Fruit classification from images using deep learning

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INTRODUCTION

Problems definition:

- **Input:** Image of a fruit.
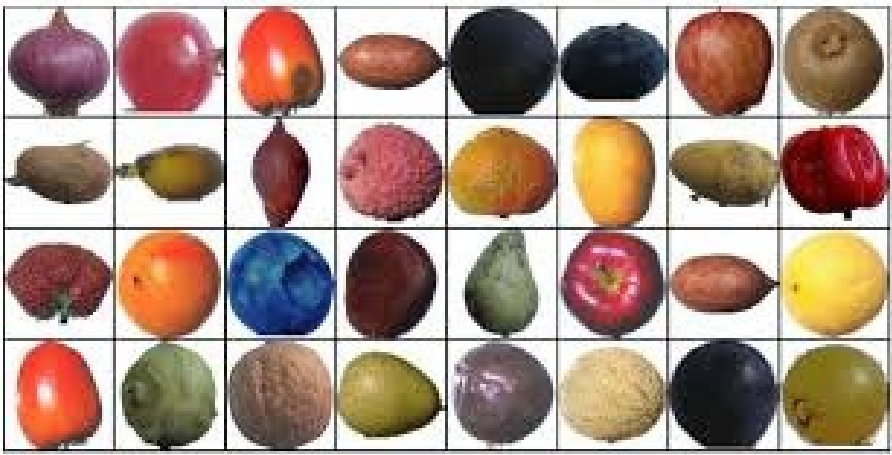- **Output:** Name of the fruit in the picture.

Challenge:

- Distinguish between fruits that are similar alike can be difficulties
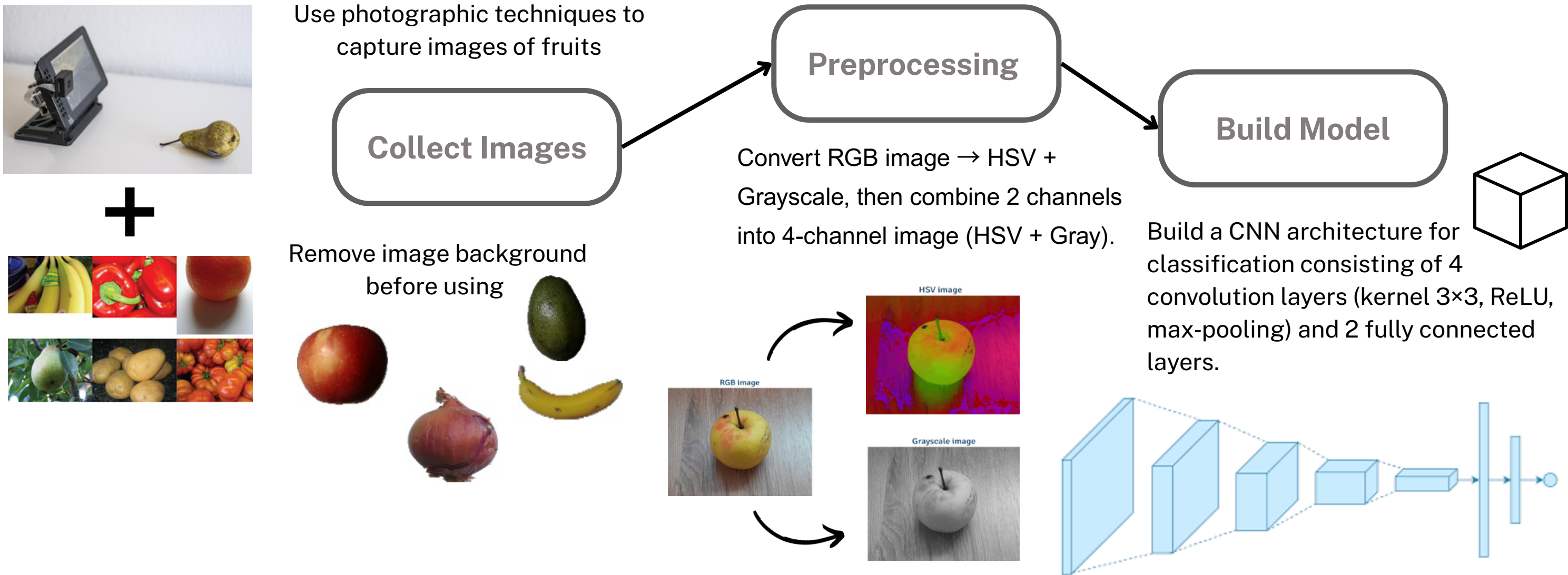- Natural changes in fruit over time can confuse results.

