First year student interventions and academic success at the University of Witwatersrand: An analysis using predictive modeling and text mining methods

2015 Pilot Study

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Orientation Week

Abstract

- First year at university brings challenges and demands that can delay student completion.
- An Early Warning System is used to identify first year students who are at greatest risk of academic fail based on a predictive model.
- The interventions are captured in the student intervention system.
- A pilot study was done to ascertain the relevance of the types of interventions on academic success.
- Binary logic regression model and J48 techniques.
- The findings shows that the types of interventions offered namely; Tutoring, Learning Excellence skills, F2Counselling, First Year Experience, Mentoring, Writing Centre, Readon are significant with a high predicting power.
- This study concludes that if more resources are allocated towards these interventions there is a greater chance of improving the student academic performance.

Aim

- To determine if there is a statistical relationship between interventions performed and first year success.
- To predict academic success score using the interventions
- Assumption: the students who met with the risk coordinators received an intervention.

Data

- 270 instances
- Dependent variable is success(0,1)
- Independent variable is mode of interaction with seven values namely Tutoring, Learning Excellence skills, F2Counselling, First Year Experience, Mentoring, Writing Centre and Readon.
- Techniques: J48 and Binary Logistic Model

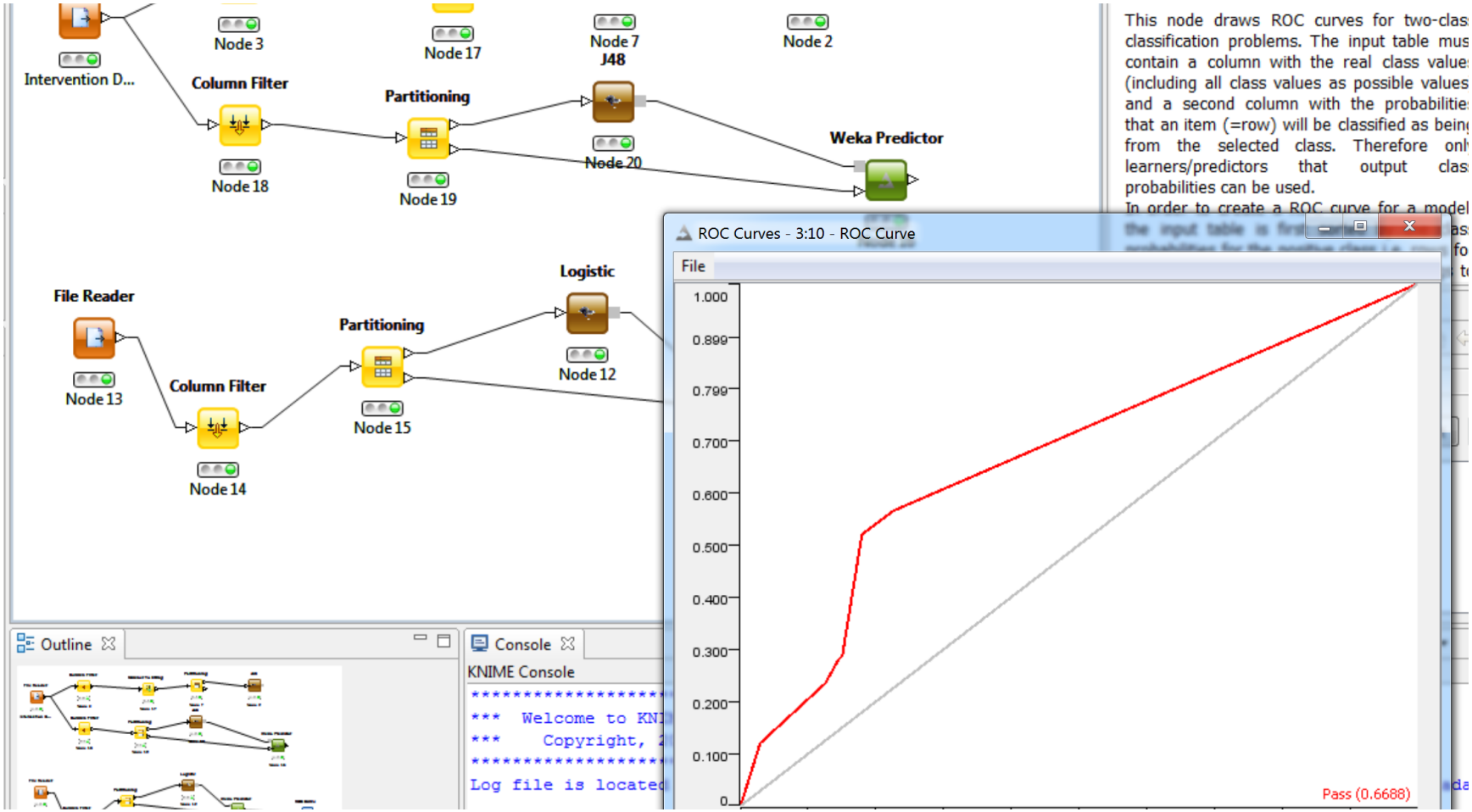
Data Mining Algorithms

- J48 is predictive machine-learning model that decides the target value (dependent variable) of a new sample based on various attribute values of the available data.
- Binary Logistic Regression Logistic regression measures the relationship between the categorical dependent variable and one or more independent variables by estimating probabilities using a logistic function, which is the cumulative logistic distribution.
- Text Mining method is the processing of unstructured data using information retrieval methods, pattern recognition, tagging an visualization.

