Track My Diet

Food Image Classification

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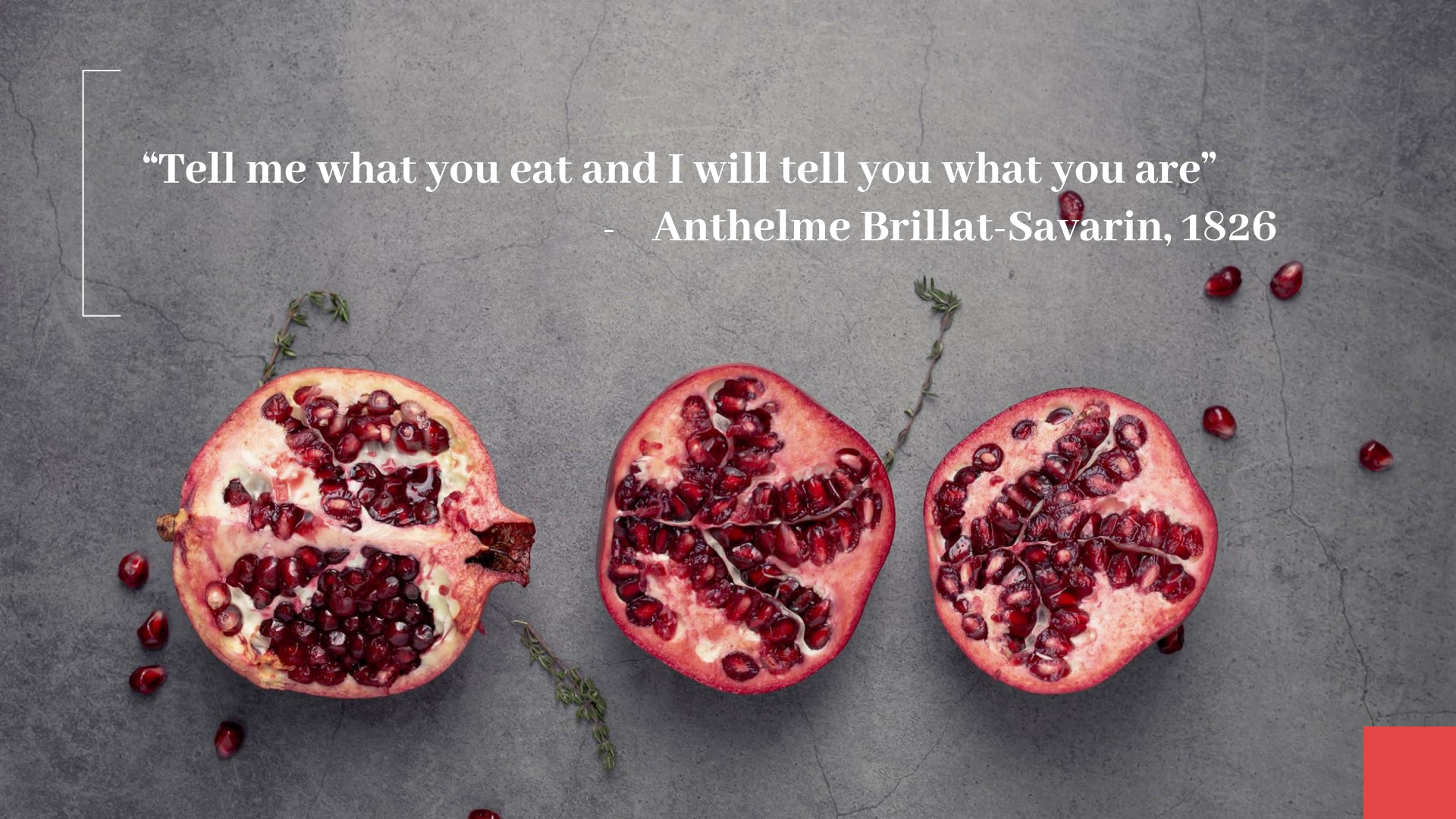

