

Grocery Shopping Recommendation Algorithm

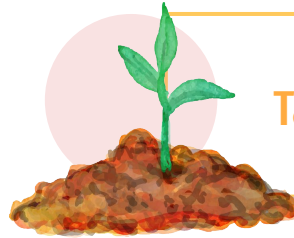
With the food you have and the recipes your prefer,
for the diet goal you aim to achieve



Table of Contents

- ➔ **Part I** Project Background
- **Part II** Business and Analytics Plan
- **Part III** Algorithm Development and Performance Evaluation
- **Part IV** Demo
- **Part V** Summary and Potential Next Steps

Project Objective



Target Users

- ✓ Desire to eat more **Natural foods**
- ✓ With a **Fast-paced** lifestyle
- ✓ Struggle on **Fitness** recipe choices



Our Focus

Develop a user-friendly mobile app for:

1. **Accurate food item identification**
2. **Food safety and quality identification**
3. **Customized recipe suggestions**



Current Fitness and Diet App

- ✗ Personalized grocery shopping lists
- ✗ Options for allergies & intolerances
- ✗ Meal planning with nutritional tracking

Table of Contents

- **Part I** Project Background
- ➔ **Part II** Business and Analytics Plan
- **Part III** Algorithm Development and Performance Evaluation
- **Part IV** Demo
- **Part V** Summary and Potential Next Steps

Business Plan



User upload a photo of a natural ingredient



Image classification 1:
What is this ingredient?

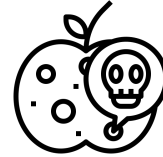
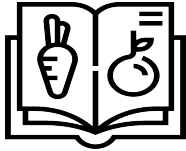
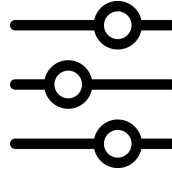


Image classification 2:
Is it fresh or rotten?



