

## Model Optimization and Tuning Phase

Date	07 July 2024
Team ID	739973
Project Title	SmartLender – Envisioning Success: Predicting University Scores With Machine Learning
Maximum Marks	6 Marks

### Hyperparameter Tuning Documentation :

Hyperparameter tuning involves adjusting the parameters that govern the training process of machine learning models to optimize their performance. It includes methods such as grid search, random search, and Bayesian optimization. Proper documentation helps in understanding the impact of different hyperparameters, streamlining the tuning process, and replicating results. Clear records of hyperparameter settings and their outcomes are essential for achieving the best model accuracy and efficiency.

model	Tuned Hyperparameters
Linear Regression	Linear Regression is a simple yet powerful algorithm in machine learning, and hyperparameter tuning is an essential step to improve its performance. Here are the common hyperparameters to tune and their optimal values for Linear Regression.

	<p><b>Tuning Methods:</b></p> <p><b>Grid Search:</b> Try all possible combinations of hyperparameters and evaluate the model's performance.</p> <p><b>Random Search:</b> Randomly sample hyperparameters and evaluate the model's performance.</p> <p><b>Bayesian Optimization:</b> Use a probabilistic approach to search for the optimal hyperparameters.</p>
Lasso Regression	<p>Lasso Regression, also known as L1-regularized Linear Regression, is a type of Linear Regression that includes a penalty term for the absolute value of the coefficients. Here are the common hyperparameters to tune and their optimal values for Lasso Regression.</p> <ul style="list-style-type: none"> <li>• <b>Regularization (<math>\alpha</math>):</b> <ul style="list-style-type: none"> <li>○ <b>Optimal values:</b> <math>\alpha = 0.1, 1, 10</math> (try different values to find the best one for your dataset).</li> </ul> </li> </ul>
Support Vector Machine	<p>Support Vector Machine (SVM) is a powerful algorithm in machine learning, and hyperparameter tuning is crucial to achieve good performance. Here are the common hyperparameters to tune and their optimal values for SVM.</p> <ul style="list-style-type: none"> <li>• <b>Number of Iterations (n_iter):</b> <ul style="list-style-type: none"> <li>○ <b>Optimal values:</b> n_iter = 100, 500, 1000 (try different values to find the best one for your dataset)</li> </ul> </li> </ul>
Decision Tree	<p>Decision Trees are a popular machine learning algorithm, and hyperparameter tuning is crucial to achieve good performance. Here are the common hyperparameters to tune and their optimal values for Decision Trees.</p> <ul style="list-style-type: none"> <li>• <b>Maximum Depth (max_depth):</b> <ul style="list-style-type: none"> <li>○ <b>Optimal values:</b> max_depth = 3, 5, 10, None (try different values to find the best one for your dataset)</li> </ul> </li> </ul>
Random Forest	<p>Random Forest is a powerful ensemble learning algorithm, and hyperparameter tuning is crucial to achieve good performance. Here are the common</p>

	<p>hyperparameters to tune and their optimal values for Random Forest.</p> <ul style="list-style-type: none"><li>• <b>Maximum Features (max_features):</b><ul style="list-style-type: none"><li>○ <b>Optimal values:</b> max_features = 'auto', 'qrt', 'log2' (try different values to find the best one for your dataset).</li></ul></li></ul>
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