Model Optimization and Tuning Phase Report

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Team ID	SWTID1749709340
Project Title	Predicting Co2 Emission by countries 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**
Decision Tree	random_state	DecisionTreeRegressor(random_state=42)
Random Forest	n_estimators, random_state	RandomForestRegressor(n_estimators=100, random_state=42)
KNN	*(none explicitly tuned)*	KNeighborsRegressor()
Gradient Boosting	n_estimators, random_state	GradientBoostingRegressor(n_estimators=100, random_state=42)

Performance Metrics Comparison Report (2 Marks):

The **optimized metrics** such as **R² Score** and **RMSE** (Root Mean Squared Error) are calculated using this section:

```
r2 = r2_score(y_test, y_pred)

rmse = np.sqrt(mean_squared_error(y_test, y_pred))
```

Model	**Optimized Metric**
Decision Tree	R² Score: e.g., 0.86 RMSE: e.g., 45.32
Random Forest	R² Score: e.g., 0.92 RMSE: e.g., 32.54
KNN	R² Score: e.g., 0.79 RMSE: e.g., 52.80
Gradient Boosting	R² Score: e.g., 0.91 RMSE: e.g., 34.12