“Tell me what you eat and I will tell you what you are”
- Anthelme Brillat-Savarin, 1826

Choosing Our Foods

- Chronic Health Conditions
- Food Allergies
- Culture
- Ethics
- Occupation
- Curiosity

Problem

- Food recall is unreliable
- Current methods can be tedious

Power of Pictures

69% of Millennials take a picture of their food before eating

- Maru/Matchbox

Power of Pictures

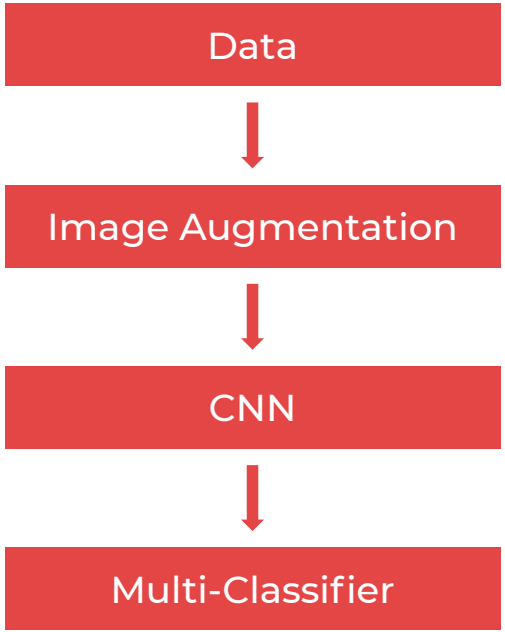
GOAL:

Food image classifier for diet tracking

Food-11 Dataset

- Created by the Multimedia Signal Processing Group at the Swiss Federal Institute of Technology
- 16,643 food images divided into 11 food group categories
- Groups further consolidated into 8 classes:
  - Dairy & Egg
  - Dessert
  - Fried foods
  - Fruits & Vegetables
  - Grains
  - Meat
  - Seafood
  - Soup

Methodology



- Keras/Tensorflow
- Transfer Learning
  - Pretrained Inception-V3
- Fine Tuning
  - Last 2 inception blocks

Final Model

- Test Accuracy - 89.3%
- Better performance
  - Fruits & Vegetables - F1 score of 95%
  - Soup - F1 score of 97%
- Weaker performance
  - Dairy & Eggs - Precision 79%, Recall 94%
  - Seafood - Precision 93%, Recall 81%

