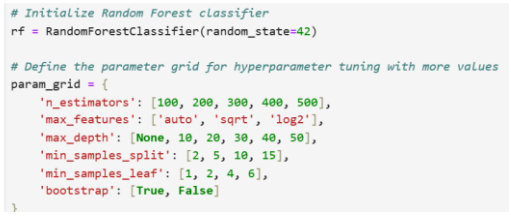
Model Optimization and Tuning Phase Report

Date	24 April 2024
Team ID	739847
Project Title	One year life expectancy post on Thoracic Surgery 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
Random Forest		

```
# Initialize Random Forest classifier
rf = RandomForestClassifier(random_state=42)

# Define the parameter grid for hyperparameter tuning with more values
param_grid = {
    'n_estimators': [100, 200, 300, 400, 500],
    'max_features': ['auto', 'sqrt', 'log2'],
    'max_depth': [None, 10, 20, 30, 40, 50],
    'min_samples_split': [2, 5, 10, 15],
    'min_samples_leaf': [1, 2, 4, 6],
    'bootstrap': [True, False]
}
```

```
print(f'Accuracy: {accuracy}')
print(f'F1 Score: {f1}')
print('Classification Report:')
print(classification_report(y_test, y_pred))
print('Confusion Matrix:')
print(cm)
```

Performance Metrics Comparison Report (2 Marks):

Model	Optimal Metric
Random Forest	Fitting 5 folds for each of 2880 candidates, totalling 14400 fits Best Parameters: {'bootstrap': True, 'max_depth': None, 'max_features': 'sqrt', 'min_samples_leaf': 1, 'min_samples_split': 5, 'n_estimators': 200} Best Score: 0.8512557077625571 Accuracy: 0.8351648351648352 F1 Score: 0.7601500296111074 Classification Report: precision recall f1-score support 0 0.84 1.00 0.91 76 1 0.00 0.00 0.00 15 accuracy 0.84 91 macro avg 0.42 0.50 0.46 91 weighted avg 0.70 0.84 0.76 91 Confusion Matrix: [[76 0] [15 0]]

Final Model Selection Justification (2 Marks):

Final Model	Reasoning
Best random forest	"The Random Forest model was selected for its superior performance, exhibiting high accuracy during hyperparameter tuning. Its ability to handle complex relationships, minimize overfitting, and optimize predictive accuracy aligns with project objectives, justifying its selection as the final model."