**MLP Horse Racing Analysis**

**Introduction**

This report presents an analysis of horse racing data using a Multi-Layer Perceptron (MLP) model. The dataset consists of cleaned data from horse racing events, with various attributes such as race\_id, horse\_id, and calculated position. The objective is to train an MLP model to predict the position of horses in races based on the provided attributes.

**Data Preparation**

The dataset is loaded from a CSV file and preprocessed to separate features and labels. The features include attributes related to horses and races, while the label is the calculated position of each horse in a race. The data is normalized to ensure consistency in feature scales.

**MLP Model Training**

An MLP model is constructed with one hidden layer containing four neurons and a logistic activation function. The model is trained using backpropagation with a learning rate of 0.1 and 1000 epochs. The training process involves forward propagation to compute predictions and backward propagation to update weights.

**Model Evaluation**

The trained MLP model is evaluated on both the training and testing datasets. Training accuracy and testing accuracy are computed to assess the model's performance. Additionally, a confusion matrix and classification report are generated to analyze the model's classification performance. Furthermore, a Receiver Operating Characteristic (ROC) curve is plotted, and the Area Under the Curve (AUC) is calculated to evaluate the model's ability to distinguish between positive and negative classes.

**Results and Findings**

The MLP model achieves high accuracy on the training dataset, indicating good performance in fitting the training data. However, the testing accuracy is lower, suggesting potential overfitting or limitations in generalization to unseen data. The confusion matrix and classification report provide insights into the model's classification performance for each class. The ROC curve shows the trade-off between true positive rate and false positive rate, with the AUC indicating the discriminative power of the model.

**Conclusion**

In conclusion, the MLP model shows promising results in predicting horse racing positions based on the provided attributes. Further analysis and refinement may be required to improve the model's generalization capability and address potential overfitting issues. Overall, the analysis demonstrates the application of machine learning techniques in the domain of horse racing prediction.