Find
n recipes

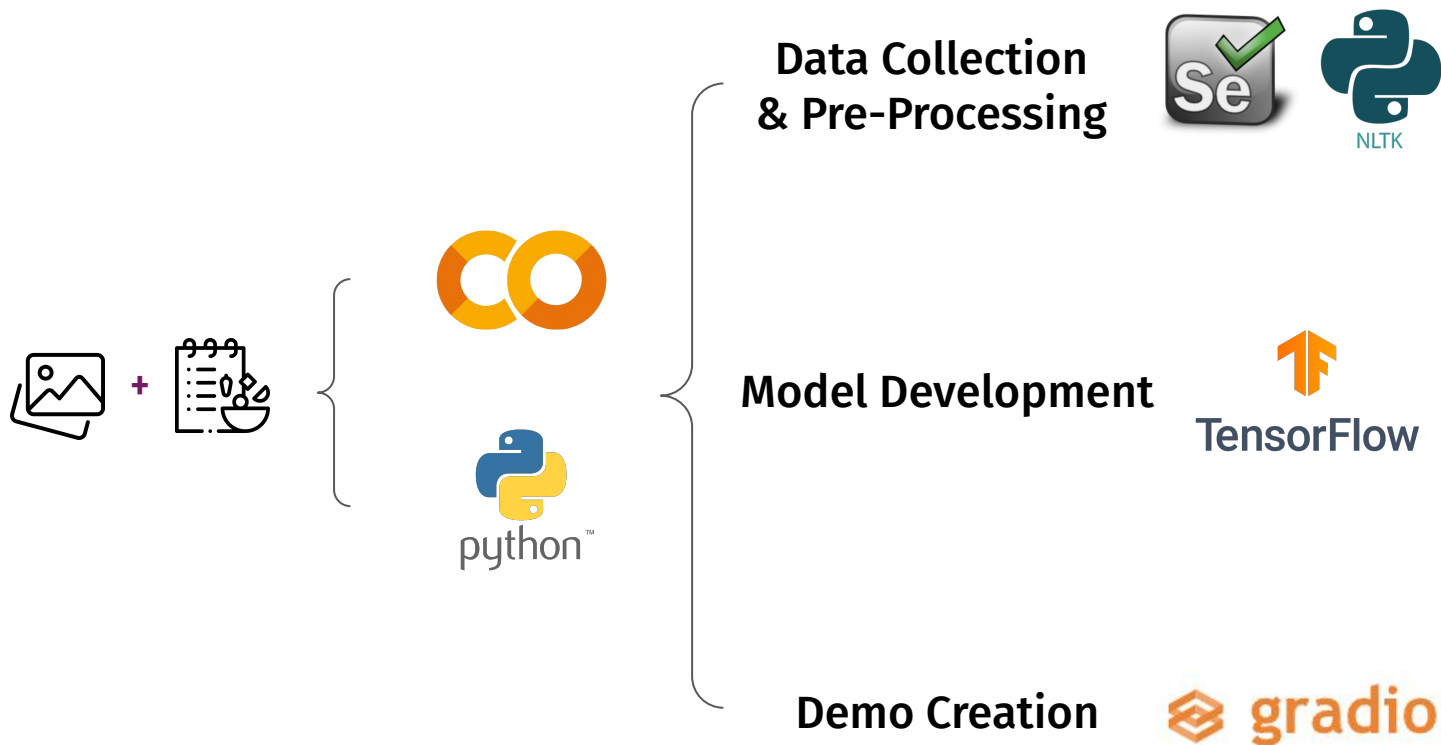


Recipe Filtering



User chooses
preferred recipes

Technical Solutions



Data Source & Analytics Success Metrics

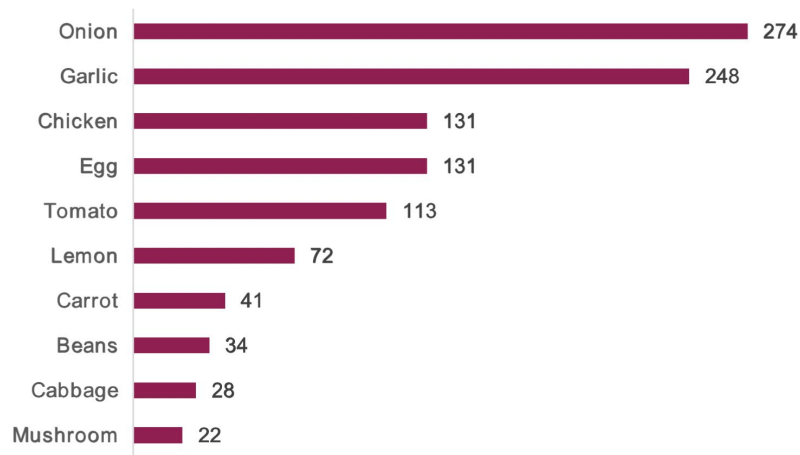
	Classify Image	Recommend Recipes	Customize Shopping List
Data Source	Ingredient Classification V1: 27k <i>scraped</i> pics V2: 27k <i>handpicked+augmented</i> pics V3: a backup set from kaggle	457 recipes scraped from allrecipes.com	3 diet types: Veggie, High Protein, Normal 7 styles: CHN, IND, KOR, JPN, GRC, MEX, ITA
	Fresh/Rotten Classification 1 Image Set from Kaggle		
Success Metrics	Classification Accuracy	Number of Recipes Available per Ingredient	Number of Customized Combinations Available (e.g. Vegetarian x Mexican, High Protein x Korean, etc.)

Additional Information on the Image Datasets



Choice of Ingredients

■ Number of Recipes



Prioritized ingredients
that appeared in more recipes.



