**Q4 Investigating the Features**

1. In the paper by Sagaceta Mejia et al., the researchers constructed several technical analysis features that were calculated using the Python Pandas TA library.
2. When deploying a neural network, it is necessary to configure a layer of inputs. These inputs form an array and, in the context of neural networks are referred to as ‘features’. 1 The difference between features and methods are that features are ‘raw data’, by virtue of the fact that it forms the input layer in MLP.

A method in programming on the other hand is a function that transforms inputs. A method typically takes a number of arguments (inputs) and the method or function will produce a particular output through the transformation of the input (argument) 2

Lastly, a model is a mathematical or programmatic representation of a real-world situation in which it supports decision making. 3

1. In the paper, the features drawn from the Pandas-TA (Technical Analysis) library are divided into Candles, Cycles, Momentum, Overlap, Performance, Statistics, Trend, Utility, Volatility and Volume. 4
2. The researchers employed two techniques in the optimization of their MLP model:
3. Early stopping to prevent overfitting, which is in line with their stated objective of formulating an emerging market ETF trend predictor.
4. Using a subset of 5 features to train the model. they are also able to efficiently use computer resources. This is a very important step in deep learning neural networks that are intensely resource hungry. This is a very important step as deep learning / neural network models can be intensely resource hungry.

The researchers summarise the results of these two optimization techniques in Table 6 on page 9. From the table, it is clear that the training time is significantly reduced when compared to training the dataset on the all features and, it is demonstrated, that the predictive accuracy of the limited feature set is improved, most likely due to the increase in epochs (training iterations).

**Q5 Optimization**

1. Cross-validation is method used in machine learning whereby a dataset is divided into a pre-specified number of blocks which are then used to train and test the outcome of several predictive algorithms. 5
2. The number of blocks used in cross-validation, is referred to as the number of folds. For instance, a common number of folds is 10 and this is what the researchers used as well. This means, the data was divided into 10 equally-sized blocks and the number of k is 10, meaning 10-fold cross validation was used to test and train the model.
3. Distance measures are methods to quantify the distance between data points in one (or more dimensions). The Jaccard distance is calculated as the ratio of the intersection and union of a combination set.
4. The Jaccard distance is equal to 1 minus the Jaccard similarity 6. As such, it is a measure of dissimilarity. Other measures encountered in lessons previously is the Euclidean and Manhattan distance. In the Euclidean distance, an application of Pythagorean geometry is encountered whereby two points in the same space or dimension is set equal to the hypotenuse of a right-angled triangle. For the distance between two point this will be:

Closely related to this is the ‘Manhattan’ distance measure which relies on absolute values and not squaring to calculate distance. For comparison, this is how one would calculate the Manhattan distance between two points:

1. The researchers indicate that an optimal solution would be one where the MLP model assist investors in timing their enter and exit points into emerging market ETFs as well as serving as an indicator of risk to ensure that investors attain maximum profit for minimum losses.

Due to the limitations of the model they do warn however that investors would be best advised to also implement the model into a broader investment framework but provide no details on how such a framework should be constructed.

References

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