Thesis Goal: Train a deep learning model to classify images of fruits and vegetables into food groups that are grouped by semantic proximity.
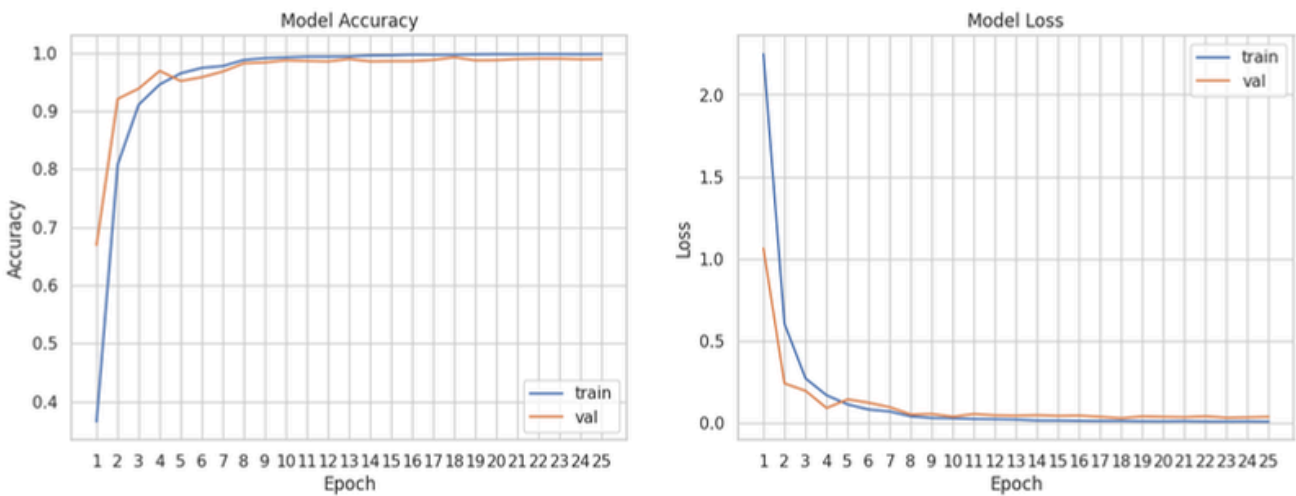
DATASETS

- **Data source:** Oltean, Mihai (2018), "Fruits 360 dataset", Mendeley Data, V1, DOI: 10.17632/rp73yg93n8.1
- **Quantity:** 56671 samples from 69 type of fruit, including 39829 samples (training set) and 16842 samples (test set).

PROPOSED METHOD

Use photographic techniques to capture images of fruits

convert to 100x100 image and randomly flip image

Collect Images

Preprocessing

Build Model

Remove image background before using

Convert RGB image → HSV + Grayscale, then combine 2 channels into 4-channel image (HSV + Gray).

Build a CNN architecture for classification consisting of 4 convolution layers (kernel 3×3, ReLU, max-pooling) and 2 fully connected layers.
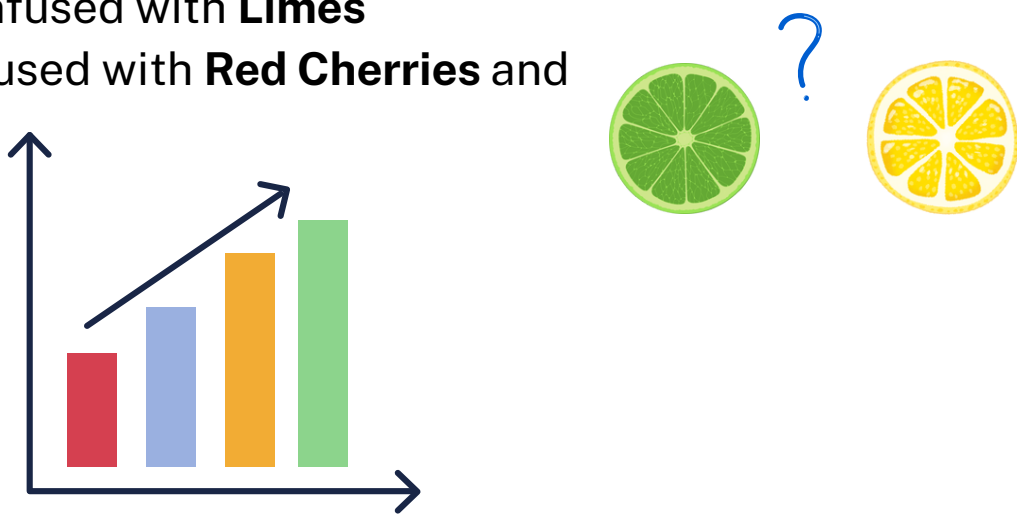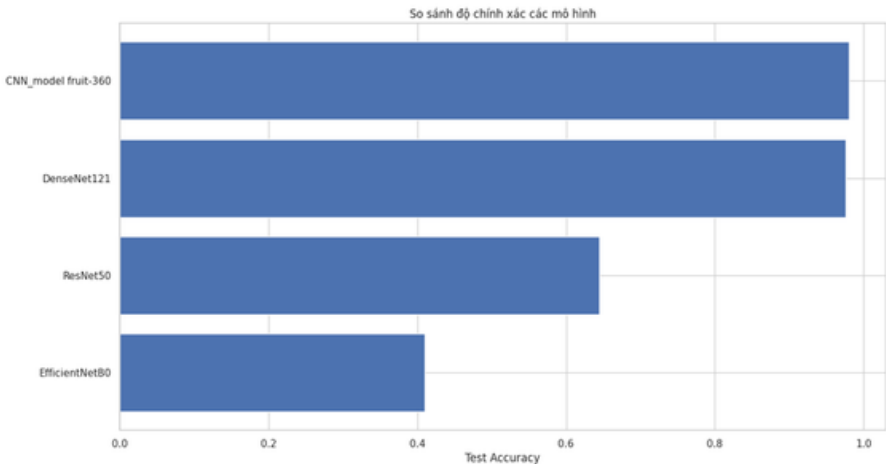
EXPERIMENTS

The model has learned effectively, without overfitting or underfitting.

Special cases through the experimental process

- **Beets** are often confused with **Apple** and **Blackberry**.
- **Lemons** are often confused with **Limes**
- **Plums** are often confused with **Red Cherries** and **Pomegranate**.

RESULTS

	MODEL_NAME	ACCURACY	TIME_SEC
0	EfficientNetB0	0.410409	3107.27
1	DenseNet121	0.975641	3185.87
2	**CNN_model**	**0.980556**	**2915.29**
3	ResNet50	0.645114	3126.94

Designing a model that fits the problem will more suitable than just relying on complex available architectures.

The model performs better than models such as **DenseNet121, ResNet50** and **EfficientNetB0**