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Impact of Big-Data on Education System

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Abstract: ***The objective of any contraption is to formulate the life of a human being trouble-free and comfortable. Big data refer to mining valuable data from a bulky quantity of unstructured and structured data. Educational institutions have huge amount of data. Thus, it is crucial to boost Big data processing in educational institution. The traditional classroom environment is no longer necessary for learning. Big Data altered the way of learning by building it easy, effortless and exciting. Technology will continuously make learning easy for the convenience of students [1]. Big data in higher education comes from different sources that include blogs, social networks, student information systems, learning management systems(LMS), research, and other machine-generated data. Big data is becoming a key to creating competitive advantages in higher education. The practice of learning management systems in education has been growing in the preceding few years. Students have started using mobile phones to access online content. Student's online activities engender massive amount of data. This has resulted in the progress of Big Data technologies and tools in education to process the huge amount of data . This paper looks into the recent applications of Big Data technologies in education and presents an assessment of prose available on Educational Data Mining and Learning Analytics.***

Keywords: Big Data, LMS, Educational Data Mining, Learning Analytics.

I. INTRODUCTION

Due to the progression of technology modern conventional approaches are adopted by educational institutions in teaching and learning. The higher education sectors are increasingly getting technology centric. Educational institutions need to gaze for tools and techniques for data acquisition, storage, analysis and decision making. The huge amount of students' data in the institutions can be considered as big data. Big Data refers to the large volume of the data as well as the technology and tools used to processes and analyze data into usable information. Academic institutions should make use of advanced technologies to yield the benefits from this huge amount of data.

Educational institutions need to record all academic related data from various activities such as students' data, tutor data, courses data, registration data, assessment data etc. Due to the advancement of information technology social communications have increasingly moved to online.

The online communications can be traced and collected and will form a huge amount of data and can be considered as big data. Thus data collection and analysis have become a challenging task in higher education sectors. Most of the higher education sectors lack proper IT infrastructure, tools as well as human expertise required for effective data collection, analysis and visualization. While collecting and analyzing student data, educational institutions face some challenges like privacy, safety, and security issues[3].

II. BIG DATA

"Big Data" refers to any set of data [4] that is so large or so complex that conventional applications are not adequate to process them. The term also refers to the tools and technologies used to handle "Big Data". Examples of Big Data include the amount of data shared in the internet everyday, YouTube videos viewed, twitter feeds and mobile phone location data. The Big Data trend has impacted all industries, including the education sectors as new technologies are being developed to automate and simplify the process of data analysis and prediction of results [5]. In the recent years, data produced by learning environments have also started to get big enough raising the need for Big Data technologies and tools to handle them. The specific attributes that define big data are called the four V's: volume, variety, velocity, and veracity.

A. Volume

In the context of big data volume is considered as one of the characteristics because of the fact that large volumes of structured and unstructured data are collected and analyzed in organizations from various sources[2]. Data is generated by human interaction through social networks, data from M2M technology and enterprise systems processes and reports.

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B. Variety

Data is available from various sources and various types such as relational data such as tables, transaction, legacy data available from Data Base Management Systems, Text Data from Web sources, XML data availability from online sources and database environment can be considered as semi-structured data, data from social networks, streaming data etc.