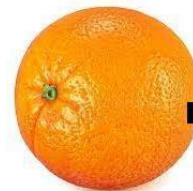
Image Augmentation Methods



Original



Flip



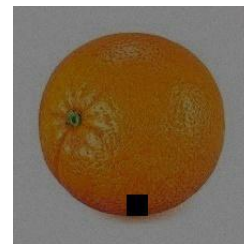
Delete square



Adjust Brightness



Add Noise

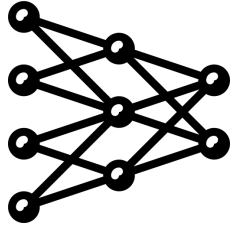


A+B+C+D

Table of Contents

- **Part I** Project Background
- **Part II** Business and Analytics Plan
- ➔ **Part III** Model Development and Evaluation
- **Part IV** Demo
- **Part V** Summary and Potential Next Steps

Model Development



Model Architecture

A CNN neural network with:

- Keras to pre-process image data
- 9 layers to extract features of the images
- class_mode parameter is set to 'categorical'

Model Training

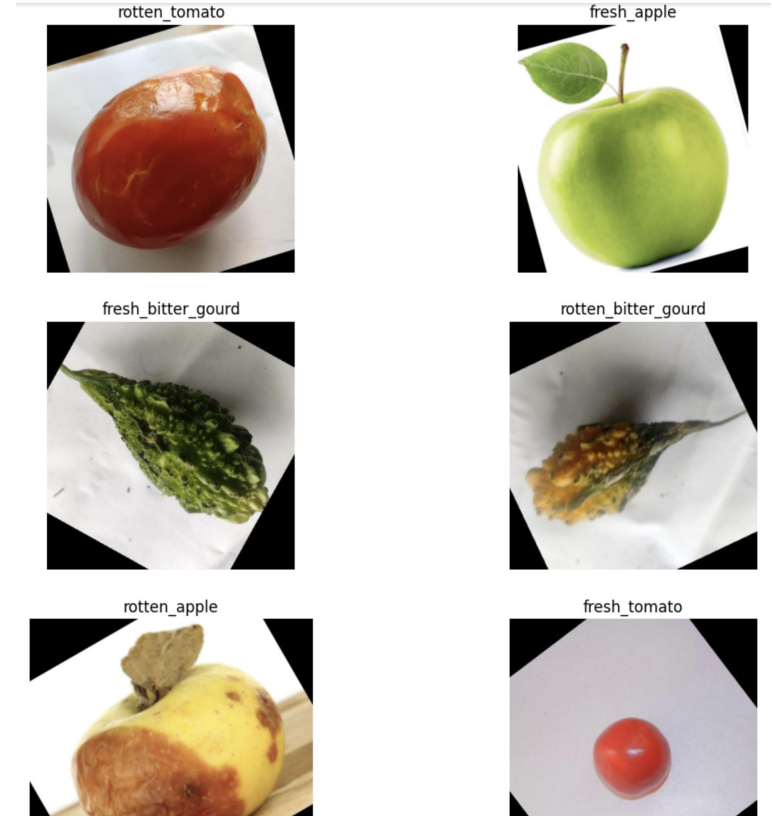
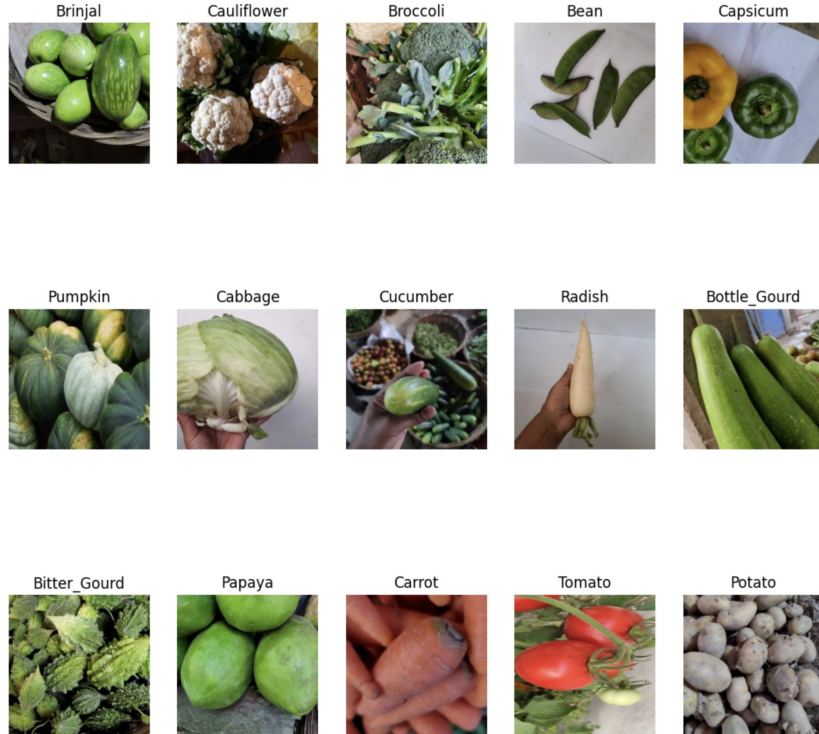
Used the four datasets to train two models respectively