Results

- Mode of interaction is significant
- Binary logistic regression model has predicting accuracy of 86.3%
- J 48 has predicting accuracy of 86,7%
- Learning Excellence Skills predicts 60%,F2 Counselling (58%),FYE(56%),Mentoring(53%),Tutoring(56%),Writing Centre(56%),Readon (50%).
- The tag cloud suggested that the most common challenges facing students are time management, study skills, repeat students, academic content management

KNIME workflow



Binary Logistic Regression Model

Correctly Classified Instances	233	86.2963 %
Incorrectly Classified Instances	37	13.7037 %
Kappa statistic	0	
Mean absolute error	0.2001	
Root mean squared error	0.3607	
Relative absolute error	91.9233 %	
Root relative squared error	104.5911 %	
Total Number of Instances	270	

J 48 Technique

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Mode = FYE: 56 (0.0)
Mode = Financial: 56 (0.0)
Mode = LearningExcellenceSkills: 55 (12.0/10.0)
Mode = Mentoring: 58 (17.0/15.0)
Mode = Readon: 44 (7.0/6.0)
Mode = Tutoring: 56 (23.0/21.0)
Mode = WritingCentre: 56 (9.0/6.0)

Number of Leaves  :     8

Size of the tree :      9
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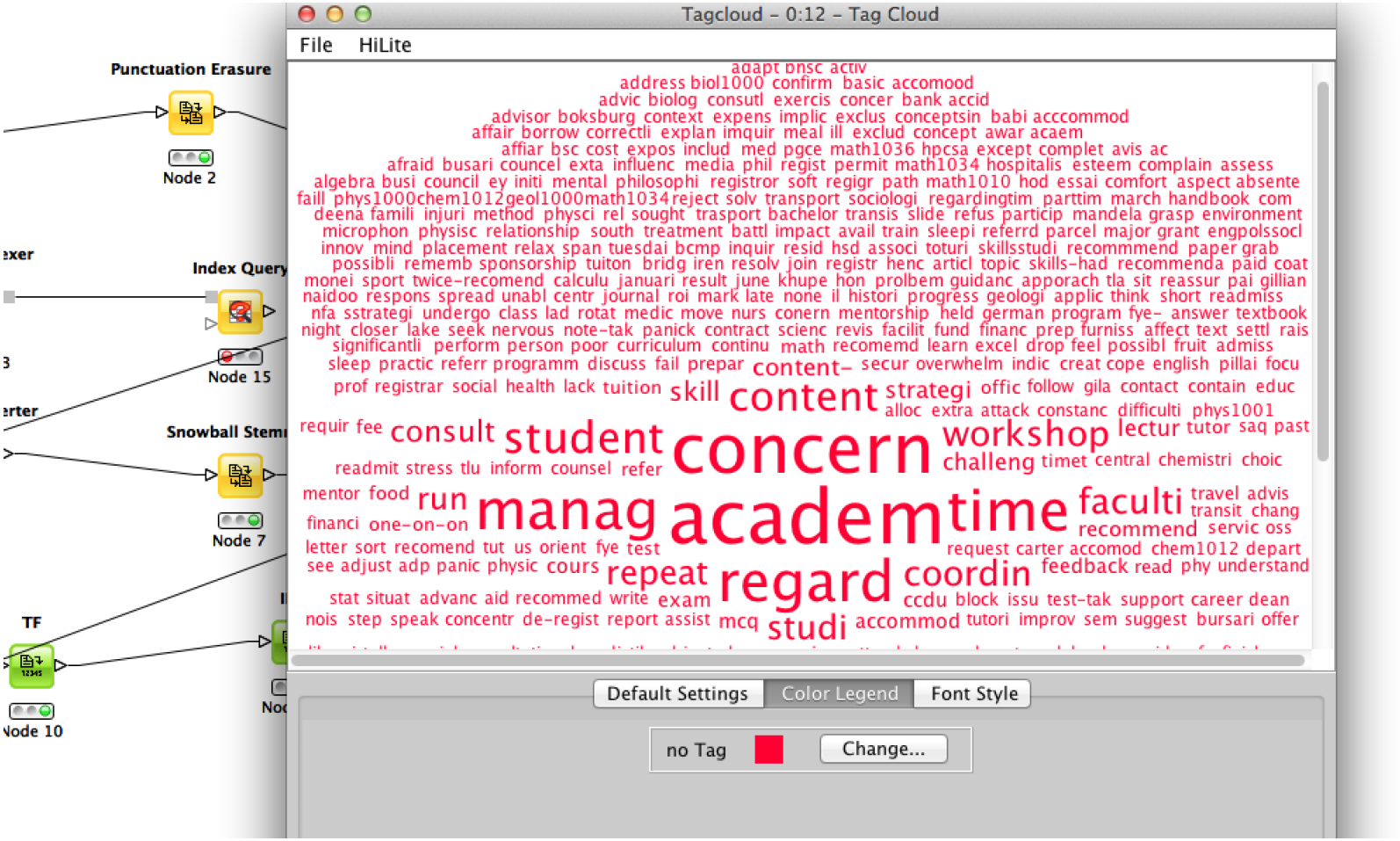
J 48 cont

Correctly Classified Instances	234	86.6667 %
Incorrectly Classified Instances	36	13.3333 %
Kappa statistic	0	
Mean absolute error	0.2171	
Root mean squared error	0.3405	
Relative absolute error	96.5079 %	
Root relative squared error	100.1268 %	
Total Number of Instances	270	

Tag Cloud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Academic Success

Questions?