

Singapore Hawker Food Classifier

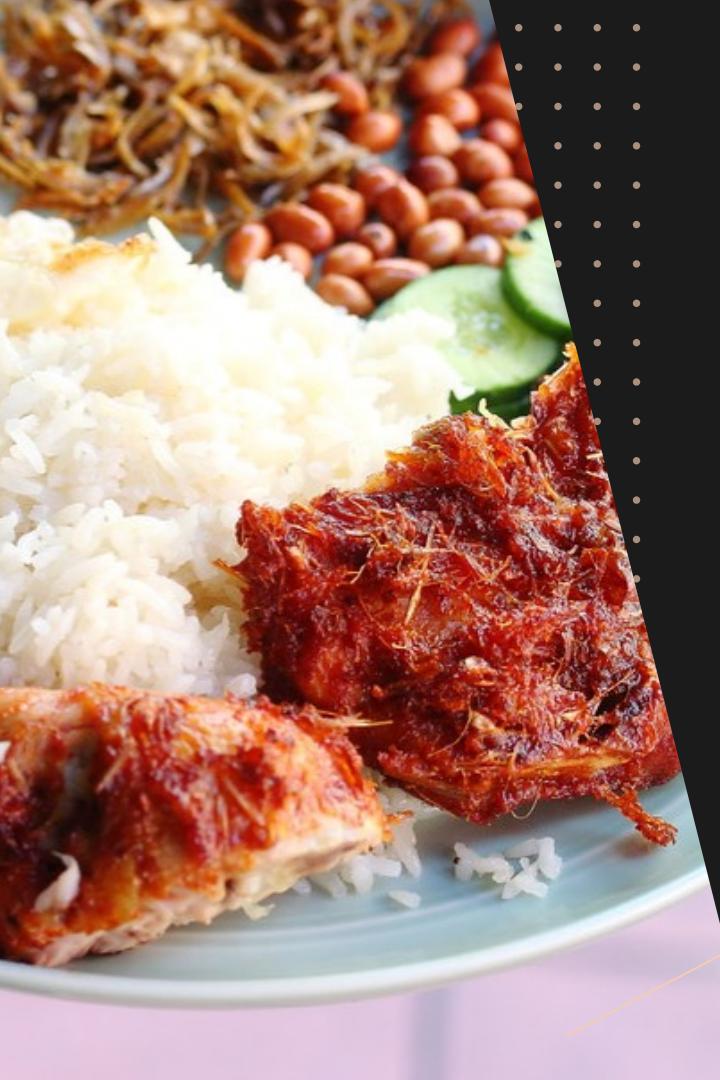
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A close-up photograph of a traditional Malaysian dish, Nasi Lemak. It consists of white rice topped with a dark, spicy sambal, sliced cucumbers, and fried anchovies. A piece of fried chicken is partially visible at the bottom left. The dish is presented on a light blue plate.

BACKGROUND

01

Problem Statement

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- The goal of this project is to build an image classifier for Singapore's 12 most famous hawker food using convolutional neural network (CNN) and transfer learning.
 - Performance of our models will be evaluated using the accuracy score (i.e. ratio of number of correct predictions to the total number of input images) for our test set (i.e. hold-out set of images to prevent data leakage)
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Why Hawker Food?

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- Source of pride for Singaporeans from all walks of life
- Reflection of our heritage and plays an important role in our lives
- Image classifier can work in tandem with the Ministry of Culture, Community and Youth (MCCY) and the National Heritage Board (NHB)'s campaign to solicit food images via online photo contributions to document our heritage
- Recent successful inscription into UNESCO Representative List of the Intangible Cultural Heritage of Humanity may entice tourists to try our hawker food
- Given its wide variety, having an image classifier will allow them to better learn, differentiate and appreciate our hawker food/culture

02

DATA



Images scrapped from Google due to lack of available dataset

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	Training	Validation	Test
Images per class	1,000	200	200
Total images	12,000	2,400	2,400

- Validation set for hyperparameter tuning
- Test set for final evaluation of model accuracy to prevent data leakage