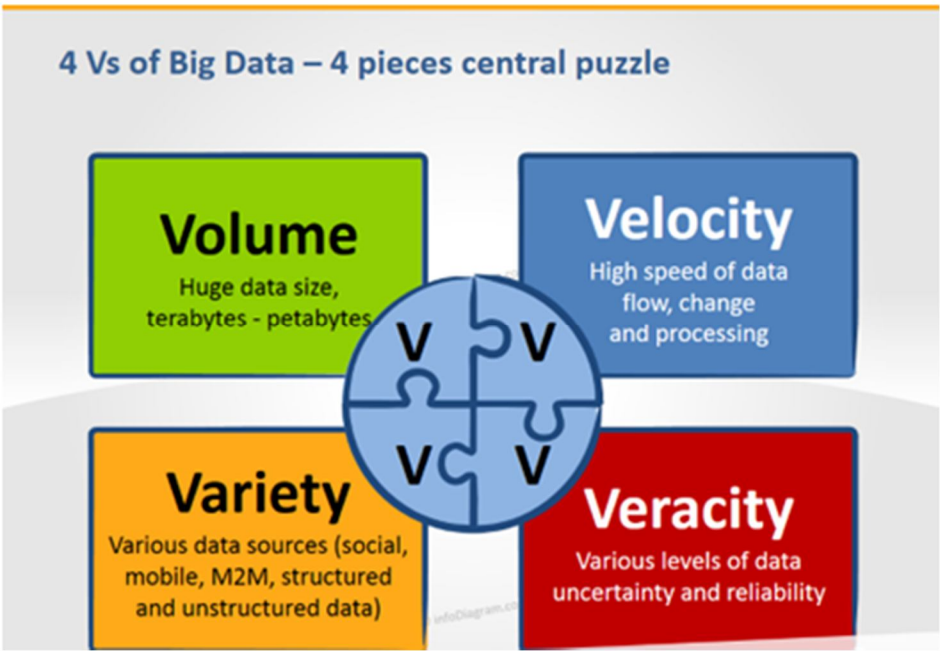
The analytic environment in organizations is extracting data from enterprise systems to include unstructured big data from various sources.

C. Velocity

Data acquisition is an ongoing process in organizations and it is required that data is being generated fast and there is a need to be processed fast for immediate analysis and decision making. Organizations use online data analytics for immediate data processing by considering the fact that late decisions will lead to missing opportunities in their business. Organizations realizes the speed of access to report difference between effective and ineffective analytics.

D. Veracity

The collected data in organizations must meet the quality standards and produce accurate results which will lead to proper action especially in critical decision making. By implementing data validation managerial levels as well as the operational level employees can trust the organizational data and can be used for successful analytics.



E. Techniques

The most popular techniques used in educational data mining are

1) *Regression* - Regression is used in predicting values of a dependant variable by estimating the relationship among variables using statistical analysis.
2) *Nearest Neighbour* - In this technique the values are predicted based on the predicted values of the records that are nearest to the record that needs to be predicted.
3) *Clustering* - Clustering involves grouping of records that are similar by identifying the distance between them in an n-dimensional space where n is the number of variables.

F. Open Source Tools

Several Open source tools exist which help in taming Big Data [6] .Some of the top tools are

1) *MongoDB* is a cross platform document oriented database management system

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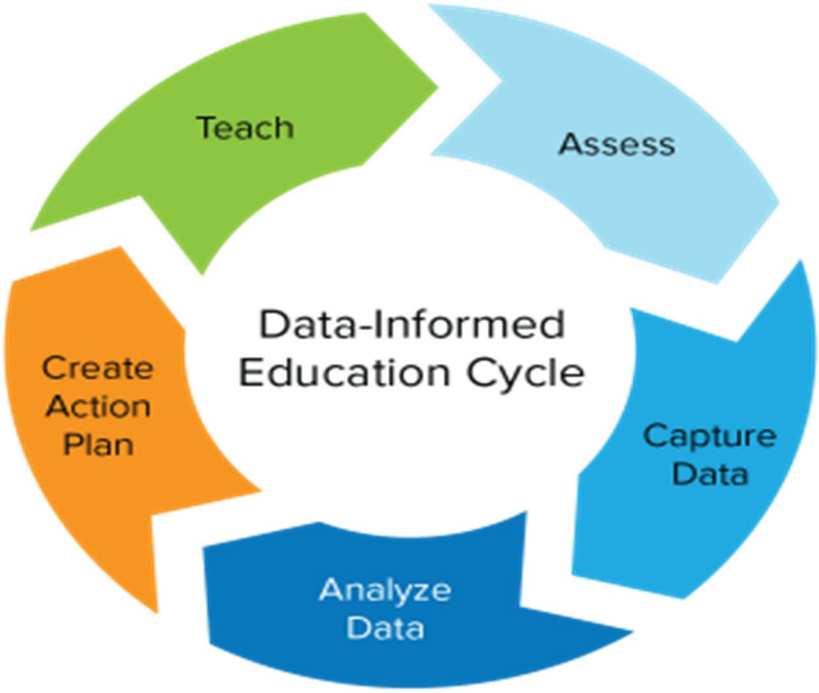
It uses JSON like douments instead of a table based architecture.

