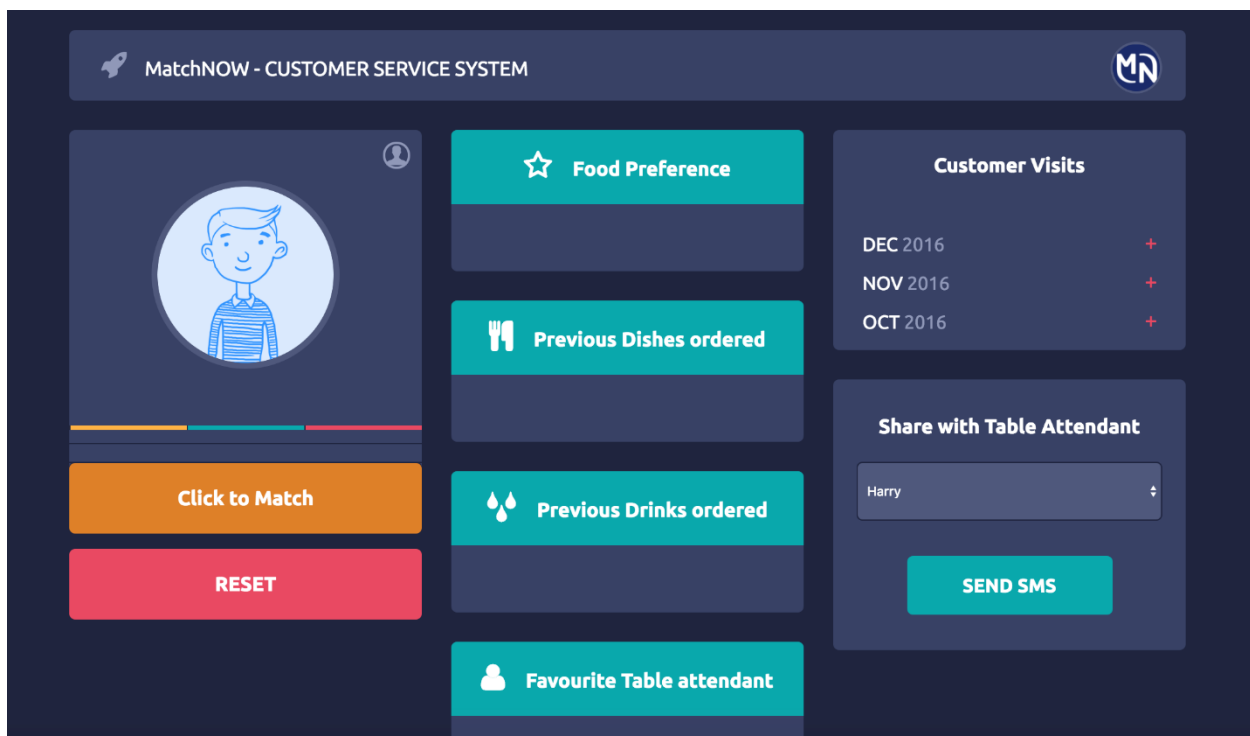
Technologies used:

1. Face Recognition API – The Microsoft cognitive API has been used to match the current customer image with that in our existing user data base
2. Emotion API - The Microsoft cognitive API has been used to detect the current emotion of the customer entering the restaurant
3. Tessel – It stores the image captured by the camera temporarily in its memory and send it to the backend webserver and the web app

4. Camera (IoT device) – It is used to capture the customer image on click
5. AWS EC2 for web server – AWS webserver & database management system(MySQL) that calls the API to match and detect customer emotion and also to fetch the current information associated with the image that is stored in the backend database server.
6. Web App – A web interface has been created for 360-degree customer profile, using JavaScript, HTML, CSS and SQL

The User Interface

1. The receptionist screen for capturing customer image and matching it:



As the customer will enter the restaurant, the receptionist will take customer's picture by clicking on the button "Click to Match". The AWS web services system will match the picture with the pictures stored in the database from the customer's previous visits. Once the match is found the customer's picture, emotion, food preferences and previous orders are displayed on receptionist's screen.

The receptionist has the option to select the customer's favorite table attendant displayed on screen from the drop down menu. As the receptionist will select the table attendant and click on the button "Send SMS", through the AWS SNS service all customer information such as emotion, food preference and previous orders will be sent as SMS to the assigned table attendant.