12 Classes of Hawker Food



Chicken Rice



Laksa



Nasi Lemak



Fried Hokkien Mee



Wanton Mee



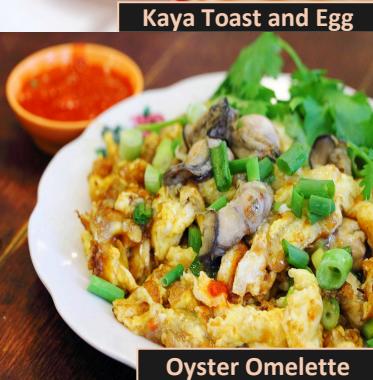
Bak Chor Mee



Satay



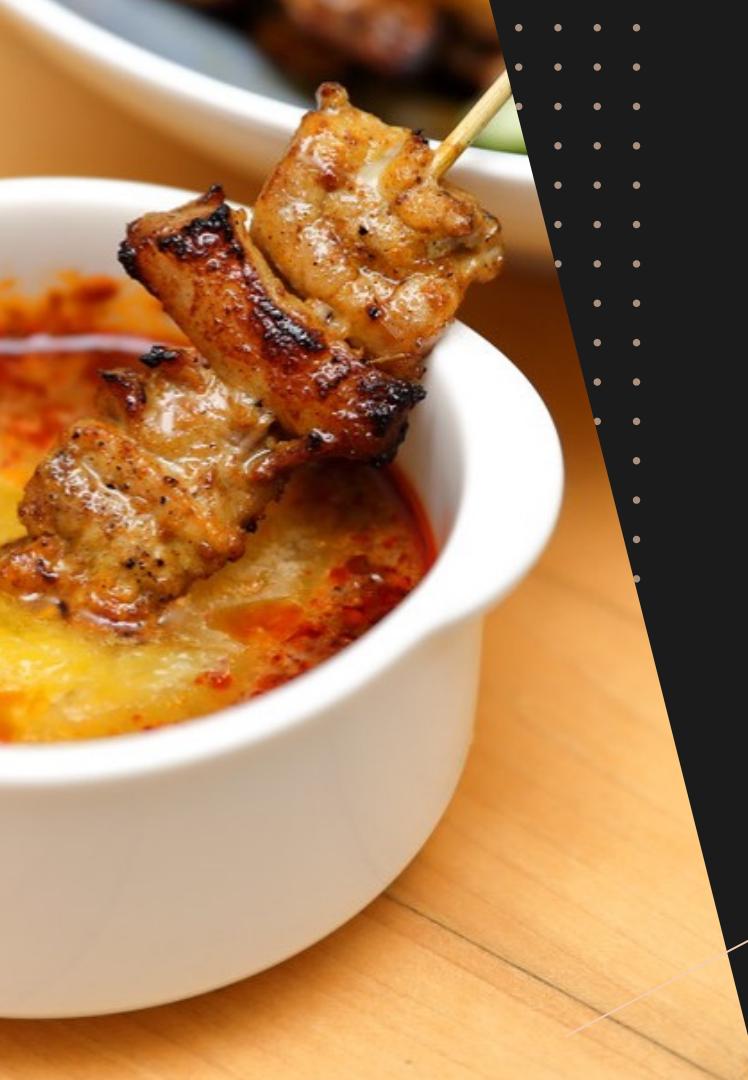
Roti Prata



Oyster Omelette



Char Kway Teow



MODEL SETUP

03

Deployed 2 main groups of models
for image classification

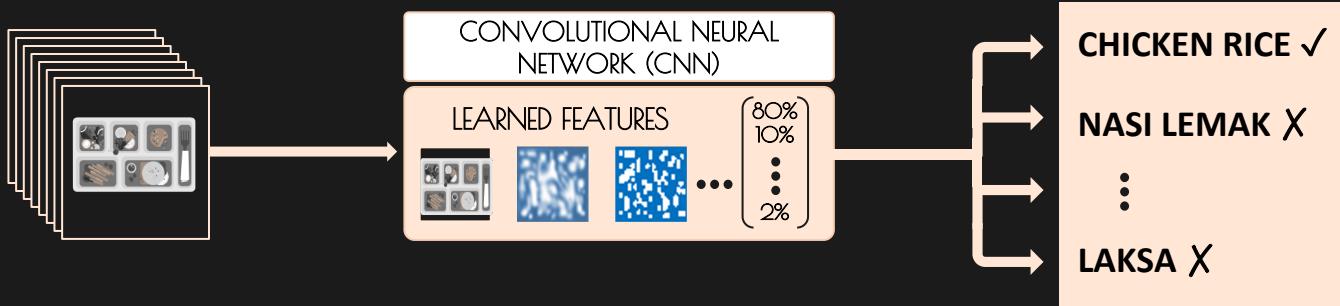
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- Group 1: Self-built convolutional neural network (CNN) model with its respective layers (e.g. Conv2D, MaxPool2D, Dense)
- Transfer learning using pre-trained models (i.e. MobileNetV2, VGG16 and ResNet50) for feature extraction and subsequent prediction

