

Performance Assessment of Faculties of Management Discipline From Student Perspective Using Statistical and Mining Methodologies

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Abstract

This paper deals with Faculty Performance Assessment from student perspective using Statistical Analysis and Mining techniques. Performance of a faculty depends on a number of parameters (77 parameters as identified) and the performance assessment of a faculty/faculties are broadly carried out by the Management Body, the Student Community, Self and Peer faculties of the organization. The parameters act as performance indicators for an individual and group and subsequently can impact on the decision making of the stakeholders. The idea proposed in this research is to perform an analysis of faculty performance considering student feedback which can directly or indirectly impact management's decision, teaching standards and norms set by the educational institute, understand certain patterns of faculty motivation, satisfaction, growth and decline in future. The analysis depends on many factors, encompassing student's feedback, organizational feedback, institutional support in terms of finance, administration, research activity etc. The statistical analysis and mining methodology used for extracting useful patterns from the institutional database has been used to extract certain trends in faculty performance when assessed on student feedback. The paper compares first the traditional approach with the statistical approach and then justifies the usage of data mining classification technique for deriving the results.

Keywords: Data Analysis, Mining, Clustering, Trend Extraction, Performance Prediction

1. INTRODUCTION

The applications of Data Mining in the field of higher education can truly be justified because typical type of data mining questions used in the business world has counter part questions relevant to higher education [2]. The need of Data Analysis and Mining in higher education is to mine faculty and students data from various stakeholders' perspective [7]. The methodology adapted to design the system is dealt extensively in the previous paper [16]. Initially 77 parameters were considered, 50 faculties performance was assessed based on the feedback obtained from various segments and averaged out to show the mean performance of Faculties using traditional approach. The ongoing research on Faculty Assessment has enabled us to increase our data size and implement segment slicing. The result generated in this paper is

strictly from student feedback. Around 3000 student records were taken into consideration. The data was smoothed and profiled, inconsistent data was removed and the operational data included two consecutive years student feedback from two institute's of management discipline. This data was then analyzed using conventional MS-Excel and the following pattern was derived as shown in Figure 1.

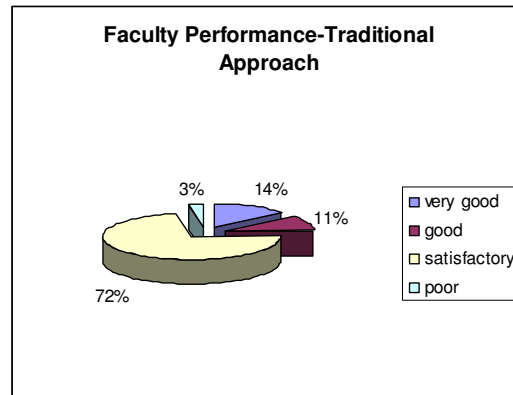


FIGURE 1: Faculty Performance – Traditional Approach

The accuracy of the result then was taken into rigorous consideration because the influence of the other parameters on the faculty performance was missing considerably. The justification of implementing statistical analysis and mining algorithms was required to extract intelligent information and to perform complex calculations, trend analysis and sophisticated data modeling, and reporting. The need was to identify critical information on the not so obvious data and extract mission critical information and intelligence that would enable better decision by the academia. This is an ongoing research work so comparative evaluation is behind the scope of this paper since similar work has been performed only on monitoring student academic performance using data mining technique.

2. DATA ANALYSIS AND MINING RATIONALE

The goal of higher education is to continually maintain quality and standards with the most efficient procedures implemented for growth and the degree of quality teaching involves the pertinent issues of how to enhance and evaluate it through overt and covert processes. Hence the Data Mining processes for knowledge discovery is to subject various classification and prediction procedures on the data. This helps institutes to predict certain trends of faculties in terms of intellectual contribution, administrative services, and standards followed which cannot be meted out using traditional approach.

3. CLASSIFICATION AND CLUSTERING

The classifier model used was the full training set and ZeroR algorithm was used to predict the classified instances. The results of classification are as shown in Table 2. Initially incorrectly classified instances was found to be around 28 % hence the data was again profiled to increase the percentage of correctly classified instances.

