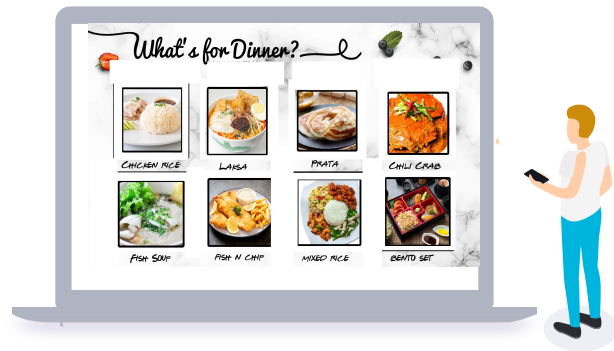# Content Recommendation using Eye Gaze & Face Recognition

By: Tricia Lam & Jovester Chai

# Contents

- Project outline
- System design
- What we have done so far
- What are we going to do next
- Problems encountered
- Demo
- Q & A

**The project seeks to predict food recommendations through the analysis of human's eye gaze and facial recognition**

We aim to create a **reliable** application that provides users of all ages and gender with good food recommendations.
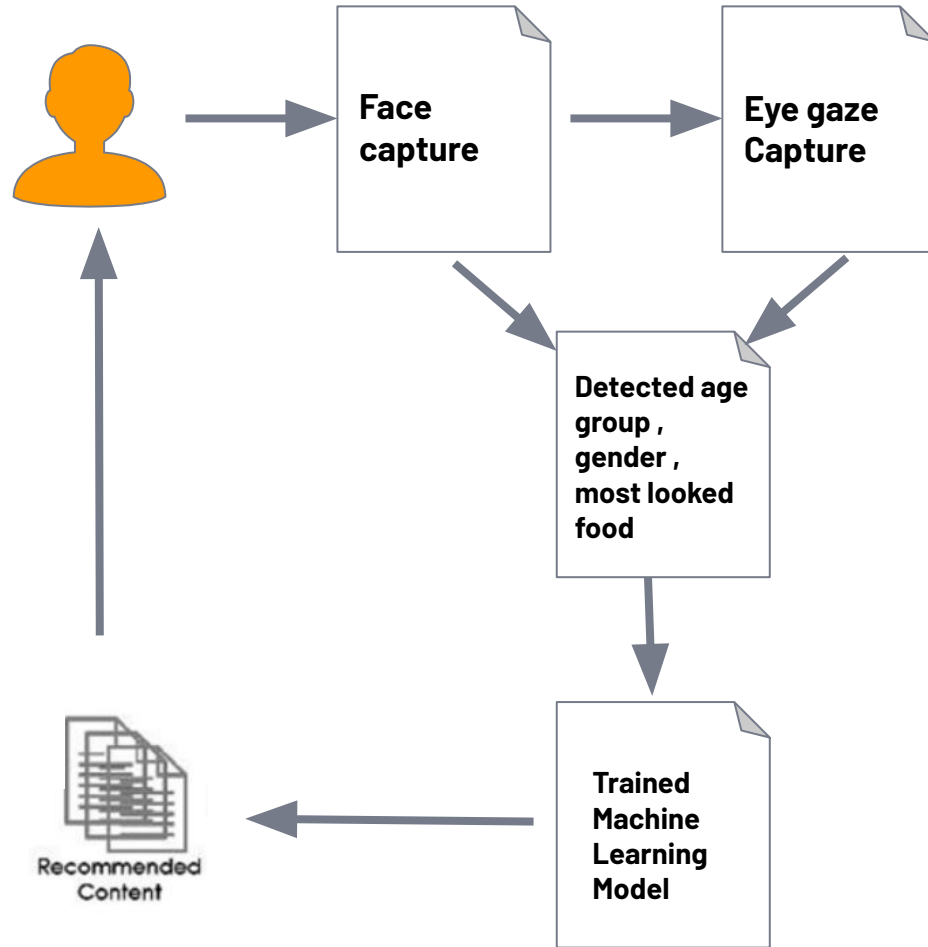
**Key features included in our system:**