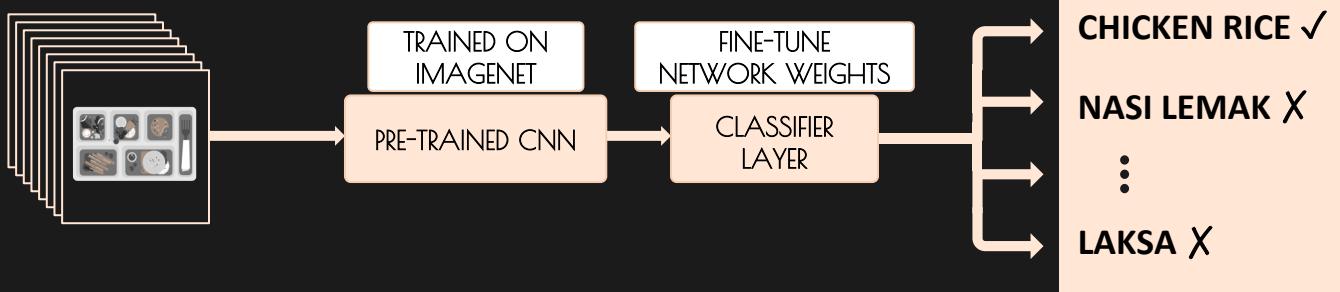
Overview of our modeling approach

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TRAINING FROM SCRATCH (GRP 1)



TRANSFER LEARNING (GRP 2)



MODEL EVALUATION

04



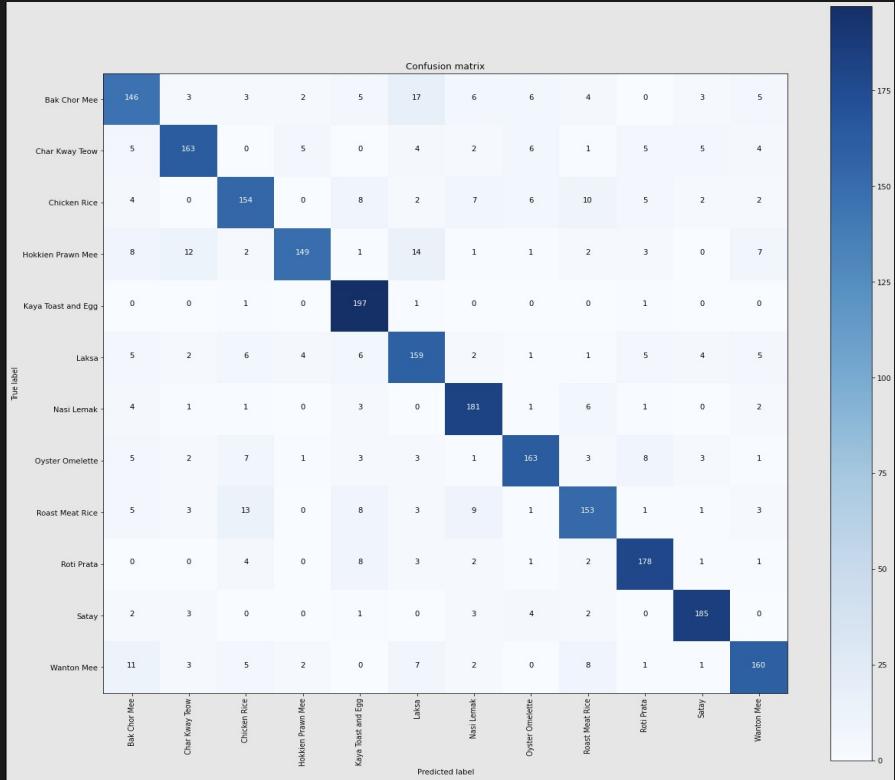
ResNet50 model chosen as it has highest test accuracy

