Forecast Model for Student's by Deep Learning and Artificial Intelligence Engine

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ABSTRACT

Class and prediction of Student's performance in exam are the standard demanding situations for educators. Diverse conventional records mining strategies consisting of selection tree and association guidelines had been used to carry out class. In latest years, the fast development of synthetic intelligence and deep learning set of rules furnished another method for wise classification and end result prediction. On this paper, a studies on how to use tensorflow artificial intelligence engine for classifying students 'performance and forecasting their destiny universities degree application is studied. An appropriate and correct forecast is essential for imparting spark off recommendation to student on software and university choice. For a more complete attention of an all rounded elements, the deep gaining knowledge of model analysed no longer most effective the conventional academic performance such as mathematic, Chinese language, english, physics, chemistry, biology and history, but additionally non-educational overall performance together with provider, behaviour, recreation and artwork. A few parameters in tensorflow engine together with the range of intermediate nodes and variety of deep gaining knowledge of layers are adjusted and as compared. With a information set of hundreds students, 75% of those information are used as the schooling information and 25% are used as the checking out statistics, the accuracy ranged from eighty% to 91%. The surest configuration of the tensorflow deep mastering model that achieves highest prediction accuracy is determined. This look at decided the elements affecting the accuracy of the prediction version.

Keywords : e-Learning assessment, Artificial Intelligence, Deep Learning, prediction modelling

I. INTRODUCTION

How to predict students' performance is always a question concerned by the students' teachers and parents. Based on the past examination results and in-class assessments, it is possible to forecast the future development of the stu-dents. It is a challenging and important matters as it in-volves the large volume of data in educational databases and the result could impact the future development of a young kid. A good and accuracy prediction could bring the benefits and impacts to students, educators and academic institutions. Various type of data mining techniques had been used for performance prediction for decades,

e.g. de-cision tree, Naive Bayes, K-Nearest Neighbour and Support Vector Machine [1]. However, with the rise of artificial in-telligence and deep learning application, using AI engine such as Google Tensorflow for pattern recognition has now been rising it importance. In this paper, we will investigate how to use artificial intelligence and deep learning algo-rithm for pattern recognition and correlation of assessment re-sults. There are some traditional data mining techniques that have been used to predict students' performance. Some researches educational data mining method had been done to identify those important attributes in stu-dents data.

II. TRADITIONAL METHOD FOR CLASSIFICATION AND PREDICTION

In order to build the predictive modelling, there are several traditional tasks used for example classification, regression and categorisation. Algorithm such as associa-tion rules and decision tree are commonly used.

Association rule reflects the interdependence and cor-relation between different things. It is commonly used in physical stores and e-commerce recommendation sys-tems. Likewise, it can be used for recommending schools and subjects to students. Support, confidence are two key concepts of them. In a given database, each transac-tion contains a set of items. Every rule is composed by two different item-sets X and Y. Support is the percent-age of the transaction contains both X and Y, confidence is the percentage of Y that contains X. In other words, support is the probability while confidence is the condi-tional probability. If the minimum thresholds of them, which have to be set by us, are satisfied, there is an asso-ciation that exists between X and Y. Association rule mining is more applicable to the situation where the index in the record are discrete value. If the indicator values in the original database are continuous data, and appropri-ate discretisation should be performed previously.

The classification decision tree model is a tree struc-ture that describes the classification of instances. The de-cision tree consists of nodes and directed edges. There are two types of nodes: internal nodes and leaf nodes, inter-nal nodes represent a feature or attribute, and leaf nodes represent a class.

When categorising, a certain feature of the instance is tested starting from the root node, and the instance is as-signed to its child node according to the test result; at this time, each child node corresponds to a value of the fea-ture. This recursively moves down until it reaches the leaf node, and finally assigns the instance

to the class of the leaf node. The decision tree can be seen as a set of if-then rules: a rule is constructed from the root node of the decision tree to each path of the leaf nodes; the charac-teristics of the internal nodes on the path correspond to the conditions of the rules, and the leaf nodes Corre-sponds to the classification of the conclusions.

III. NEW METHODS USING DEEP LEARNING AND ARTIFICIAL INTELLIGENCE

Neural network is another emerging technique used in educational data mining. The advantage of neural net-work is that it has the ability to detect all possible interac-tions between predictors variables [2]. When more compu-ting power is nowadays available, more layers of neural network can be implemented and deep learning analysis can be practically implemented. Deep learning could per-form detection even in a complex nonlinear relationship between dependent and independent variables [3]. It is considered as one of the best prediction method.