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=== Classifier model (full training set) ===
ZeroR predicts class value: satisfactory
Time taken to build model: 0.02 seconds
=== Evaluation on training set ===
=== Summary ===
Correctly Classified Instances    2890
Kappa statistic                   0
Mean absolute error               0.0254
Root mean squared error          0.112
Relative absolute error          100%
Root relative squared error      100 %
Total Number of Instances        2890
    
```

TABLE 2: Classifier model (full training set)

Then clustering of the correctly classified data was performed using EM algorithm where clusters were generated based on the parameter value and for every parameter cluster the percentage of ratings were found out as shown in the table 4 and then the cumulative value was averaged out to find out the mean and the ratings were represented using percentages. A snapshot of the cluster formation which is an intermediate process is also shown in the table 3.

Row Id.	Cluster id	Dist clust-1	Dist clust-2	Subject Knowledge	Teaching Ability with use of new Teaching Aids	Motivation Self_Students	Aggre_per
84	1	1.1136	4.3082	8	8	4	40
85	1	1.9408	2.024	9	9	5	43
86	2	3.5222	0.27612	10	10	5	48
87	2	3.5222	0.27612	10	10	5	48
88	2	3.2658	0.81656	10	10	5	45
89	2	2.9407	1.901	10	8	5	47
90	2	3.7414	0.3378	10	10	5	50
91	2	3.7414	0.3378	10	10	5	50
92	2	3.7414	0.3378	10	10	5	50

TABLE 3: A snapshot of the intermediate cluster generation process

	Cluster 1	Cluster 2	Cluster 3	Cluster 4	Cluster 5	Cluster 6	Cluster 7	Cluster 8
very good	2.839	6.0199	59.6441	218.529	50.2789	16.6368	2.0933	45.8842
Good	67.6326	11.8359	17.4102	2.0227	45.9184	37.7739	10.66	56.7013
Satisfactory	636.33	4.9919	115.724	1.7551	195.544	312.472	148.407	223.753
Poor	7.6643	6.0078	1.0183	1.3386	3.4087	8.7138	14.303	3.3781

Cluster 9	Cluster 10	Cluster 11	Cluster 12	Cluster 13	Cluster 14	Average		
1	1.9775	40.0564	10.0671	1.0022	5.9714	32.99999		
3.0049	4.0798	39.2667	40.6924	4.997	1.0043	24.50001		
