MODEL OPTIMIZATION AND TUNING PHASE

5.1. Tuning Documentation

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Team ID	LTVIP2026TMIDS66183
Project Title	Civil Engineering Insight Studio
Maximum Marks	10 Marks

Model Optimization and Tuning Phase

The **Model Optimization and Tuning Phase** in the **Civil Engineering Insight Studio** project focuses on improving the efficiency, accuracy, and reliability of the analytical processing model rather than adjusting machine learning parameters. Since the project uses rule-based and statistical models, optimization is achieved by refining calculation logic, improving data handling, and enhancing system performance.

Threshold values for project metrics such as progress completion, cost variance, and schedule deviation are adjusted to better reflect real-world civil engineering scenarios. Data preprocessing rules are optimized to reduce noise, handle missing values effectively, and ensure consistent inputs. Computational workflows are streamlined to minimize processing time and improve responsiveness of dashboards and reports.

Performance testing is conducted to ensure the system handles multiple project records efficiently without degradation. These optimization and tuning activities enhance the overall accuracy and usability of the Civil Engineering Insight Studio, ensuring reliable insights for effective project management.

Model	Tuned Parameters	Description

Analytical Processing Model (Rule-Based & Statistical)	Threshold Values	Defines acceptable limits for project progress, cost variance, and schedule deviation to identify risks accurately.
	Data Validation Rules	Ensures input values are within realistic and acceptable ranges for civil engineering projects.
	Aggregation Logic	Controls how data is summarized across tasks, phases, and projects to provide meaningful insights.
	Update Frequency	Determines how often analytics and dashboards are refreshed to reflect the latest project data.

Hyperparameter Tuning Documentation (8 Marks):

The Civil Engineering Insight Studio project does not employ machine learning models that require traditional hyperparameter tuning. Instead, the system uses rule-based and statistical analytical models, where tuning focuses on adjusting operational parameters to improve accuracy, reliability, and performance of project insights.

Multiple test scenarios, including normal progress, delayed execution, and budget overrun cases, are used to evaluate and fine-tune these parameters. Through iterative testing and adjustment, the system achieves consistent and reliable analytical outputs, ensuring effective decision support for civil engineering stakeholders.

Optimization Approach

- Optimize data preprocessing to remove noise, duplicates, and inconsistencies
- Refine rule-based and statistical calculations for accurate project metrics
- Tune threshold values for progress, cost variance, and schedule deviation
- Improve data aggregation logic for meaningful project-level insights

5.2 Final Model Selection Justification (2 Marks):

Final Model	Reasoning
Analytical Processing Model (Rule-Based & Statistical Models)	The final model configuration provides an optimal balance between accuracy, interpretability, and execution speed for civil engineering project analysis. The tuned thresholds, validation rules, and aggregation logic improve the reliability of project insights without increasing system complexity, making the model well-suited for real-time monitoring and decision support in civil engineering projects.