1. Eye Gaze Tracking

2. Integrated facial recognition into existing application

3. Machine Learning Recommender

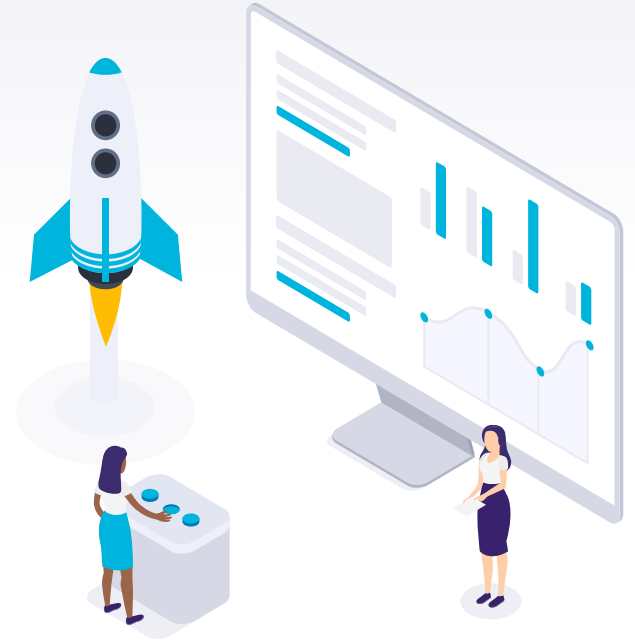4. Practical application for users to use

# System Design

Face capture

Eye gaze Capture

Detected age group , gender , most looked food

Trained Machine Learning Model

Recommended Content

# Statement Of Work

- What is needed?
- What are our objectives?

# Statement Of Work

**What is needed?**

- A batch of Data for Machine Learning purposes.
- Suitable Model and Algorithm to train Data

**What are our objectives?**

- **Objective 1** :
  - Train a Model with Data and Algorithm
  - Integrate trained Model
- **Objective 2** :
  - Implement suitable Model to recommend food items

# What have we done so far

## Sprint 1

**Jovester**

- ✓ Implement smile detection into facial recognition
- ✓ Integrate facial recognition into the deployable codes
- ✓ Integrate Collaborative Filtering Model into the facial recognition and eye tracking

**Tricia**

- ✓ Conduct Survey
- ✓ Update UX for the pages
- ✓ Data preparation
- ✓ Building & Implementing the embedded Collaborative Filtering Model into the deployable code

## Sprint 2

**Jovester**

- ✓ Project outline
- ✓ Use a decision tree model for the recommender system

**Tricia**

- ✓ Designed and improved powerpoint slides
- ✓ Drew the System design
- ✓ Work on neural network collaborative filtering model
- ✓ Work on 2 collaborative model in which both uses different feature vectors
- ✓ Added evaluation metrics for each models
- ✓ Collected more data
- ✓ Do model comparison
- ✓ Integrate best model into app
- ✓ Fixed bugs on the app

# Differences between new and old Dataset

## Old

- Ratings
- Food Descriptions
- Address
- 24 rows of food records

## NEW

- Ratings
- Food Descriptions
- Address
- **Age Group**
- **Gender**
- **Top 6 food preferences**
- **1000 rows** **of user and food record**

We've **successfully** built 4 different models

# How we utilize the dataset in our model

Our 4 models mainly fall in this 3 types of model..

**1** **Decision Tree**

**Label Encoding** features into dummy features.

Combine the food items data (0, 1) into a single string
- Eg, 00001000001101000 001001

Input : gender (dummy), age (dummy) and food item combination.

Output: 6 selected food items of similar users

**2** **Collaborative Filtering**

**Age Group** + **Gender** = User group

1st Model :
- Vectors in the user-food matrix have been directly used as feature vectors

2nd Model:
- Singular value decomposition has been used to generate feature vectors.

# How we utilize the dataset in our model

**3** **Neural Network**

**One hot encode** categorical datas

For every row of records , loop them, so that the i th food in the row is the indicated food and the next food(k th ) chosen by user will be the recommended food for that user .

Before:

| UserID | Gender | Age Group | laksa | Chili Crab | Char Kway Teow | Japanese Bento | Curry laksa |
|--------|--------|-----------|-------|-----------|----------------|----------------|-------------|
| 1 | Female | 65 and above | 0 | 1 | 0 | 1 | 1 |

After:

| | gender | age_group | indicated_food | rcmd_food |
|---|--------|-----------|----------------|-----------|
| **0** | 0 | 2 | 0 | 2 |
| **1** | 0 | 2 | 0 | 3 |
| **2** | 0 | 2 | 0 | 5 |
| **3** | 0 | 2 | 0 | 7 |
| **4** | 0 | 2 | 0 | 12 |

# Model Evaluation

| Decision Tree | Neural Net Collaborative Filtering |
|---|---|

**Decision Tree**

- Score: 0.08%
- Accuracy: **37% - 22%**

**Neural Net Collaborative Filtering**

- Accuracy: 13.22%
- Classification Accuracy: 50%
- Intersection metrics: **0.501**