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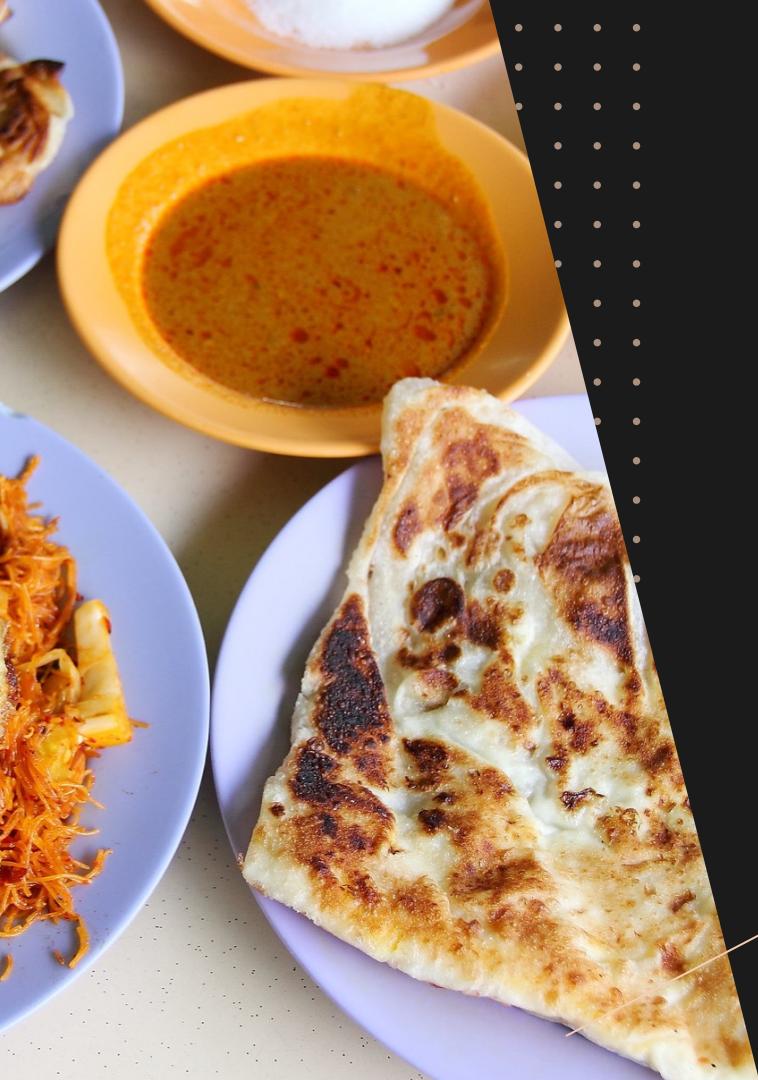
	Baseline	CNN	MobileNetV2	VGG16	ResNet50
Training Accuracy	-	77.2%	76.8%	88.9%	86.1%
Validation Accuracy	-	75.3%	74.8%	81.1%	82.2%
Test Accuracy	8.3%	76.4%	73.4%	80.8%	82.8%

- Test accuracy chosen as evaluation metric as evaluated on test set (i.e. hold-out set)
- This ensures there is no data leakage

ResNet50 model works well to classify images into respective classes



- Highest accuracy class is almost 100% spot on (i.e. Kaya Toast and Egg with 197/200 images correctly classified)
- Even lowest accuracy class (i.e. Bak Chor Mee) has 146/200 images correct

A collage of Indian food items. On the left, there's a yellow bowl of red dal, a white plate with a large piece of golden-brown roti, and a blue plate with a salad of shredded vegetables. The right side of the image is a solid black background with white text.

LIMITATIONS

05

Chosen model struggles slightly with classifying noodle-related images

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- From our confusion matrix earlier, our ResNet50 model tends to struggle with noodle-related images (e.g. 17 Bak Chor Mee images inaccurately predicted as Laksa).
- This phenomenon is also observed in other models that we have built.



FUTURE WORK

06



Ways to expand/improve current scope of project

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- Re-classification of noodle-related images, to collect and train our models on even more images so that they get better at recognising and predicting features
- Expand the coverage of our image classifier to include more hawker food classes (i.e. increase comprehensiveness of classifier)
- In terms of practical usage, we can collaborate with MCCY and NHB to deploy our model in their Our Singapore Heritage website to ensure that photo contributions are accurately tagged.
- To facilitate tourists in distinguishing between the various hawker food classes, we can also work to deploy our image classifier in an app so that they can easily upload images for prediction

A vibrant red plate holds a dish of stir-fried oysters. The oysters are partially open, revealing their meat. The dish is garnished with fresh green cilantro and a drizzle of a dark, glossy sauce, possibly soy or chili oil. In the background, a small white bowl containing a red dipping sauce is visible.

THANKS!

Any questions?

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