- 65% train, 17.5% validation, 17.5% test

Model Evaluation

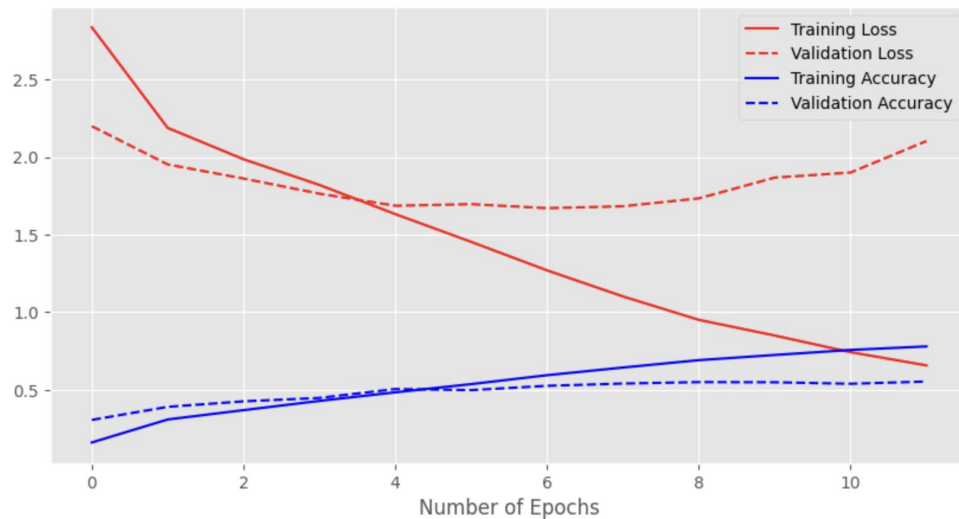
Refer to classification accuracy as model evaluation metrics

Image Example



Model Evaluation - Ingredient Classification (1/3)

