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# PROCEEDINGS OF JOHOR INTERNATIONAL INNOVATION INVENTION COMPETITION AND SYMPOSIUM 2024 (JIICaS 2024)



*“Flourish and Nurturing Sustainable  
Innovation for a Prosperous Nation”*

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## **Preface**

**In the name of Allah, the Almighty who gives us the enlightenment, the truth, the knowledge and with regards to Prophet Muhammad (peace be upon him) for guiding us to the straight path. We thank to Allah for giving us guidance and strength to write this e-book.**

**This e-book compiles the extended abstracts that submitted to Johor International Innovation Invention Competition and Symposium 2024 (JIIICaS2024), where JIIICaS2024 is a virtual platform for all creative minds to share and present their invention and innovation. Each abstract gives a brief background on the innovation or project.**

**We hope that this e-book will help the readers to get to know the innovation done by the students and get some ideas to develop future innovation products.**

## Foreword Rector



Assalamualaikum warahmatullahi Wabarakatuh,  
Salam Sejahtera, Salam Malaysia MADANI and  
Salam UiTM Dihatiku.

In the name of Allah, the Most Gracious, the Most  
Merciful.

It is a great honor to welcome you to the Johor  
International Innovation, Invention, Competition, and  
Symposium 2024 (JIICaS 2024). This event

connects various disciplines, focusing on education and engaging educators,  
students, researchers, and innovators from all walks of life.

Innovation is not just about ideas; it demands perseverance, creativity, and  
determination to turn those ideas into reality. The remarkable projects  
showcased today highlight the dedication and spirit of all participants.  
Initiatives like this not only explore new technologies but also cultivate skills  
and leadership among our youth. At Universiti Teknologi MARA (UiTM) Johor  
Branch, we are fully committed to fostering a dynamic culture of innovation,  
promoting the commercialization of new products, and encouraging  
meaningful collaborations with industry and society.

As we celebrate this event, I would like to extend my heartfelt gratitude to all  
sponsors, judges, the College of Computing, Informatics and Mathematics,  
UiTM Pasir Gudang Campus as the event organizer, as well as to the  
researchers and participants for their hard work in making this event a  
success. Let us continue striving for innovation and excellence. May the  
ideas presented today inspire us and lay the groundwork for future  
achievements.

Thank you.

**Associate Professor Dr. Saunah Zainon**  
**Rector**  
**Universiti Teknologi MARA (UiTM)**  
**Johor Branch**

## **(A-ST090) DATA RETRIEVAL RELATED TO RESOURCE ALLOCATION, COURSE AND STUDENT PERFORMANCE USING GRAPH DATABASE**

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### **ABSTRACT**

The emergence of the big data era is a direct result of the rapid and exponential growth in the amount of data produced daily. Given the vast amount of data, it has the potential to provide us with valuable insights if we possess the ability to interpret it. Different groups, mainly higher education institutions (HEI), are actively evaluating and exploring big data in a planned way and this profession is commonly referred to as Learning Analytics (LA). LA involves the systematic gathering, quantification, analysis, and transmission of information about learners and their surrounds to understand and improve learning and its environments. This field use data from the Learning Management System (LMS) and the Massive Open Online Course (MOOC) platform. The aim of this study is to provide a data retrieval model that relies on an ontology and using several query strategies to evaluate its effectiveness. The study employed a case study approach and involved a sample of 11 participants, who were chosen across a focus group. The interview result is crucial for identifying the essential information needed in LA pertaining to course allocation, course performance, and student performance. The interview result is necessary in determining the classes and queries for the purpose stated in this study, from a faculty management and lecturer perspective. The suggested model comprises an independent ontology called Student Performance and Course (SPC), and SPARQL queries for the data manipulation. Furthermore, the ontology can be divided into three distinct ontologies to encompass more precise subjects.

Keywords: Learning analytics, HEI ontologies, Course performance, Student performance

### **1.0 INTRODUCTION**

The increasing utilisation of LMS has emerged as a major and influential trend in the field of education during the past decade. Universities utilise LMS to effectively manage and monitor their courses and training programs and subsequently, the utilisation of e-learning had a significant surge following the onset of the COVID-19 pandemic, particularly on Massive Open Online Course (MOOC) platforms (Yuan et al., 2020).

According to (Laécio Araujo Costa & Lais do Nascimento Salvador, 2019), LA involves the gathering, examination, and understanding of data pertaining to students and their engagement with educational systems. The main objective of learning analytics is to

gain a thorough understanding of students' learning habits, identify areas that need improvement, and use data-driven decision-making to optimise the learning experience. Educational practices are monitored, assessed, and enhanced through the use of various technologies and data sources.

