

Assignment : 3



- Aim

Build the image classification model by dividing the model into the following four stages:

- a. Loading and preprocessing the image data
- b. Defining the model's architecture
- c. Training the model
- d. Estimating the model's performance.

- Course objectives

1. To apply the algorithms to a real-world problem, optimise the model's learned and report on the expected accuracy that can be achieved by applying the models.

- Course outcomes

CO2: Build and train deep neural network models for use in various applications

CO4: Evaluate the performance of the model built using Deep learning

- softwares and hardware requirements:

sr.no	Hardwares & softwares	version / specification
1.	Jupyter notebook	V.7.13.008
2.	Computer /pc	IS version, 64 bit, 8GB

FOR EDUCATIONAL USE

- Theory

Algorithm / steps for image classification

Step 1

Loading and preprocessing the image data

- i. import libraries
- ii. Load dataset
- iii. normalize and split

Step 2

Defining the model's architecture

- i. Initialize the sequential model
- ii. Add (conv2D) with ReLU Activation
- iii. Add max-pooling layer
- iv. Flatten the feature maps
- v. Add dense layer with ReLU
- vi. Add output layer with softmax for classification

Step 3

Training the model

- i. compile model using optimizer (e.g. Adam) and loss function
- ii. Train model using fit() with training data, batch size, epochs and validation split.



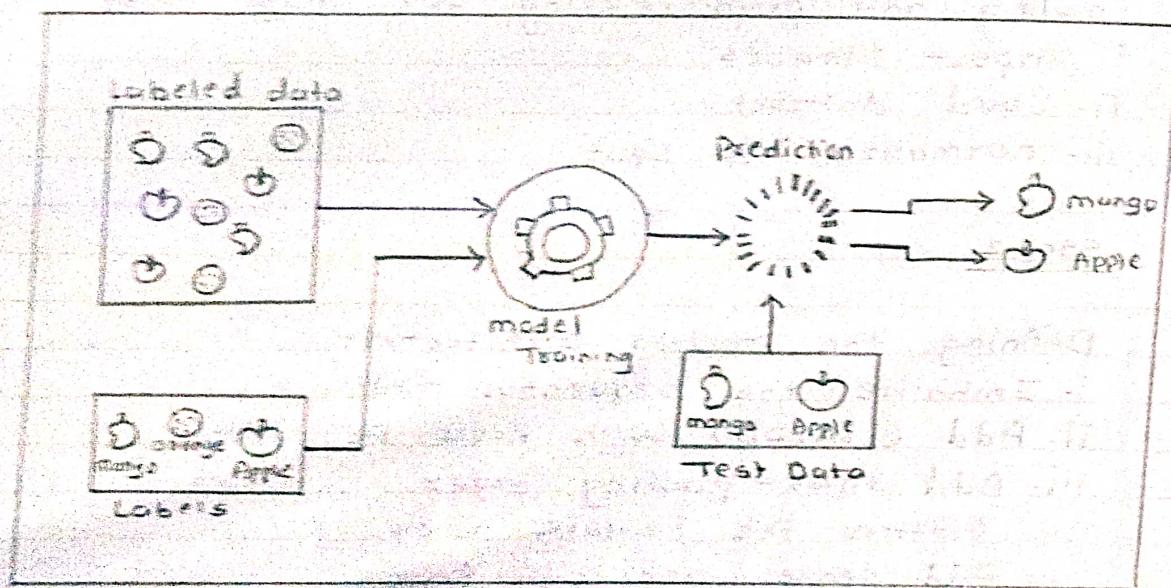


Fig (Image classification).

Step 4

Estimate the model's performance

- Evaluate model using `evaluate()` on test data.
- Plot training / validation accuracy and loss
- Use `predict()` for prediction
- (Optional) Generate a confusion matrix and a calculate accuracy matrix like precision and recall

Image classification

- Image classification is the task of assigning an input image.
- one label from a fixed set of categories. this is one of core problems in a computer vision, that despite its simplicity
- Let's take an example to better understand. when we perform image classification in our system will receive an image as input, for
- for example, cat, Now the system will be aware of a set of categories and its goal is to assign a category of the image
- It is a topic of pattern recognition in computer vision.



1. choose dataset for images
2. Collect libraries and required functions
3. Prepare dataset for Training : Preparing our dataset for training will involve assigning paths and creating categories (labels)
4. create a Training a data : Training is an array that will contain image pixel values and the index at which the image in categories list.
5. shuffle the dataset
6. Assigning Labels and Features
7. Split X and Y for use in CNN
8. Define, compile and train the CNN model
9. Accuracy and score of model.

Advantages of image classification

- i. Automation and efficiency
- ii. High Accuracy with deep learning
- iii. Scalability
- iv. Real - time

Disadvantages of Image classification

1. Data Dependency
2. High computational cost
3. Overfitting Risk
4. Sensitive to data quality

Application of Image classification

1. Medical Imaging

Used to detect disease in X-Rays, MRIs and CT scans (e.g. tumor detection)

2. Facial Recognition

Employed in security systems, unlocking devices, and verifying identities in banking and e-commerce

3. Autonomous vehicles

Helps in identifying road signs, pedestrians, and obstacle for safe navigation in self-driving car

4. Social media and content management

Platforms like Facebook and Instagram use image classification for tagging, content moderation, and search, recommendation.



- Conclusion

In this practical, I have learned and build image classification model by dividing the model into Loading defining, Training and estimating the model performance as per the evaluation of model output and accuracy with evaluation parameter.