Model 1
With scraped images

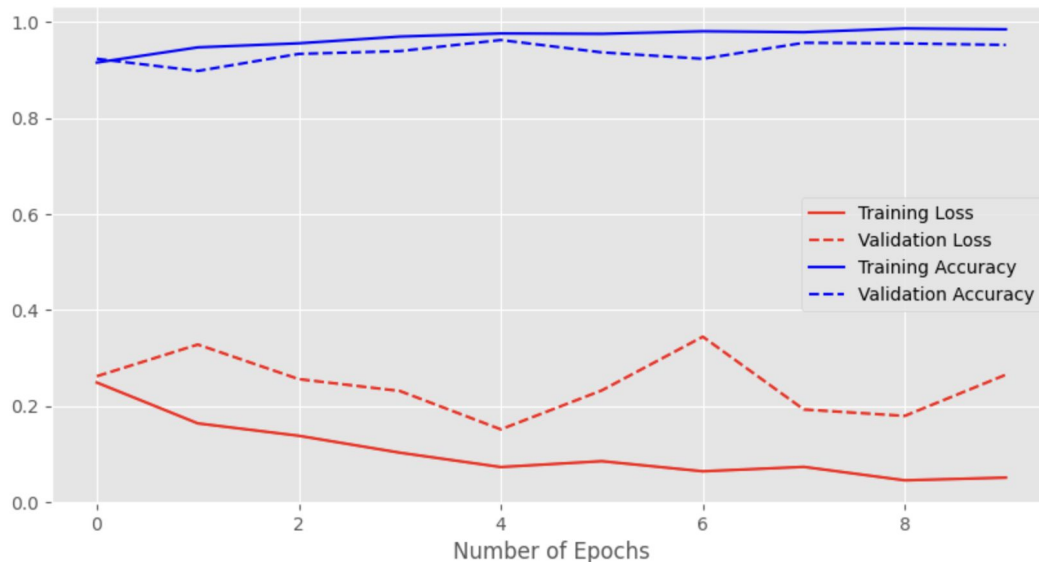


Evaluation:
loss: 1.9843, accuracy: 0.5544

Model Evaluation - Ingredient Classification (2/3)

Model 2

With handpicked and
augmented images



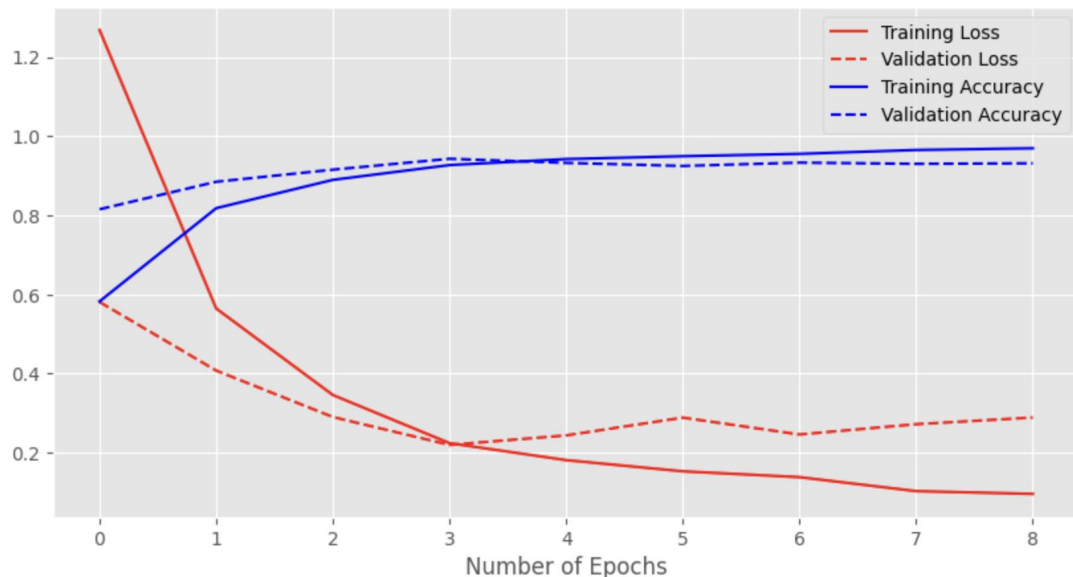
Evaluation:

