**International Journal of Information Retrieval Research**
Volume 12 • Issue 1

# Artificial Intelligence and Deep Learning-Based Information Retrieval Framework for Assessing Student Performance

S. L. Gupta, Birla Institute of Technology, International Centre, Oman
Niraj Mishra, Waljat College of Applied Sciences, Oman

## ABSTRACT

Improving the quality of education is a challenging activity in every educational institution. Through this research paper, a model has been proposed representing the challenges in order to manage the trade-off to maintain the philosophy of continuous quality improvement and strict control based on higher education institutions (HEIs). Several standards criteria, performance parameters, and key performance indicators are studied and suggested for a quality self-assessment approach. After the data is collected, the significant features are selected for analysis of data using dedicated gain, which are designed by integrating the information gain and the dedicated weight constants. After that, deep learning methodologies like regression analysis, the artificial neural network, and the Matlab model are used for evaluating the academic quality of institutions. Finally, areas of development have been recommended using the probabilistic model to the administrators of the institutions based on the prediction made using a deep neural network.

## KEYWORDS

Academic Quality, Artificial Intelligence, Deep Learning, Machine Learning, Performance Evaluation, Student Academic Performance Quality Improvement in Higher Education

## 1. INTRODUCTION

The knowledge sector has observed a fast increase where the universities/colleges strive for global presence and inserts the supplementary feature for globalization process. Online educational repositories are increasing thereby enhancing the learning platforms due to the advancements in the technology (Treasure-Jones et al., 2019) which are significantly demonstrating the impact on Higher Education Institutes. Lot of education mining techniques are being used using deep learning and artificial intelligence to analyse the education data and predict the performance of students in order to improve the Institution achievement and ranking and thereby also enhancing student academic achievements (Agrawal & Pandya, 2015). In depth knowledge is needed for the higher education institutions to evaluate, assess, plan and make decisions in order to remain competitive with other educational institutions. Due to the accumulation of lot of educational data, it had led

DOI: 10.4018/IJIRR.2022010101

various researchers and research communities to work on data analytics for predicting the learner's behaviour and formulate performance indicators for optimizing the formulations of policies for higher educational institutions (Azcona and Smeaton, 2017;Viberg et al., 2018) ). Thus, a new term developed as 'Educational Data Science' is the field which explores the educational data in order to perform academic analytics, predictive analytics and learning analytics (Piety et al., 2014).

The Artificial Neural Network (ANN) is the most used methodology in the Educational Data Mining (Coelho & Silveira, 2017). Few of the drawbacks of this methodology were removed with the emergence of the Deep Learning methodology (Lecun et al., 2015). Deep learning is a branch of machine learning where several computational layers enable the model to learn from patterns (Wang et al., 2017) or events learning (Nawaz et al., 2012). Not much literature is available for Deep Learning ANN's but research has proved that the Deep Learning is being used in learning analytics and is used to evaluate performance of students (Okubo et al., 2017) and assessment of the students (Li et al., 2017) in academics.

Through this research paper, we propose a model for predicting the performance of student and helping the higher educational institutions to have an edge over other competitors and improve their learning process and performance of the institute. Section 1 gives and introduction about deep learning and learning analytics. Section 2 elaborates our objective for our research work and Section 3 discusses the contribution of the various researchers which has helped us to carry forward our research. Section 4 describes the methodology and Section 5 represents the implementation of our proposed model through regression analysis, deep learning and Matlab. Section 6 represents the results and discussion and Section 7 describes the conclusion for our research work.

## 2. PROBLEM STATEMENT AND OBJECTIVE

The factors which act as a predictor for performance of students in higher education institutes using ANN has not been studied much by researchers and this research gap has been the main focus area of the present study.

Hence the study was done with following objectives.

The purpose of the research is to study the various aspects of quality, namely commitment of Board of Trustees towards quality management, improvement in teaching and learning, mapping of stakeholders expectations, and professional development assistance by affiliating university. The basic purpose of the research is to predict the academic quality of institutions using deep neural network, and to improve the areas using probabilistic based recommendation model.

This research has contributed to the knowledge in area of ANN, but there are several limitations of this study which should be kept in mind when interpreting the findings, The study has been conducted on students of 10 universities and colleges in Oman and thus generalization of the findings should be done with caution. It is also suggested to have further empirical investigation to establish whether the constructs in the proposed model vary across countries and types of higher education institutes.

## 3. RELATED WORK

Learning analytics is the area related to prediction in academics which can thereby focus on students or higher education institutes. The data is gathered, assembled, examined and analyzed for information of students and higher education institutes in learning analytics in order to understand the overall learning environment and optimizing the performance of students and institute (Siemens & Long, 2011). It helps the higher education institutions in assessing their academic performance, framing and formulating strategies and policies and helps in effective decision making (Leitner et al., 2017). Learning analytics in higher education focuses on predicting academic growth of institutions, predicting student's performance, reducing attrition rate and formulating policies which help in increasing the stability of the institution. Thus, synonyms to Learning analytics would be Educational analytics