Learning Analytics is the discipline that focuses on the measurement, collecting, analysis, and reporting of data to get a deeper understanding of learning processes and enhance them (Spinner et al., 2019). By monitoring students' learning progress and measuring their performance, educators and researchers might gain advantages, particularly in e-learning contexts (Purwoningsih et al., 2020). Meanwhile research on (Elnozahy et al., 2019) has revealed that certain universities have begun to prioritise data analysis and policy formulation to improve the educational process. By employing online learning behaviour analytics, developers may effectively assess students' performance and forecast and depict their progress.

Learning analytics can assist educators in comprehending student performance trends and enhancing the curriculum and teaching quality. Simultaneously, the system has the capability to intervene with underperforming students at the opportune moment, employing methods such as dialogue prompts or educational materials to enhance their learning efficacy.

Currently, universities maintain more than one system to manage their educational system, which includes matters related to students and courses. For instance, in order to comprehend student performance, certain universities may employ multiple systems for the same purpose. When assessing student performance, it is crucial for the lecturer and faculty coordinator to identify the precise information needed. That will function as the primary indicator for the student monitoring method. According to (Nurmoslim et al., 2017), the on-going assessment data is very crucial for the lecturer to identify the problematic student. By closely monitoring the students' carry marks, the lecturer can identify the students who require extra attention from their lecturer. Another crucial metric for assessing student achievement is the tracking of class attendance and participation, which can also be employed to measure student performance in online forums (Hussain et al., 2018). Addressing the student performance, it will greatly enhance the overall course performance. Based on the previous interview conducted in the study, the researchers have invented a data retrieval model which focuses on student performance and course performance information that might also involve data from MOOCs platform. Furthermore, the creation of the data retrieval model utilising a graph database also enables the integration of data from many universities. This will provide heterogeneous data that can be utilised for comparison analysis, as it includes data from different universities.

## **2.0 OBJECTIVE**

To develop a Graph Based Data Retrieval Model that incorporate data related to resource allocation, course and student performance.

### 3.0 METHODOLOGY

The study main objective is to create a Graph Based data Retrieval Model using diverse data from HEI courses and student performance. The model designed consist of seven layers: Data Preparation, Competency Question (CQ) Preparation and Analysis, Data Preprocessing, Ontology Model Development, Ontology Validation, Ontology Alignment and Integrated Repository.

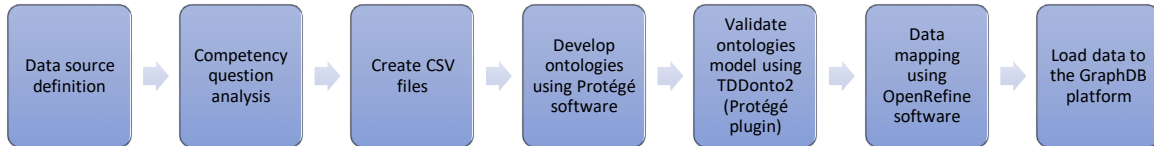


Figure 1: Heterogenous Data Retrieval Process

The CQ that was generated from the interview session is very significant in the model that is being proposed since it is used to determine the classes that are included in the research ontology as well as the types of queries that are used. Once the data is load into the repository, the data will be manipulated by using the SPARQL queries.

### 4.0 RESULTS

The construction of the data retrieval system provides considerable benefits, including the assistance it provides to the faculty administrator in improving the efficiency with which resources are allocated, as well as the enhancement of the method for monitoring the performance of both the course and the students. This organised framework will assist HEI in becoming more effective in terms of resource management, and it will also provide these institutions with improved monitoring capabilities that are able to accommodate enormous data sets. If this model is implemented, the data will be centralised, which means that lecturers will no longer be required to retrieve the data from a variety of LMS platforms in order to do their analysis. Because they have used the offered query strategies, the faculty administrator and lecturer are now only needed to conduct the queries. All of the calculations are done within the GraphDB platform, which eliminates the requirement for the faculty administrator and lecturer to perform the calculations manually any longer.

### 5.0 CONCLUSION

In conclusion, the HEI can manage the allocation of its resources and monitor the course and student performance with the use of this data retrieval model. Using this methodology, faculty administrators can plan which courses to provide each semester according to the number of lecturers they currently have. By using this strategy, the lecturer may simply keep an eye on the attendance and also to the on-going assessment results of their students. Furthermore, if past student performance data is

needed for comparison, this approach also provides it. Additionally, this cutting-edge strategy was one of the first to provide data integration among HEI universities. Data from different universities can be compared thanks to the integration of heterogeneous data. Universities and researchers may additionally compare their data with the data from other universities in addition to viewing the LA specific to their own institutions.

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