# Model Optimization and Tuning Phase Template

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| Date | 10 July 2024 |
| Team ID | 739688 |
| Project Title | Revolutionising Liver Care-Predicting Liver Cirrhosis using Advanced 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 |
|---|---|---|
| Random Forest | 'n_estimators': [100, 200, 300],<br>'max_features': ['auto', 'sqrt', 'log2'],<br>'max_depth': [10, 20, 30, None],<br>'min_samples_split': [2, 5, 10],<br>'min_samples_leaf': [1, 2, 4],<br>'bootstrap': [True, False]<br>} | Best parameters: {'bootstrap': False, 'max_depth': 20, 'max_features': 'sqrt', 'min_samples_leaf': 1, 'min_samples_split': 10, 'n_estimators': 200} |
| KNN | param_grid = { | Best parameters: {'bootstrap': False, 'max_depth': 20, 'max_features': 'sqrt', 'min_samples_leaf' |

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|---|---|---|
| | 'n_estimators': [100, 200, 300],<br>'max_features': ['auto', 'sqrt', 'log2'],<br>'max_depth': [10, 20, 30, None],<br>'min_samples_split': [2, 5, 10],<br>'min_samples_leaf': [1, 2, 4],<br>'bootstrap': [True, False]<br>} | : 1, 'min_samples_split': 10, 'n_estimators': 200} |
| xgboost | aram_grid = {<br>'max_depth': [3, 5, 7],<br>'learning_rate': [0.01, 0.1, 0.2],<br>'n_estimators': [100, 200, 300],<br>'subsample': [0.8, 0.9, 1.0],<br>'colsample_bytree': [0.8, 0.9, 1.0]<br>} | Best parameters: {'colsample_bytree': 0.8, 'learning_rate': 0.01, 'max_depth': 5, 'n_estimators': 200, 'subsample': 0.8} |

**Performance Metrics Comparison Report (2 Marks):**

| Model | Baseline Metric | Optimized Metric |
|---|---|---|
| Random Forest | Accuracy: 0.8666666666666667 | Accuracy: 0.887719298245614 |

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|---|---|---|
| KNN | Baseline KNN Accuracy: 0.8947368421052632 | Baseline KNN Accuracy: 0.8847368421052632 |

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

| Final Model | Reasoning |
|---|---|
| KNN | I have choosen KNN model because it shows higher accuracy and prediction needs to be accurate incase of medical field |