loss: 0.2605, accuracy: 0.9568

Model Evaluation - Ingredient Classification

Model 3

With the backup image
dataset

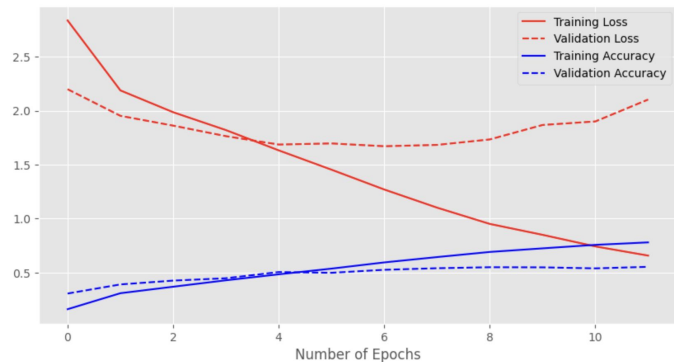


Evaluation:

loss: 0.2669, accuracy: 0.9337

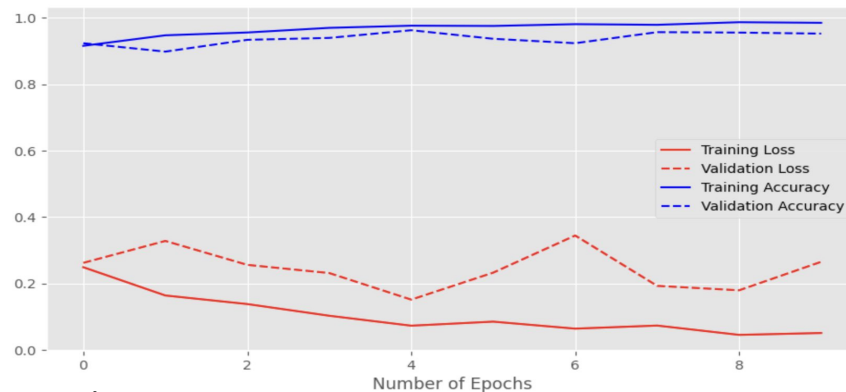
Model 1 With scraped images

Evaluation: loss: 1.9843, accuracy: 0.5544



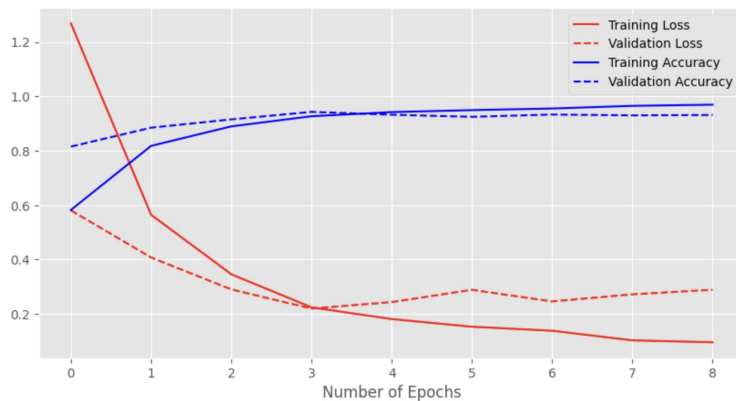
Model 2 With handpicked and augmented images