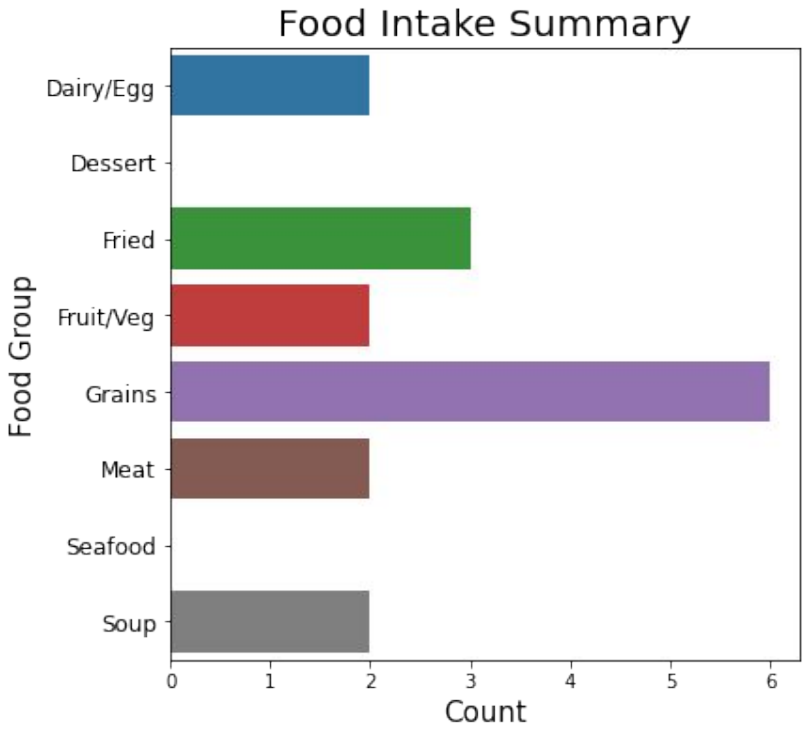
Real World Test

Food Item: Bulgolgi
Predicted: Meat
Probability: 92.69%

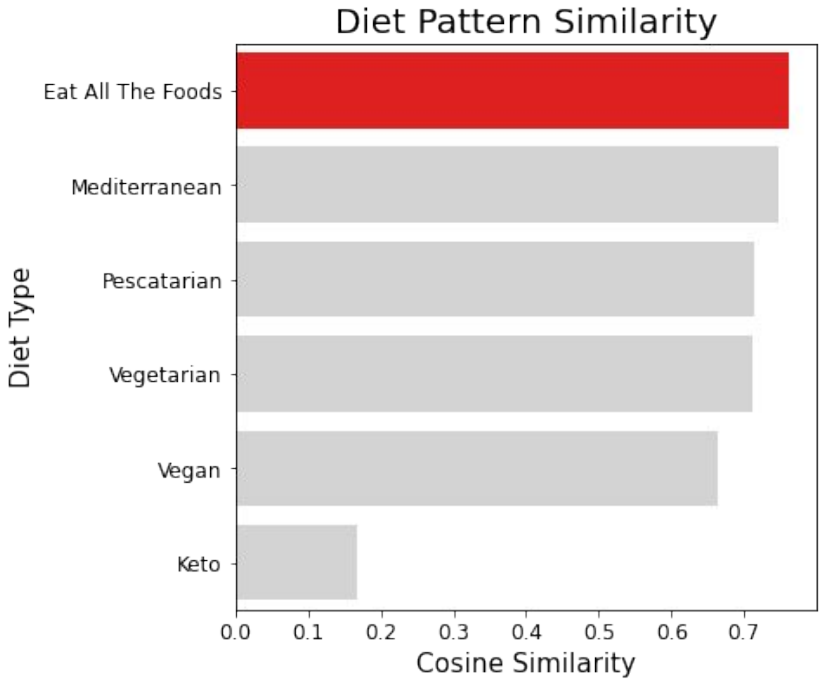
Food Item: Lettuce
Predicted: Fruit/Veg
Probability: 99.89%

Food Item: Pizza
Predicted: Dairy/Egg
Probability: 50.22%

My Diet Breakdown



What kind of eater am I?



Future Work

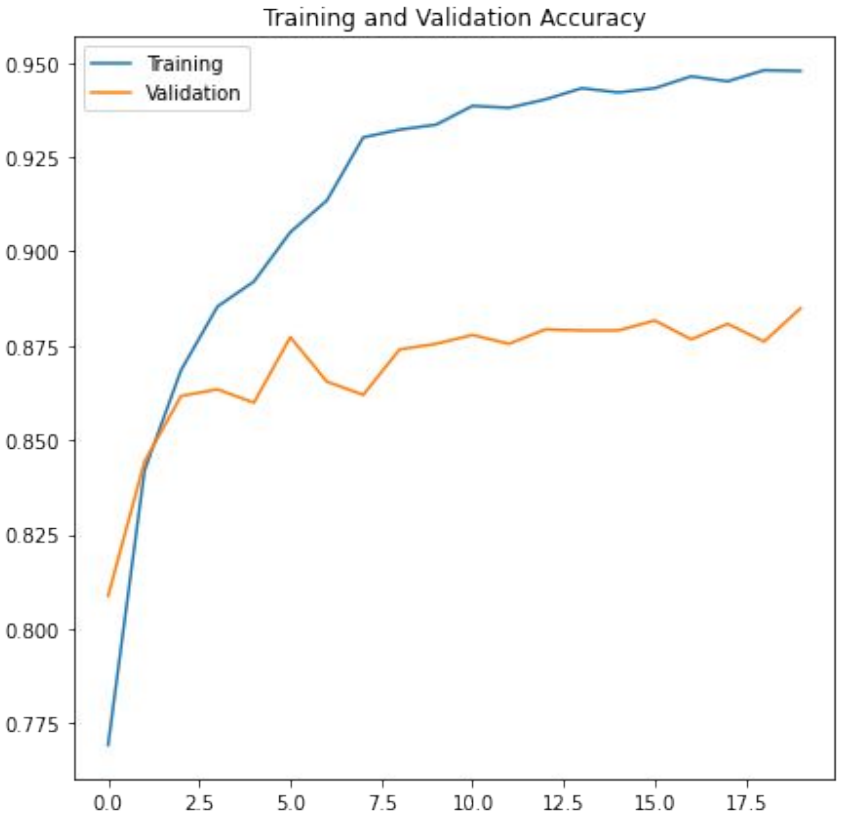
- Mobile app
- Additional applications
  - Restaurant Analysis
  - Social media trends
- Multi-class => Multi-label

