Hello!
My name is Seung Woo Choi,
and I am a Data Scientist.
You can find me at:
linkedin.com/in/seung-woo-choi/

Food Image
Classification
via CNNs

# My Vision

# Potential Applications

### Recipe Recommender System

The user takes a picture of ANY food with his/her phone, and the model accurately predicts the food class and provides a generic recipe for the food class.

**Uses:** traveling in a foreign country, trying a new cuisine

### Object Classification

The user takes a picture of ANY object with his/her phone, and the model accurately identifies the object.

**Use:** “eyes” for the visually impaired

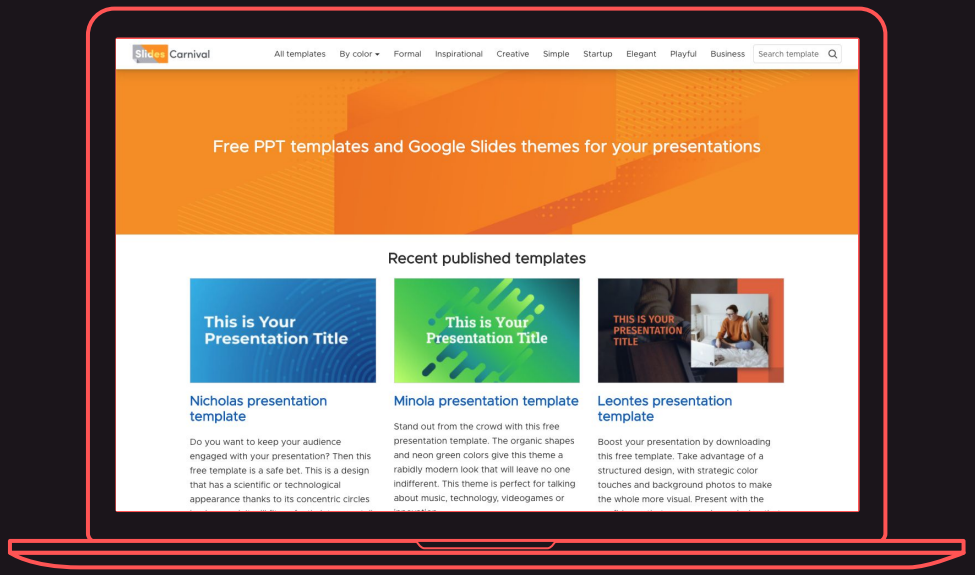
### Dinner Recommender System

The user takes a picture of his/her dinner, and the model accurately predicts the food class and recommends a similar/different food class for tomorrow’s dinner.

**Use:** deciding what to eat for dinner  tomorrow

# A Reality Check...

Silicon Valley: Not Hotdog (Season 4, Episode 4 Clip)



# Problem Statement

- Collect image data for 5 food classes:
  - Burger
  - Hotdog
  - Pizza
  - Taco
  - Sushi
- Build CNNs from scratch and pre-trained, SOTA models to predict multiclass food classes

# About the Data

- **Data source:** Reddit's pushshift.io API
- **Collection method:** scraping urls
- **Image data:** .jpg and .png files
- **Ideal sample size:** 1,000 images/class
- **Actual sample size:** 253-282/class
- **Retention rate:** scraped 600/class → used < 300/class → **42-47% retention**
- **Efficiency: 26.7%** of ideal sample size
- **Data cleaning:** removed manually