Evaluation: loss: 0.2605, accuracy: 0.9568



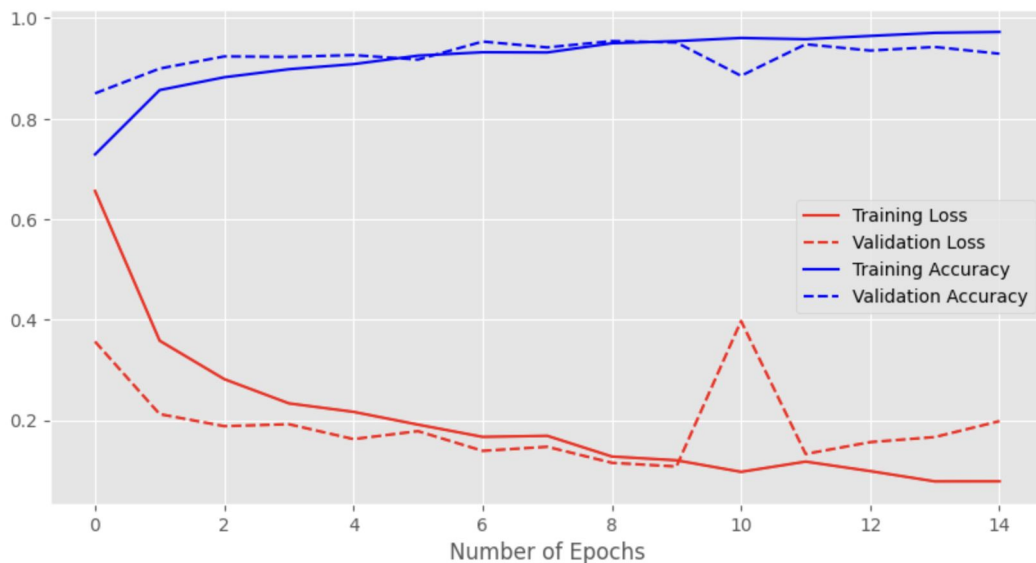
Model 3 With the backup image dataset

Evaluation: loss: 0.2669, accuracy: 0.9337



Model Evaluation - Fresh / Rotten Classification

Model 1
With Kaggle Dataset



Evaluation:

loss: 0.1642, accuracy: 0.9391

Table of Contents

- **Part I** Project Background
- **Part II** Business and Analytics Plan
- **Part III** Algorithm Development and Performance Evaluation
- ➔ **Part IV** Demo
- **Part V** Summary and Potential Next Steps

