**ABSTRACT**

Students learning performance is one of the core components for assessing any educational systems. Student’s performance is very crucial in tackling issues of learning process and one of the important matters to measure learning outcomes. The ability to use data knowledge to improve education systems has led to the development of the field of research known as educational data mining (EDM). EDM is the creation of techniques to investigate data gathered from educational settings, allowing for a more thorough and accurate understanding of students and the improvement of educational outcomes for them. The use of machine learning (ML) technology has increased significantly in recent years. Researchers and teachers can use the measurements of success, failure, dropout, and more provided by the discipline of data mining in education to predict and simulate education processes. Therefore, this work presents an analysis of student’s performance using data mining methods. The paper presents both clustering and classification techniques to identify the impact of students performance at early stage with on the GPA. For the clustering technique, the paper uses dimensionality reduction mechanism by T-SNE algorithm with various factors at early stage such as admission scores and first level courses, academic achievement tests (AAT) and general aptitude tests (GAT) in order to explore the relationship between these factors and GPA’s. For the classification technique, the paper presents experiments on different machine learning models on predicting student performance at early stages using different features including courses’ grades and admission tests’ scores. We use different assessment metrics to evaluate the quality of the models. The results suggest that educational systems can mitigate the risks of student’s failures at the early stages.

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**LIST OF SYMBOLS**

|  |  |  |  |
| --- | --- | --- | --- |
| **S.NO** | **NAME** | **NOTATION** | **DESCRIPTION** |
| 1. | Class | Class Name  *-attribute*  *-attribute*  *+operation*  *+operation*  *+operation*  *+ Public*  *-private*  *# protected* | Represents a collection of similar entities grouped together. |
| 2. | Association | NAME  Class B  Class A  Class A  Class B | Associations represents static relationships between classes. Roles represents the way the two classes see each other. |
|  | Actor |  | It aggregates several classes into a single classes. |
| 4. | Aggregation | Class A  Class A  Class B  Class B | Interaction between the system and external environment |
| 5. | *Relation*  (uses) | Uses | Used for additional process communication. | |
| 6. | Relation  (extends) | extends | Extends relationship is used when one use case is similar to another use case but does a bit more. | |
| 7. | Communication |  | Communication between various use cases. | |
| 8. | State | Statee | State of the process. | |
| 9. | Initial State |  | Initial state of the object | |
| 10. | Final state |  | Final state of the object | |
| 11. | Control flow |  | Represents various control flow between the states. | |
| 12. | Decision box |  | Represents decision making process from a constraint | |
| 13. | Usecase |  | Interact ion between the system and external environment. | |
| 14. | Component |  | Represents physical modules which is a collection of components. | |
| 15. | Node |  | Represents physical modules which are a collection of components | |
| 16. | Data Process/State |  | A circle in DFD represents state or process which has been due to some event or action | | |
| 17. | External entity |  | Represents external entities such as keyboard, sensors, etc. | | |
| 18. | Transition |  | Represents communication that occurs between processes. | | |
| 19. | Object Lifeline |  | Represents the vertical dimensions that the object .  . | | |
| 20. | Message |  | Represents the message exchanged. | | |

**LIST OF ABBREVATION**

|  |  |  |
| --- | --- | --- |
| **S.NO** | **ABBREVATION** | **EXPANSION** |
| 1**.** | DB | Database |
| 2. | JVM | Java Virtual Machine |
| 3. | JSP | Java Server Page |
| 4. | PWS | Personalized Web Search |
| 5. | UPS | User Personalized Search |
| 6. | JRE | Java Runtime Environment |