# Limitations

**Data Collection**

Google Images vs. Reddit

**Sample Size**

Ideal vs. restricted due to manual removal of incorrect images

**Low Budget**

AWS SageMaker

**Processing Speed**

Test runs for modeling

Hyperparameter tuning

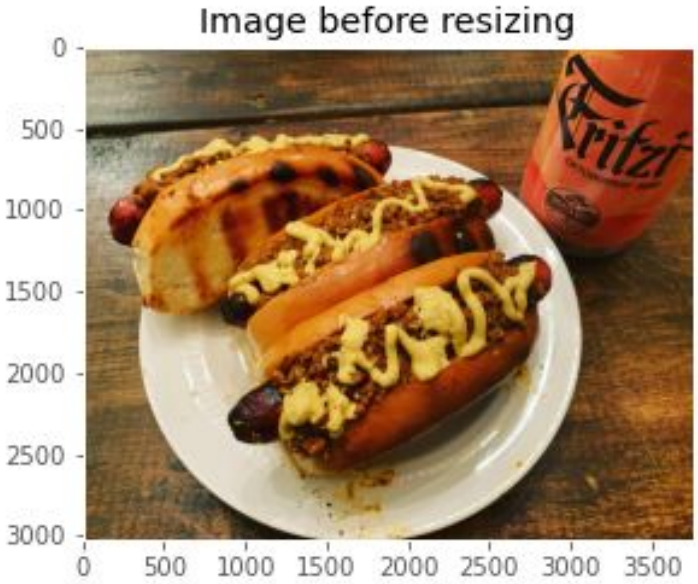
# Exploratory Data Analysis

# Class Membership

## Example: Burger and Hotdog

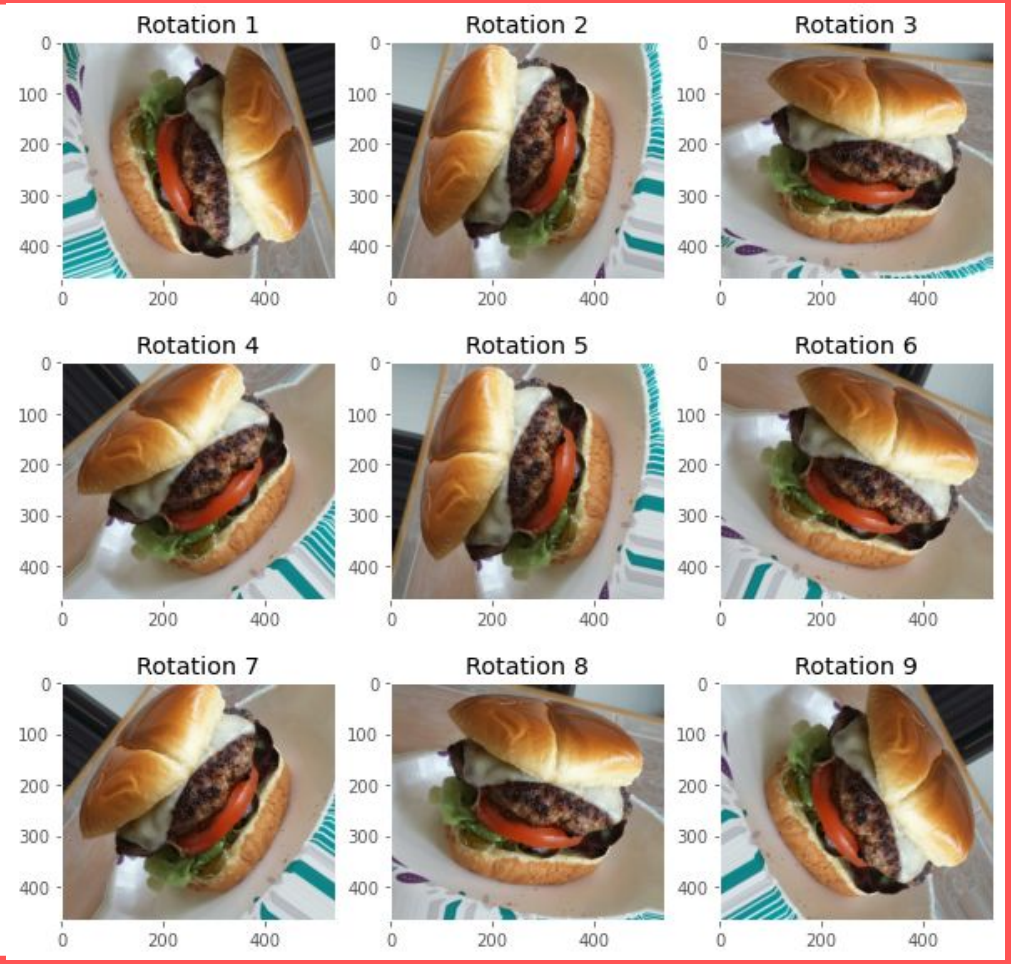
## Example: Pizza and Taco

## Example: Sushi



## Image Before and After Resizing

# Data Augmentation: Random Rotation

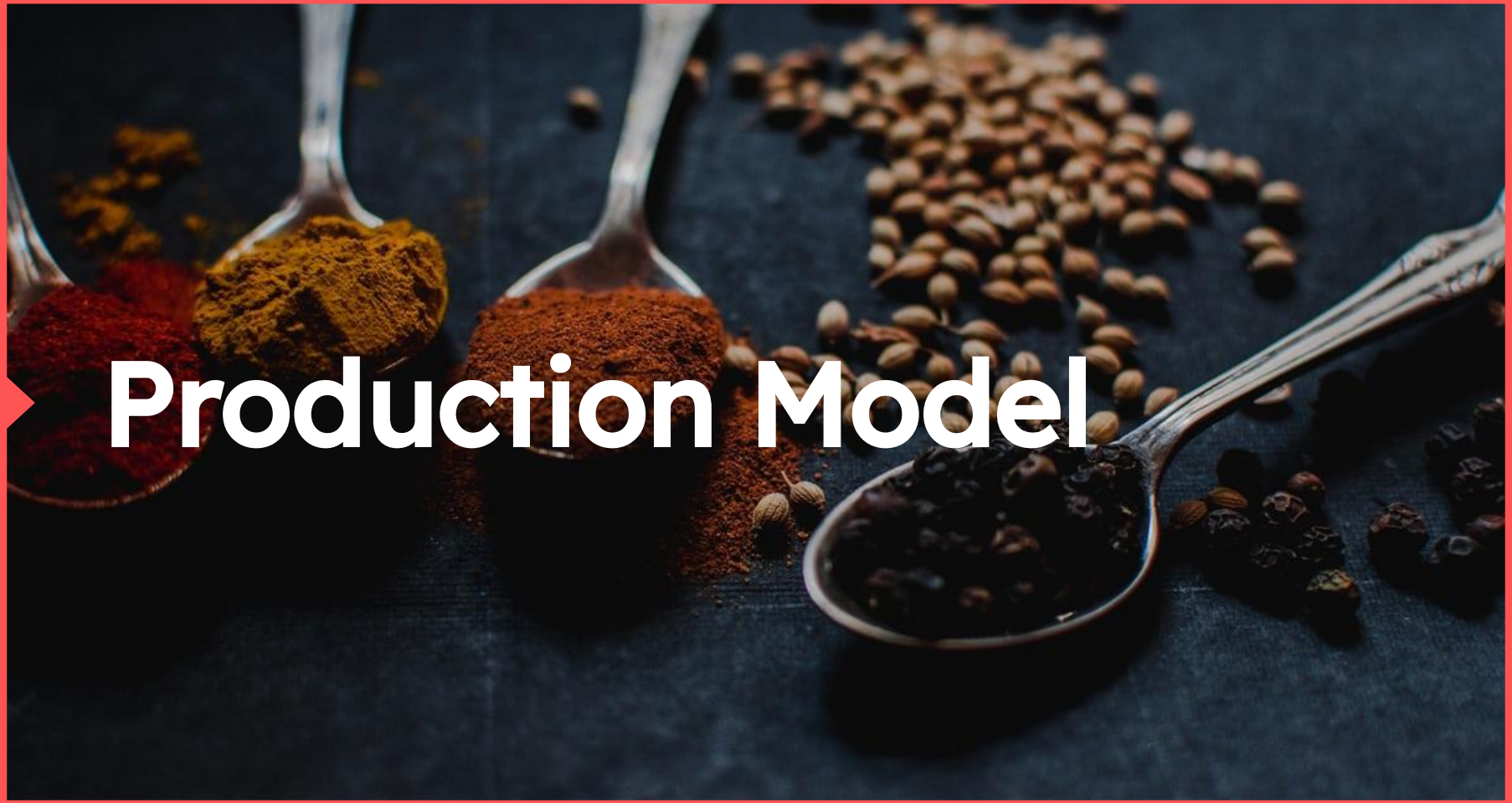


# Modeling

# Models

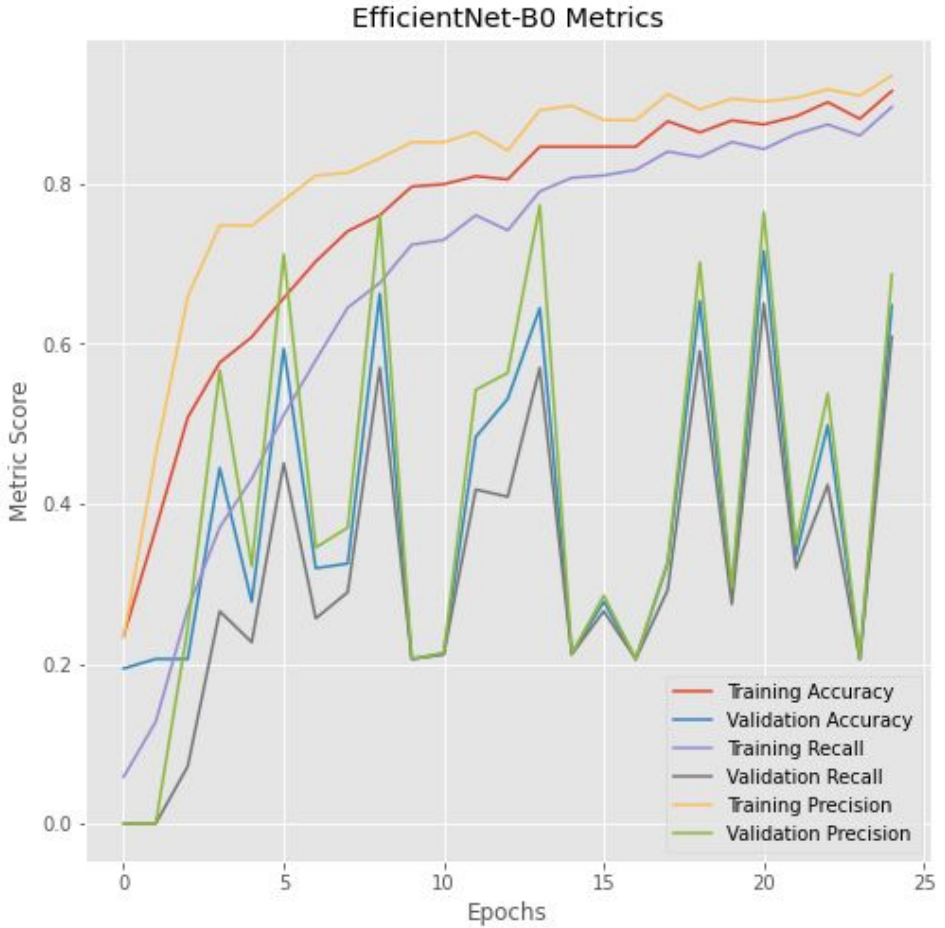
**Null Model**
Majority Class: **Burgers**
