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**Assessment Cover Page**

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| *Module Title* | Machine Learning (10 ETCS) |
| *Assessment Title* | CA1 Project |
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I declare it to be my own work and that all material from third parties has been appropriately referenced.

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1. Introduction:

The goal of this project would be to develop a predicting model for estimating math scores based on different features like gender, race/ethnicity, parents' level of education, completion of course, completion of test preparation, and scores obtained in reading and writing.

Understanding and predicting performance in mathematics academic set conditions of the development and establishment of math skills that are vital in most fields of academia and professions

### 2. Implementation & Validation

The dataset (JIKADARA, 2024) consists of 1000 instances, each being described by 8 unique attributes. A preview of the first five rows of the data is show in Figure 1. Preliminary steps of data pre-processing included looking through the dataset with care in order to fine-tune the integrity of the dataset for analysis. This mainly involved the crosschecking of data types to be compatible for analytical methods, identification of missing or null values to take the appropriate action and help in maintaining the completeness of the data set, and checking of categorical variables for instances with single unique values that may affect the result of the analysis.

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Figure 1 Top five rows of the dataset.

Moreover, the distribution was checked for the numerical data to assess its fit for statistical analysis. In the preprocessing step, one more important step in this phase was the correlation among numerical variables. Being that a high correlation was obtained between reading and writing scores, this will be suggestive of possible multicollinearity. This means that its reading score is so high that it masks the effects of other parameters. So, to avoid the harmful effect on model performance, the reading score was omitted from further analysis. On the other hand, multicollinearity has been said to be capable in this regard of obscuring the individual effect of the independent variables on the dependent variable, hence seriously affecting the whole interpretation.

### 3. Hyperparameter Tuning

The primary objective of hyperparameter tuning is to maximize the model’s performance. Wherein the training process, it's a bit different, the model parameters are learned, while the hyperparameters are set before the training process and have a very big effect on model performance. Grid Search Cross-Validation (GridSearchCV) is one of the most used hyperparameter tuning techniques. Only this way, it's possible to work systematically through many possible combinations of hyperparameter values, assessing the combination using cross-validation. In other words, GridSearchCV will ensure the data is folded into a specified number of k-folds such that each combination will be tested over separate parts of the data to ensure good estimates of generalization on the unseen data for each set of hyperparameters. The outcome is the hyperparameters' set that gives the best performance, as quantified by a given score or metric.

4. Results & Conclusion

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# 5. References

JIKADARA, B. (2024). *Student Study Performance*. [online] www.kaggle.com. Available at: https://www.kaggle.com/datasets/bhavikjikadara/student-study-performance.