Hadoop is a framework that allows distributed processing of big datasets across clusters of networked computers using simple programming models.

III. EMERGENCE OF BIG DATA IN EDUCATION

In the existing learning environments, users learn in online communities like discussion forums, online chats, instant messaging clients and various Learning Management Systems . Recent learning methods like Flipped Classroom [7] greatly depend on online activities. Several frameworks [8] and models have been proposed for online learning management systems to improve the learning experience. Students have started using smart phones to access learning content. As the learning environments have become accessible anywhere through the internet, students access their courses anywhere and indulge in learning activities. Students' activities through learning management systems create large amount of data. In addition to the data available from student activities, data are also created by educational institutions which use applications to manage courses, classes and students. Therefore the amount of data available enormous . Traditional processing techniques cannot be used to process them. Due to the limitations of the conventional data processing applications, the educational institutions have started exploring "Big Data" technologies to process the educational data.



A. *Applications In Learning*

Big Data techniques can be used in a variety of ways in learning analytics as listed below.

1) *Feat Prediction :* Student's performance can be predicted by analyzing student's interaction in a learning environment with other students and teachers
2) *Slow destruction Risk Detection :* By analyzing the student's behavior, risk of students dropping out from courses can be detected and measures can be implemented in the beginning of the course to retain students.
3) *Data Visualization :* Reports on educational data become more and more complex as educational data grow in size. Data can be visualized using data visualization techniques to easily identify the trends and relations in the data just by looking on the visual reports.
4) *Smart feedback :* Learning systems can provide intelligent and immediate feedback to students in reponse to their inputs which will improve student interaction and performance.
5) *Course Recommendation :* New courses can be recommended to students based on the interests of the students identified by analyzing their activities.