Baseline Accuracy: **21.06%**

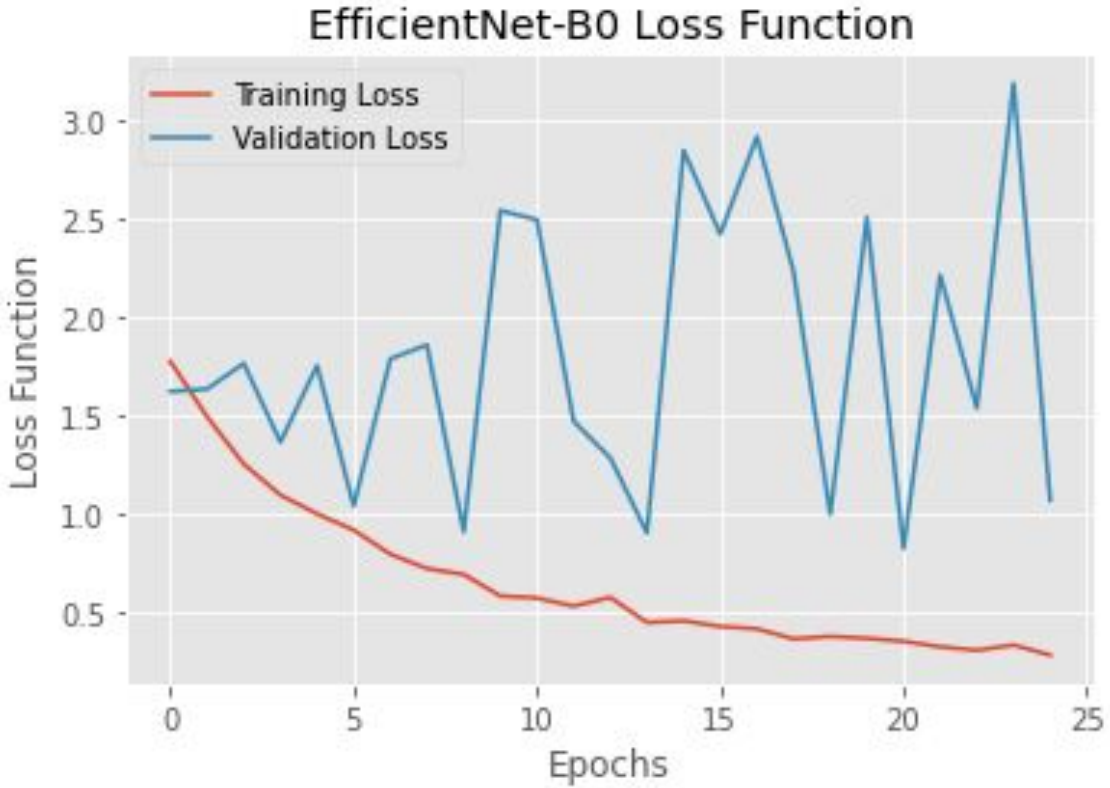
| Model Type | Validation Accuracy | Vs. Null Model | Validation Loss |
|---|---|---|---|
| CNN with 9 layers | 45.37% | 2.15x | 1.57 |
| CNN with 15 layers | 33.13% | 1.57x | 1.85 |
| ResNet50 (IBM) | 28.66% | 1.36x | 1.57 |
| EfficientNet-B0 (Google) | 64.78% | 3.07x | 1.06 |