In this study, the Google Tensorflow Deep Learning analytic engine is used to predict students future develop-ment. The attributes analysed are the academic perfor-mance such as the examination scores of various tradi-tional academic subjects including Mathematic, Chinese, English, Physics, Chemistry, Biology and History, and their non-academic performance such as conduct, sport, arts and participation of services are included in the analysis. Two thousand records are generated according to the fol-lowing rules :

1. Good at physics and mathematics but poor in Chinese€engineering in University A
2. Good at physics, Chemistry and English but poor in Sport €Medicine in University A
3. Good at physics, Chemistry, English and Conduct but poor in Chinese € Medicine in University B
4. Good at Chinese and Service but poor in biology, maths and conduct € Education in University C

5. Good at Chinese but poor in biology, maths and conduct €Chinese in University C

6. Good at Chinese, English but poor in Maths, Physics €Translation in University D

7. Good at Sport and Chinese but poor in history € Education in University D

8. Good at Sport and Chinese and poor in conduct €Sport Science in University D

9. Good at Maths and art but poor in Chinese, English €design in University E

10. Good at Physics, Maths, English but poor in Chinese €engineering in University B
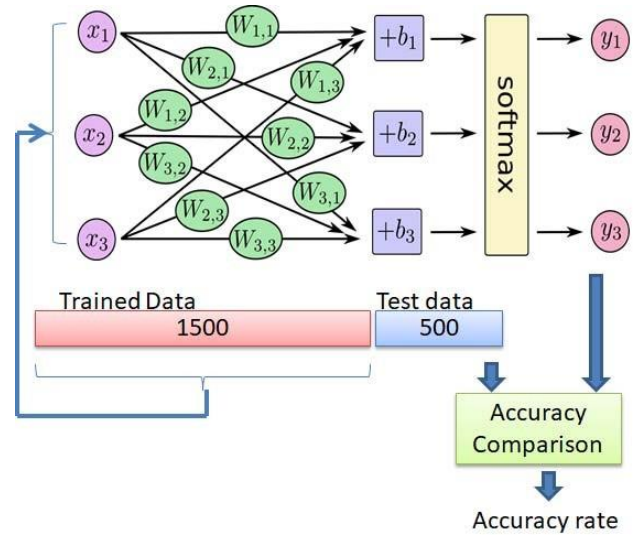
At the beginning, these 2000 data sets were divided into two parts. The first data part contains 75% of the data set, i.e. 1500 data sets, were set as the training data, while the remained 25% data, i.e. 500 data sets, were used as the test data.

The assessment performance of various subjects were used as the input x_1, x_2,… x_n . The corresponding program and university selection outcome were used as the output y_1, y_2,… y_m . To build up the prediction model, the Convolution Neural Network (CNN) model is used. CNN is commonly used in the pattern recognition problem. Using a one-hot output system, a full connected network was built up with the relationship between different nodes is $Wx + b = y$.

```
for itt in range(epoch):
    avg_cost = 0
    feed_dict = {X: input, Y: output}
    c, _ = sess.run([cost, optimizer],
feed_dict=feed_dict)
```

Figure 1. Structure of the Convolution Neural Network and softmax cross entropy

Applying the softmax cross entropy to evaluate its cost function, the main structural was completed as shown in Figure 1.

In this research, Python and the Deep Learning Engine Tensorflow is used for the development. TensorFlow is an open-source software library for data flow pro-gramming across a range of tasks. It is a symbolic math library, and also used for machine learning applications such as neural networks. It enables this research to be started easily with deep learning in the cloud. The framework has broad support in the industry and has be-come a popular choice for deep learning research and application development, particularly in areas such as computer vision, natural language understanding and speech translation. The scores and future development of students follow certain pattern and therefore this pattern recognition engine is used for the analysis. The following loop for iteration is run to train the model:

After the model is trained, the following code in Ten-sorflow is run to test the performance of the trained model:
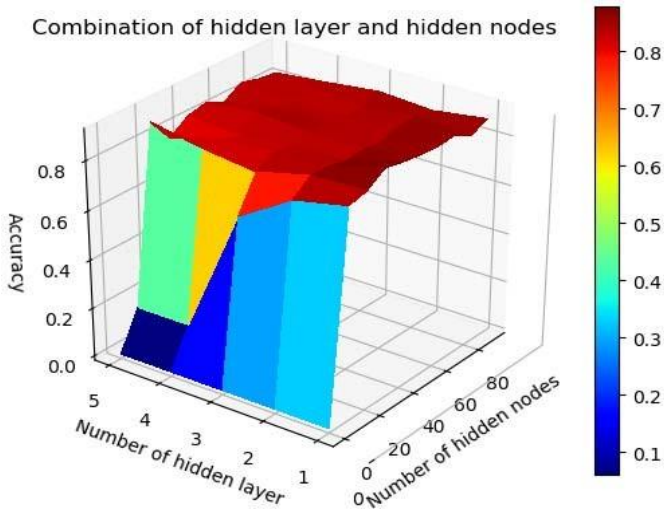
Figure 2. Hidden layers in Tensorflow