2. Table attendant will update the latest Customer information:

The interface is titled 'Update Customer's latest orders' and features a rocket icon. It includes a 'Table Attendant ID' field with a person icon and a placeholder 'please enter table attendant id'. A logo with the letters 'MN' is in the top right corner. The main area contains four input fields: 'Customer ID' (placeholder: 'please enter customer id'), 'Dishes ordered' (placeholder: 'please enter dishes ordered'), 'Customer Emotion' (placeholder: 'please enter cusotmer emotion'), and 'Drinks ordered' (placeholder: 'please enter drinks ordered'). A large teal 'Submit' button is at the bottom right. On the left, there is a circular illustration of a woman with orange hair wearing a headset and sitting at a desk with a laptop, with the text 'What did the customer order today' below it.

After catering to the customer, the table attendant will use this interface to capture his assigned customer's current emotion and the latest orders. This information will help in performing analytics on the customer's latest information, helpful in providing the personalized service on customer's next visit.

3. Taking customer feedback to understand the user experience -

The interface is titled 'Customer Feedback Form' and features a rocket icon. It includes a 'Customer ID' field with a person icon and a placeholder 'please enter customer id', and a 'Table Attendant ID' field with a placeholder 'please enter table attendant id'. A logo with the letters 'MN' is in the top right corner. Below the input fields, the text 'How would you rate our service today?' is displayed. There are three yellow circular icons representing different ratings: a smiling face (Excellent), a neutral face (Average), and a frowning face (Poor). Each icon is positioned above a corresponding teal button labeled 'Excellent', 'Average', and 'Poor' respectively.

This interface is important part of the customer experience, where the customer enters the feedback based on his/her service experience in the restaurant on that day.

Competitive Analysis

There several open source APIs available in market. We have evaluated and identified the Microsoft Cognition API for our use case as it best matches with our requirements of accurately detecting (upto 70%) the customer through facial recognition and also be able to predict the emotion of the customer in real time.

(a) IBM Watson Visual Recognition API: <https://www.ibm.com/watson/developercloud/visual-recognition/api/v3/?node#introduction>

(b) Microsoft Cognition API: <https://www.microsoft.com/cognitive-services/en-us/face-api>

(c) Google Vision API: <https://cloud.google.com/vision/>

From the web search we came across several companies who have deployed products that are similar to what we propose, yet there are few underlying differentiations.

The following table lists the features that are included/not included in our solution.

	U.K. based firm	L.A. based jewelry boutique - Tarina Tarantino	Team MatchNow
Purpose	Using facial recognition for Law and security enforcement system	High end store using facial recognition to spot VIP customers	Tool providing facial recognition to identify existing customer and match services to customer preferences for restaurants
Value proposition	Reduction in crime rate through tracking	Increase in particular segment customer loyalty	Increase in customer experience and hence loyalty
Differentiation	More accurate/ advanced face matching. Also based on skin texture, hair etc. Works even when person is wearing eyeglasses. No emotion detection	Designed to recognize celebrity customers only. No emotion detection.	Face Match upto 70% accuracy. Predictive analytics to identify the all customer's history and emotions
Persona	Suspicious / peculiar behavioral customers	Celebrities	Young to middle aged frequently visiting customers
Audience	Law breakers / Suspects	VIP customers	Loyal customers who sign-up for face matching services

Results summary

As intended we have successfully captured the customer's image and analyzed it in real-time to identify the customer as previous customer and fetch its previous engagements with the restaurant. Using the cognitive API we were also able to predict the customer's emotion.

The successful execution of this project involved the following three main tasks-

- (a) Successfully integrating all the different components of our solution such as the camera, tessell hardware, cognitive APIs, web services, webserver and data base system.
- (b) Leverage the face recognition API to identify the customer as loyal customer, leverage cognitive API to identify customer emotion, and perform descriptive analytics to display customer's past visits in the restaurant.
- (c) Develop user interface with smooth user experience to effectively display and capture the customer's information and feedback.

The solution MatchNow can be strengthened further to make it more effective in providing personalized customer service by building recommendation engine to predict the food choices of the customer visiting the restaurant. The prediction can be done based on the previous customer emotions, the food preferences or the dishes and drinks ordered by the customer.