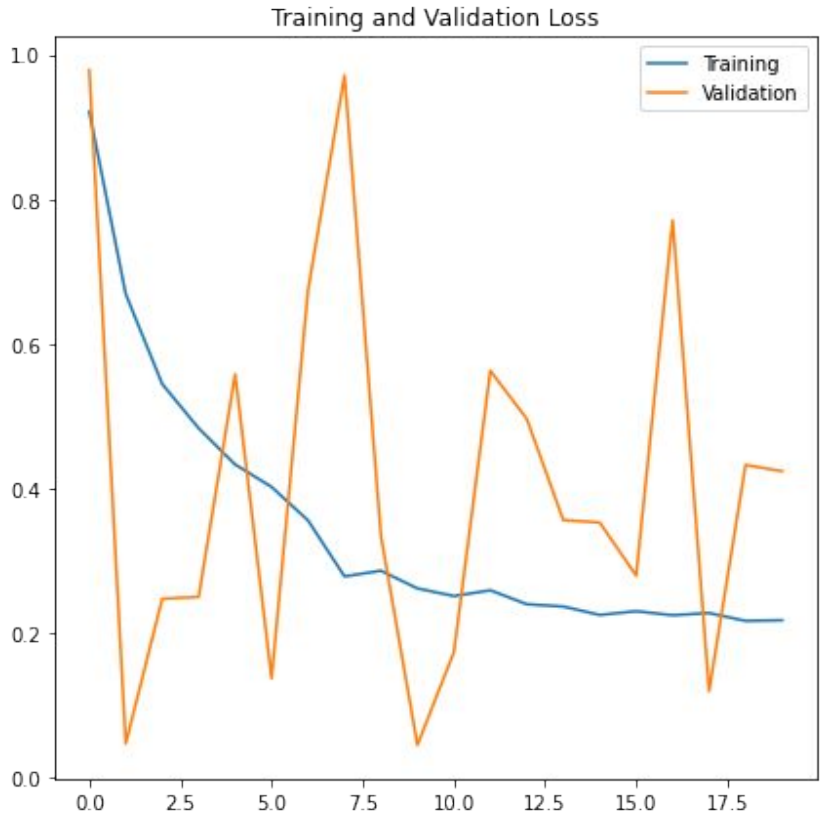
```
Food Item: Beef Noodle Soup
Predicted: Meat
Probability: 66.49%
```