Demo on Gradio

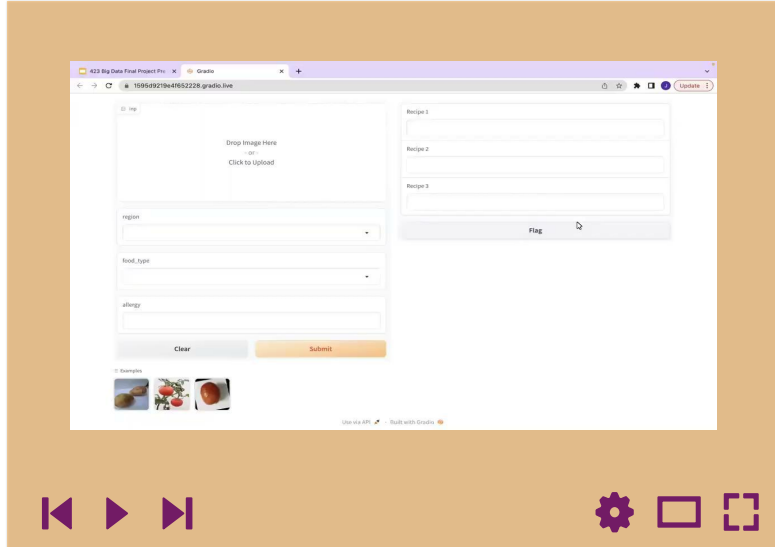


Table of Contents

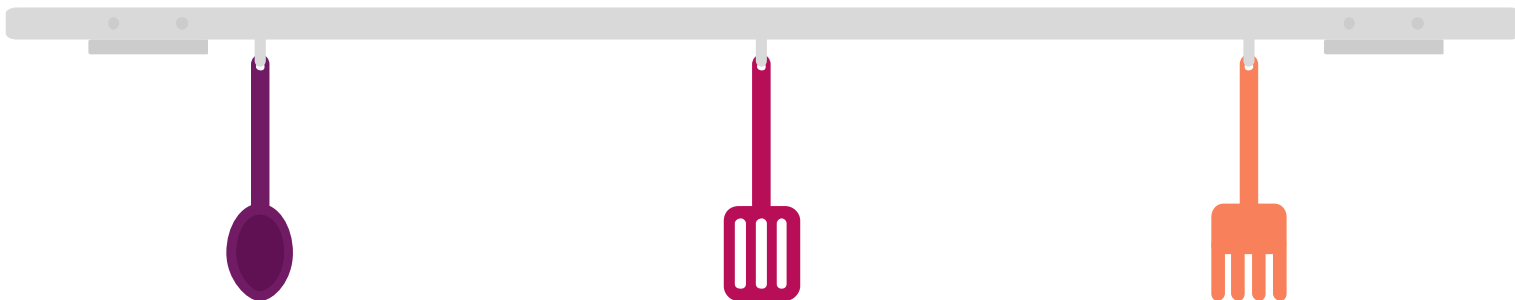
- **Part I** Project Background
- **Part II** Business and Analytics Plan
- **Part III** Algorithm Development and Performance Evaluation
- **Part IV** Demo
- ➔ **Part V** Summary and Potential Next Steps

Progress Summary

1. Originally planned features that have been realized:

- Ingredient classification
- Fresh/Rotten classification
- Customized recipe recommendation

2. Successfully built a image dataset with relatively higher classification accuracy



Reflection and Potential Next Steps

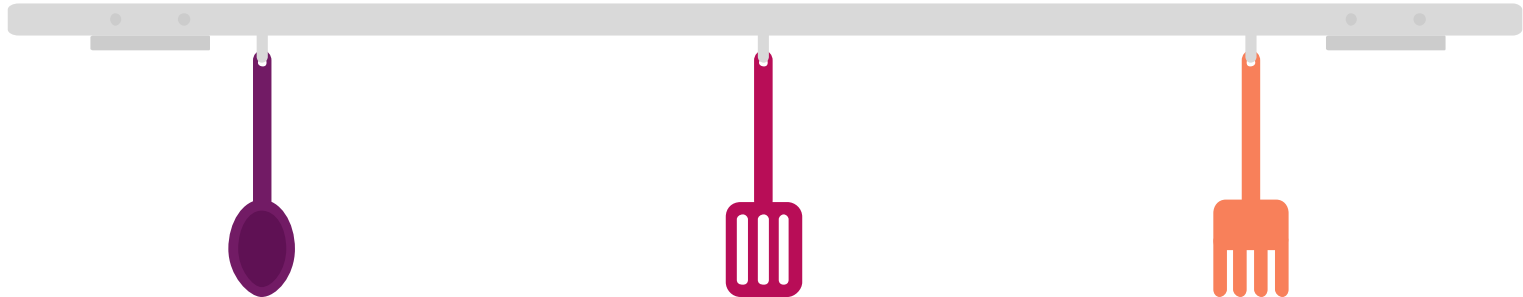
Reflection

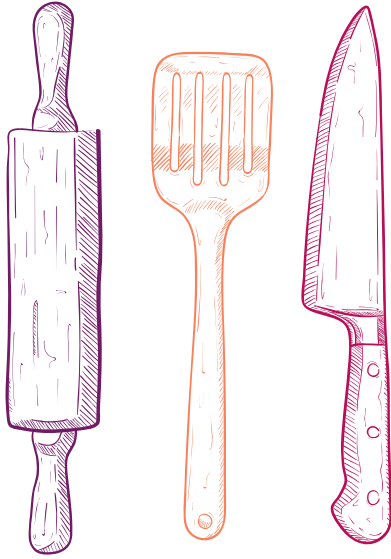
What we could improve:

1. Increase ingredients included in the dataset (currently the number is 30)
2. Increase the number of recipe per ingredient
3. Increase model accuracy and reduce overfitting
4. Improve the bridging of two classification algorithms

Potential Next Steps

1. Experiment with publicly available image dataset: ImageNet, CIFAR, or Open Images
2. Model tuning: activation function, optimization algorithm, etc.
3. Improve the demo





Thank you!