44.8842	8.9885	180.93	183.253	6.017	6.9517	147.8572		
9.3508	2.663	1.0011	10.1516	1.0006	1.0005	5.071443		
58.2399	17.7088	261.254	244.164	13.0168	14.9279			
[total]	714.466	28.8554	193.796	223.646	295.15	375.597	175.463	329.717

Table 4: Clustered data of Faculty Performance based on student feedback

The ratings were then represented using pie chart which is shown in the figure below and the representation reveals more accuracy than the traditional approach because the clusters generated are influenced heavily by all the attributes which had been taken into consideration.

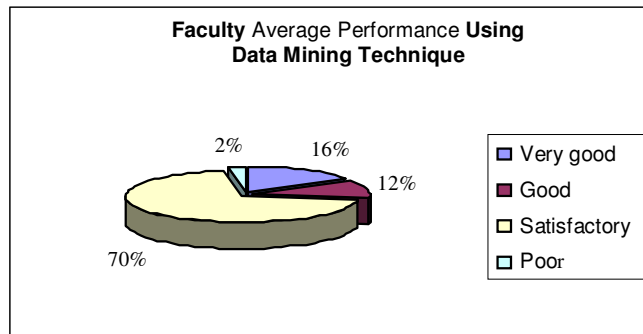


FIGURE 2: Faculty Average Performance Using Data Mining Technique

4. FACULTY PERFORMANCE TREND EXTRACTION USING OLAP STATISTICAL TOOL

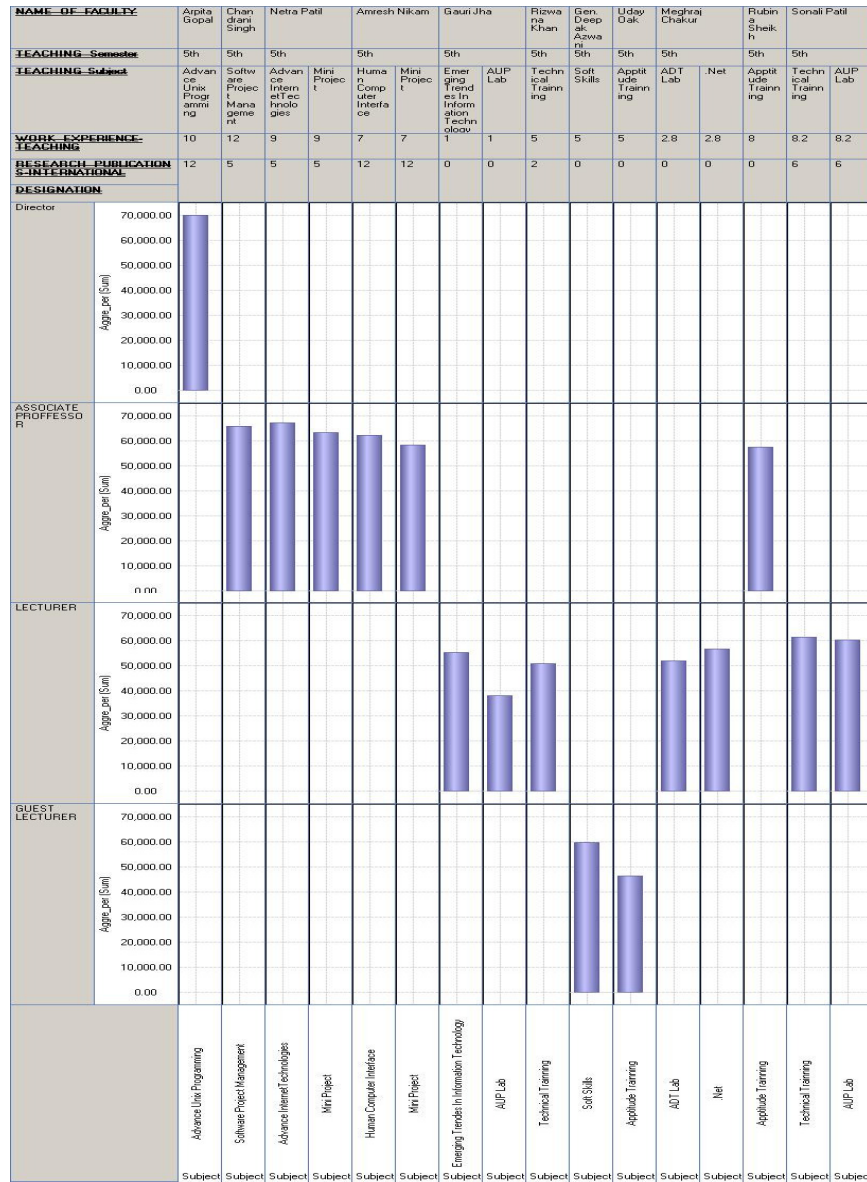


TABLE 5: Performance trend- management faculty

In the above section the overall performance of the management faculties based on student feedback have been shown first using traditional approach and then by using mining methodology to provide a more accurate result. In this section we have used OLAP statistical tool to extract certain trends in faculty performance and also to assess individual faculty performance across several parameters represented in the cube form and extracted it in to the grid and synchronized with the chart. The patterns as identified are as follows:

- The consistency in performance of faculties in the Associate Professor level was found to be more leveled than the faculties at the lecturer level.
- Also the dip in the performance when analyzed across the lecturer level was found to be more than that at the Associate Professor Level.
- The performance of the visiting faculties showed a subsequent drop in spite of them having considerable industry and teaching experience.

5. CONCLUSION AND FUTURE WORK

The future work will contain association rule mining on the student feedback database and dependencies will be analyzed to draw some meaningful conclusions.

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