**Model Optimization and Tuning Phase Template**

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| Date | 12 July 2024 |
| Team ID | SWTID1719935963 |
| Project Title | Automated Weather Classification using  Transfer Learning |
| Maximum Marks | 10 Marks |

**Model Optimization and Tuning Phase**

The Model Optimization and Tuning Phase involves refining neural network 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 (8 Marks):

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| **Model** | **Tuned Hyperparameters** |
| Vgg19 | training\_set,  validation\_data=test\_set,  epochs=10,  steps\_per\_epoch=len(training\_set),  validation\_steps=len(test\_set)  **Shortnote**:-trains a machine learning model for 10 epochs, using the entire training set for each epoch and the entire test set for validation at the end of each epoch. This ensures comprehensive training and evaluation of the model. |
| Vgg16 | training\_set,      validation\_data=test\_set,      epochs=20,      steps\_per\_epoch=len(training\_set),      validation\_steps=len(test\_set)  **Shortnote**:-trains a machine learning model for 20 epochs, using the entire training set for each epoch and the entire test set for validation at the end of each epoch. This ensures comprehensive training and evaluation of the model. |
| ResNet-50 | training\_set,  validation\_data=test\_set,  epochs=10,  steps\_per\_epoch=len(training\_set),  validation\_steps=len(test\_set)  **Shortnote**:-trains a machine learning model for 10 epochs, using the entire training set for each epoch and the entire test set for validation at the end of each epoch. This ensures comprehensive training and evaluation of the model. |

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### Final Model Selection Justification (2 Marks):

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| **Final Model** | **Reasoning** |
| Vgg16 | training\_set,      validation\_data=test\_set,      epochs=20,      steps\_per\_epoch=len(training\_set),      validation\_steps=len(test\_set)  **Shortnote**:-trains a machine learning model for 20 epochs, using the entire training set for each epoch and the entire test set for validation at the end of each epoch. This ensures comprehensive training and evaluation of the model.     1. **High Training Accuracy**: The model achieves 100% accuracy on the training set, indicating it has perfectly learned the patterns in the training data. This is often a sign of effective model training but can sometimes indicate overfitting if the test accuracy is significantly lower. 2. **High Test Accuracy**: The model also performs exceptionally well on the test set with a 93.67% accuracy. This high test accuracy suggests that the model generalizes well to new, unseen data, which is crucial for its real-world application. 3. **Comparison to Other Models**: The test accuracy of 93.67% is greater than that achieved by other models, indicating superior performance. This comparison is important because it validates that the current model performs better in terms of generalization and predictive accuracy. 4. **Final Model Selection**: Given the combination of perfect training accuracy and high test accuracy, this model is considered optimal. It demonstrates both a strong ability to learn from the training data and to generalize this learning to new data. This balance makes it a robust choice for deployment.   In conclusion, the model's high performance on both the training and test sets, along with its superior performance compared to other models, justifies its selection as the final model for the given task. |