# Model Evaluation

| Collaborative filtering (SVD) | Collaborative filtering (vectors in the user -food matrix) |
|---|---|
| <ul><li>RMSE : 1.0350</li><li>MSE: 1.071</li></ul> | <ul><li>RMSE:**0.691**</li><li>MSE: **0.527**</li></ul> |

# Model Evaluation

| Decision Tree | Neural Net Collaborative Filtering | Collaborative filtering (SVD) | Collaborative filtering (vectors in the user –food matrix) |
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**Neural Net Collaborative Filtering**

- Accuracy: 13.22%
- Classification Accuracy: 50%
- Intersection metrics: 0.50

**Collaborative filtering (SVD)**

- RMSE : 1.0350
- MSE: 1.071

**Collaborative filtering (vectors in the user –food matrix)**

- RMSE:0.691
- MSE: 0.527

Thus , considering the **size of our dataset** and our **use case scenario** while evaluating how the various **model performs** , we chose to go with the **Collaborative filtering that uses vectors in the user -food matrix.**

# What are we going to do next

| Sprint 3 | Sprint 4 |
|---|---|

**Jovester**

- Try out some other more models
- Help out Tricia if necessary

**Tricia**

- Collect more data to improve the accuracy of the neural network model
- Change the description of the recommendations , so that it will only appear when user hover around the picture
- Try out more algorithms
- Make the app less buggy

**Jovester**

- Add more features into application
- Give the application a better look

**Tricia**

- Change the previous batch's facial recognition codes to a new codes so that age + gender detection would be more accurate
- Menu selection -> user can choose which of the 3 menu they wished to view
- Changed the interface of the app

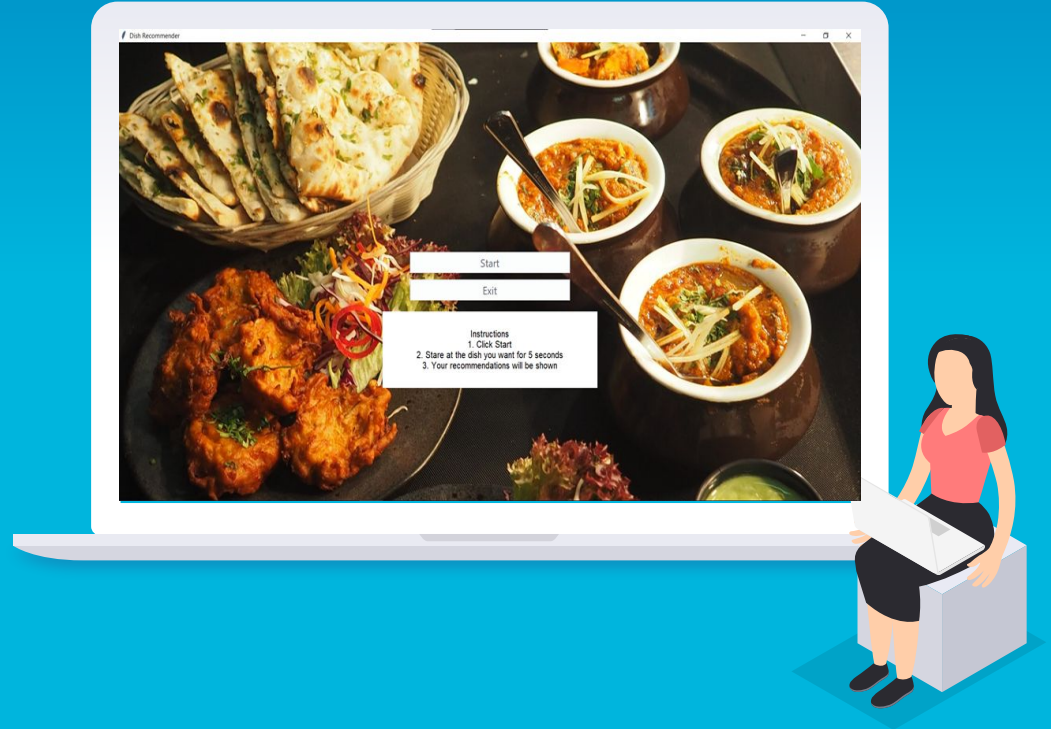# Problems Encountered (Tricia)



1. **Challenging to find the best model that fits our user scenario**

2. **Insufficient dataset**

# Problems Encountered (Jovester)



1. **Lack of rating feature in dataset**
   a. Without the rating feature , the confidence score of models would drop

DEMO

# THANKS!

## Any questions?