Model Optimization and Tuning Phase Template

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Project Title	Sloan Digital Sky Survey (SDSS) galaxy classification using machine learning
Maximum Marks	10 Marks

Model Optimization and Tuning Phase

The Model Optimization and Tuning Phase involves refining machine learning models for peak performance. It includes optimized model code, fine-tuning hyperparameters, comparing performance metrics, and justifying the final model selection for enhanced predictive accuracy and efficiency.

Hyperparameter Tuning Documentation (6 Marks):

Model	Tuned Hyperparameters	Optimal Values
CNN	Kernel size, Batch size and Number of filters	Kernel size = 3 Batch size = 8 Number of filters= 32 + 65 + 128 + 256
VGG16	Finetine_at and Number of Layers	Base_Layers = 19 Finetune_at = 100

Performance Metrics Comparison Report (2 Marks):

Model	Optimized Metric
CNN	
VGG16	

	accuracy	loss	val_accuracy	val_loss
0	0.627667	2.358680	0.645968	1.210565
1	0.684480	1.209981	0.585032	1.634703
2	0.694304	1.133193	0.709917	1.050935
3	0.713208	1.189432	0.727525	1.612369
4	0.720651	1.065884	0.715477	1.020766
5	0.734842	1.015147	0.726830	1.032038
6	0.741540	0.979775	0.709685	1.091861
7	0.752456	0.918784	0.731233	1.007552
8	0.764464	0.862766	0.762280	0.871927
9	0.772204	0.805564	0.702271	1.028391
10	0.778158	0.767598	0.776877	0.800327
11	0.786841	0.730349	0.776182	0.792598
12	0.791704	0.702501	0.781511	0.797190
13	0.793540	0.693993	0.776877	0.794707
14	0.801975	0.669766	0.749073	1.051305
15	0.805150	0.655939	0.767377	0.900276
16	0.808872	0.645367	0.771548	0.844698
17	0.810311	0.634315	0.793559	0.740710
18	0.815421	0.616893	0.787535	0.742540
19	0.820581	0.612604	0.763438	0.815696

```
accuracy: 0.6593 - loss: 25.6037 - val_accuracy: 0.7458

accuracy: 0.6849 - loss: 9.9770 - val_accuracy: 0.6504 -

accuracy: 0.7083 - loss: 12.2451 - val_accuracy: 0.6395

accuracy: 0.7315 - loss: 14.5729 - val_accuracy: 0.7057

accuracy: 0.7492 - loss: 17.1226 - val_accuracy: 0.6613

accuracy: 0.7791 - loss: 16.8684 - val_accuracy: 0.7639

accuracy: 0.7967 - loss: 18.3998 - val_accuracy: 0.7588

accuracy: 0.8094 - loss: 19.7980 - val_accuracy: 0.7247

accuracy: 0.8270 - loss: 20.9309 - val_accuracy: 0.7523

accuracy: 0.8348 - loss: 22.9380 - val_accuracy: 0.7544
```

Final Model Selection Justification (2 Marks):

Final Model	Reasoning
CNN	VGG16 couldn't able to extract features as efficient as CNN