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Figure 3. No. of hidden node (j) and No. hidden layers (k) Vs the prediction accuracy

The number of hidden layers and number of nodes are adjusted for comparing the best performance configuration (Figure 2.). By adapting different calculation factor and element, such as hidden nodes, hidden layer and learning rate and so on, accuracy up to 90% was achieved.

IV. RESULTS AND DISCUSSION

A. Effect of Number of Hidden Node and Layers to the Prediction Accuracy

The number of hidden nodes (j) and number of hidden layers of deep learning (k) are adjusted and the accuracy of the prediction is compared. The prediction accuracy against different j and k are summarised as follow:-

(j)	10	20	30	40	50	60	70	80
(k)								
1	0.84	0.86	0.91	0.89	0.88	0.88	0.88	0.84
2	0.80	0.85	0.85	0.83	0.84	0.83	0.85	0.86
3	0.67	0.80	0.84	0.83	0.84	0.85	0.83	0.83
4	0.15	0.83	0.83	0.80	0.86	0.85	0.83	0.85
5	0.15	0.87	0.77	0.82	0.84	0.80	0.85	0.83

The number of hidden node (j) and the number of hidden layers (k) and the prediction accuracy are plotted in the 3D chart in Figure 3. In this result, the number of hidden layers does not have significant impacts on the accuracy. However, when the number of hidden layers increase, the accuracy also increase until the number of hidden layer exceed 20.

2. Effect of Number of Learning Rate and Number of Iteration to the Prediction Accuracy

Next, the relationship between the number of iteration (p) and the learning rate (q) are compared. The number of hidden layer (k) is set to 3 while the number of hidden nodes (j) is set to 20. The number of iteration (p) and the learning rate (q) are summarised in the table below

(p) / (q)	5000	10000	15000	20000	25000
0.001	0.834	0.842	0.836	0.828	0.824
0.002	0.83	0.828	0.836	0.836	0.802
0.003	0.78	0.834	0.844	0.818	0.856
0.004	0.862	0.846	0.838	0.86	0.844
0.005	0.834	0.838	0.788	0.856	0.846
0.006	0.818	0.858	0.842	0.816	0.848
0.007	0.492	0.858	0.852	0.818	0.856
0.008	0.862	0.844	0.854	0.828	0.856
0.009	0.806	0.836	0.838	0.696	0.832
0.010	0.808	0.858	0.842	0.828	0.822
0.011	0.802	0.856	0.86	0.83	0.866
0.012	0.846	0.826	0.834	0.646	0.852
0.013	0.84	0.82	0.854	0.854	0.862
0.014	0.862	0.846	0.832	0.652	0.83
0.015	0.824	0.826	0.878	0.528	0.85
0.016	0.76	0.822	0.84	0.838	0.848
0.017	0.844	0.832	0.154	0.83	0.858
0.018	0.838	0.852	0.808	0.844	0.82
0.019	0.864	0.828	0.236	0.838	0.782

V. CONCLUSION

Classification and prediction is a general problem. Tra-ditional data mining techniques such as association rules, decision tree, clustering and so on had been use for a few decades for solving this problem. The raising popularity of using Tensorflow for deep learning and artificial intelli-gence opened a new approach and direction for solving classification problem and prediction of non-linear results.

In this research, the number of hidden layers, hidden notes, the number of iteration and the learning rate are ad-justed and compared. It is discovered that it is not always true that the deep the deep learning model, i.e. the more number of hidden layer, the more accurate will the result be. There is an optimal point at are required to be tested and identified.

For the learning rate, a higher learning rate could help to speed up the convergence of the trained model. Howev-er, if the learning rate is too high, the result might overshoot the optimal point. Therefore, the prediction performance could be improved with a low momentum and high learn-ing rate. Then gradually, the momentum can be increased and the learning rate can be decreased for ensuring con-vergence.

This study demonstrated that deep learning could be an effective tool for predicting the students' performance. The result ranged from 80% to 91%. The prediction result is good enough to provide appropriate recommendations for students, their teachers and parents to decide their de-velopment pathway. It is believed that more applications of deep learning could be used for education and corpo-rate staff training in the future.

VI. REFERENCES

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