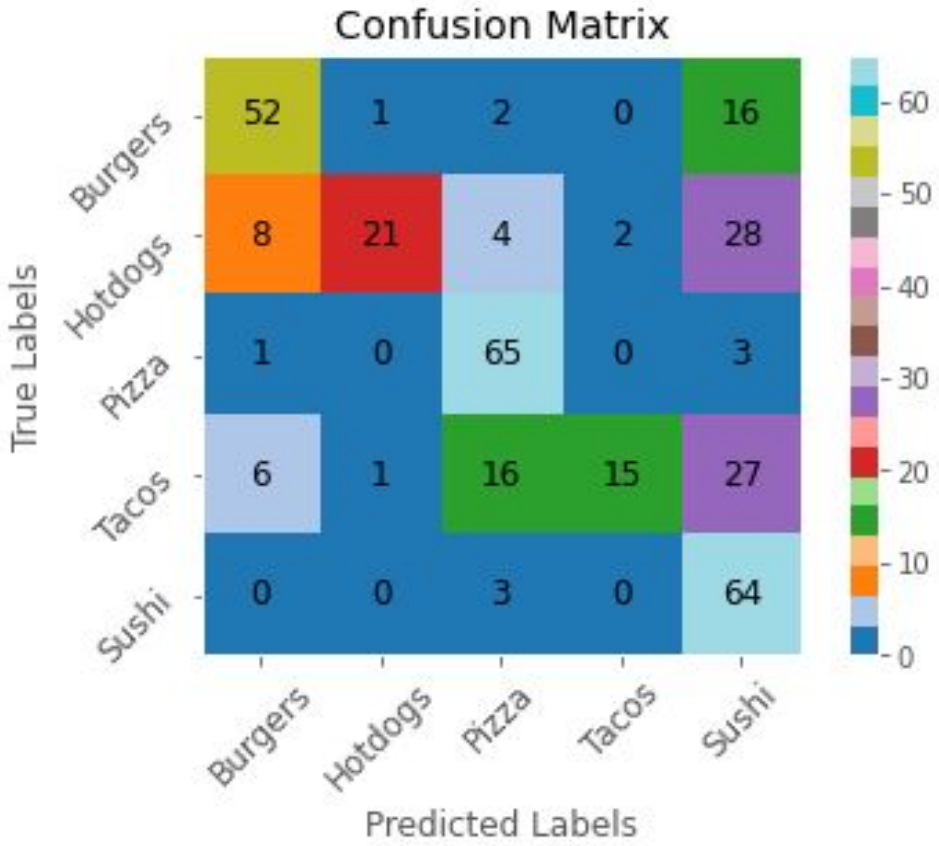
# Production Model

# EfficientNet-B0: Classification Metrics






## EfficientNet-B0: Loss Function




## EfficientNet-B0: Confusion Matrix

# Conclusion

**5**

Number of classes

**253 to 282**

Number of images per class

**64.78%**

Accuracy on unseen data

# Thanks!

Any questions?