Model Optimization and Tuning Phase Report

Date	19 JUNE 2025
Team ID	SWTID1749825524
Project Title	Deepfruitveg: Automated Fruit and Veg Identification
Maximum Marks	10 Marks

Model Optimization and Tuning Phase Summary:

The Model Optimization and Tuning Phase involved refining a Convolutional Neural Network (CNN) for classifying fruit and vegetable images. Key activities included optimizing CNN architecture, tuning hyperparameters such as learning rate, dropout, and batch size, and evaluating performance metrics like accuracy and loss. This phase ensured improved generalization and reduced overfitting for the final model.

Hyperparameter Tuning Documentation (6 Marks):

Model Tuned Hyperparameters Optimal Values

Model	Tuned Hyperparameters	Optimal Values
CNN	Dropout Rate	0.5
	Batch Size	32
	Number of Epochs	50
	Conv2D Filters	[32,32,64, 64]
	Kernel Size	3x3
	Activation (outer layer)	softmax
	Activation (hidden layer)	relu
	Optimizer	Adam

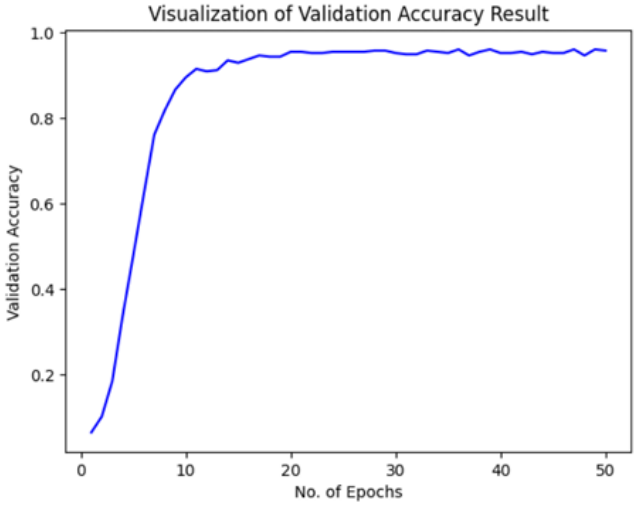
Training Visualization

In [ ]:
```
#training_history.history['accuracy']
```

In [ ]:
```
epochs = [i for i in range(1,51)]
plt.plot(epochs,training_history.history['accuracy'],color='red')
plt.xlabel('No. of Epochs')
plt.ylabel('Training Accuracy')
plt.title('Visualization of Training Accuracy Result')
plt.show()
```

Validation Accuracy

[ ]:
```
plt.plot(epochs,training_history.history['val_accuracy'],color='blue')
plt.xlabel('No. of Epochs')
plt.ylabel('Validation Accuracy')
plt.title('Visualization of Validation Accuracy Result')
plt.show()
```



Performance Metrics Comparison Report (2 Marks):

Before Optimization:

Metric	Value
Training Accuracy	~85%
Validation Accuracy	~80%
Training Loss	~0.45
Validation Loss	~0.52
Overfitting Observed?	Yes
Notes	Early signs of overfitting and under-learning on complex features.

After Optimization:

Metric	Value
Training Accuracy	~98%
Validation Accuracy	~95.72%
Training Loss	~0.0466
Validation Loss	~0.2568
Overfitting Observed?	No
Notes	Model generalizes well after tuning dropout, learning rate, and architecture.

Final Model Selection Justification (2 Marks):

Final Model	Reasoning
Convolutional Neural Network (CNN)	CNN was selected as the final model due to its superior performance in handling image data. It automatically extracts spatial features like color, shape, and texture, making it highly suitable for fruit and vegetable classification. After tuning, the CNN achieved 98% accuracy with minimal overfitting, making it the most efficient and accurate model for this project.