Thanks

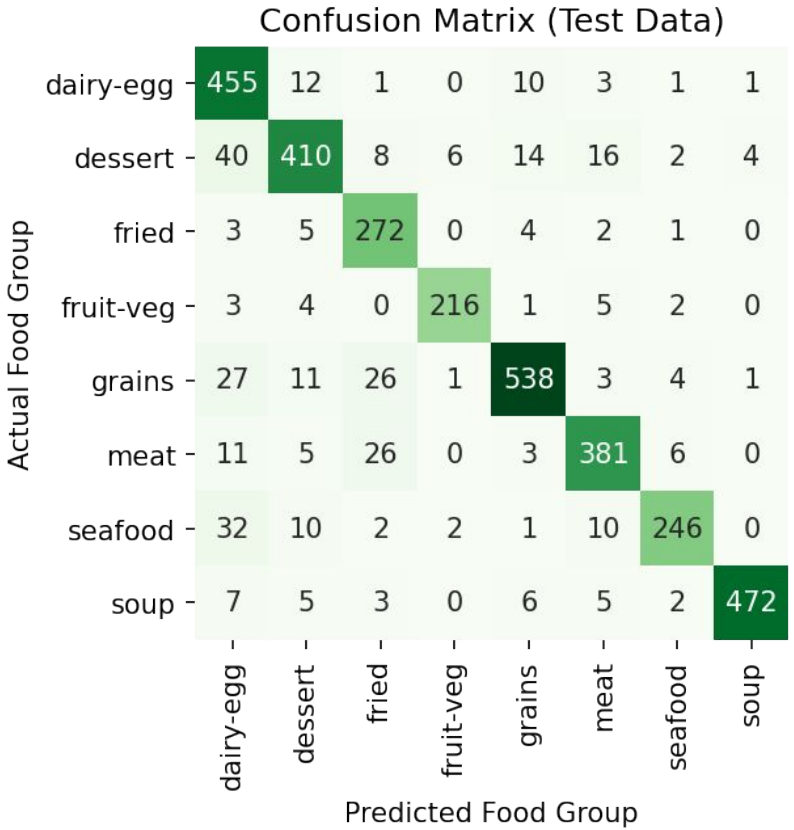
Do you have any questions?

Appendix - Model Training





Appendix - Confusion Matrix



Appendix - Per Class Metrics

Class	Precision	Recall	F1
Dairy/Egg	0.78	0.9	0.84
Dessert	0.89	0.84	0.86
Fried	0.87	0.9	0.88
Fruit/Veg	0.96	0.93	0.95
Grains	0.94	0.9	0.92
Meat	0.83	0.92	0.88
Seafood	0.89	0.8	0.84
Soup	0.99	0.91	0.95
Macro avg	0.89	0.89	0.89
Weighted avg	0.89	0.89	0.89

Appendix - Test Images

Food Item: Garlic Bread
Predicted: Grains
Probability: 74.14%

Food Item: Sandwich
Predicted: Grains
Probability: 92.49%

Food Item: Soybean Stew
Predicted: Soup
Probability: 38.80%

Food Item: Tonkatsu
Predicted: Fried
Probability: 39.24%

Food Item: Popcorn Chicken
Predicted: Fried
Probability: 37.67%

Food Item: Lettuce
Predicted: Fruit/Veg
Probability: 99.89%

Food Item: Beef Soup
Predicted: Soup
Probability: 81.43%

Food Item: Rice
Predicted: Grains
Probability: 99.82%

Appendix - Test Images

Food Item: Apple
Predicted: Fruit/Veg
Probability: 99.24%

Food Item: Bulgolgi
Predicted: Meat
Probability: 92.69%

Food Item: Oatmeal
Predicted: Grains
Probability: 96.47%

Food Item: Grilled Cheese
Predicted: Grains
Probability: 45.07%

Food Item: Tomatoes
Predicted: Fried
Probability: 68.60%

Food Item: Kimchi
Predicted: Dairy/Egg
Probability: 70.46%

Food Item: Beef Noodle Soup
Predicted: Meat
Probability: 66.49%

Food Item: Pizza
Predicted: Dairy/Egg
Probability: 50.22%

Resources

- https://www.epfl.ch/labs/mmspg/downloads/food-image-datasets/
- https://www.kaggle.com/vermaavi/food11
- Maru/Matchbox
- Singla, Ashutosh, Lin Yuan, and Touradj Ebrahimi. "Food/non-food image classification and food categorization using pre-trained googlenet model." *Proceedings of the 2nd International Workshop on Multimedia Assisted Dietary Management*. 2016.
- slidesgo.com