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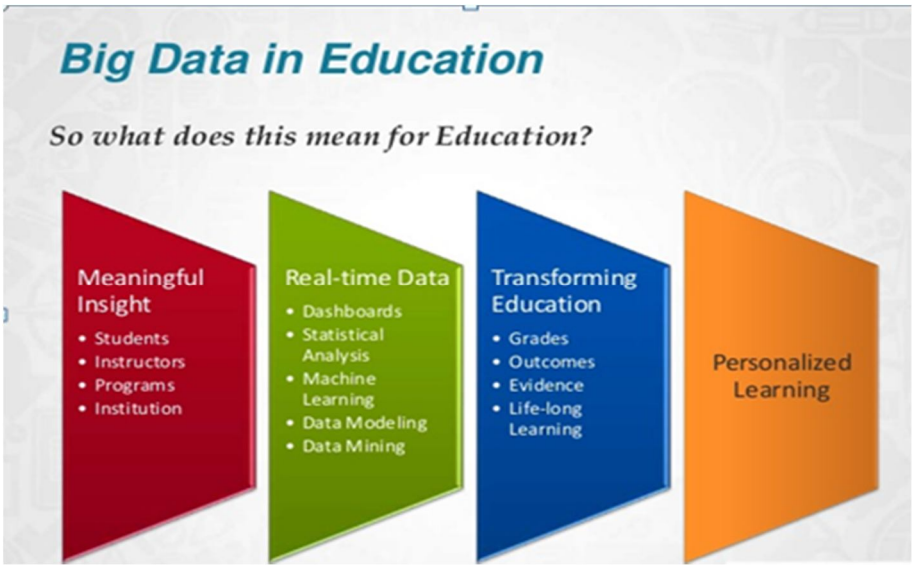
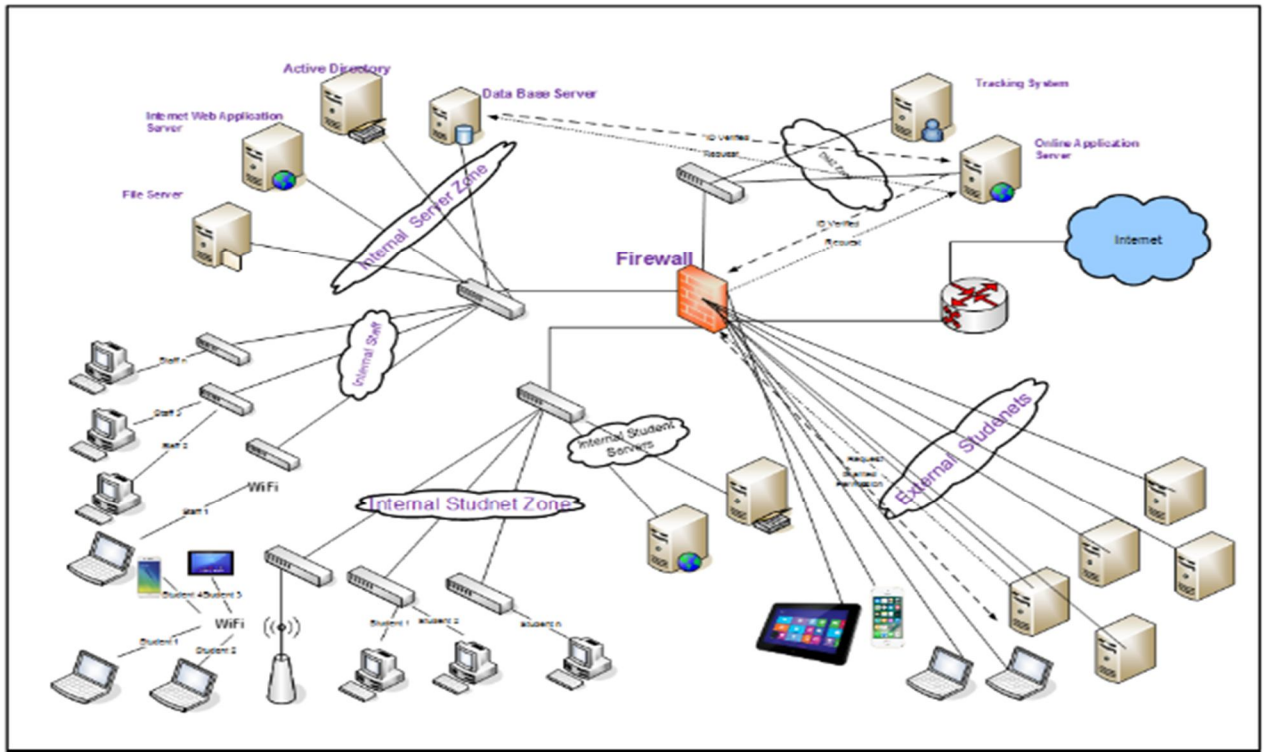


B. Framework

Data gaining can be achieved from various educational and administrative activities happening regularly. The data will be collected from student registration, student admission

results, Student Information System, Learning management System, E Library access, Quality Assurance Survey, Social media communications, Performance of assessments, online quizzes , Assessment Results . The overall management of Big Data involves acquisition, storage, processing and analyzing it for various purposes and we can visualize the infrastructure, to handle Big Data related tasks, as structural design as shown in following figure



The information technology architecture shows the server confirmation, networks and various types of internal users and external students. The data is accessed and communications are through personal computers, laptops or mobile devices. In the suggested big data architecture, information management shows the data collection, storage, retrieval of data, analysis and output generation life

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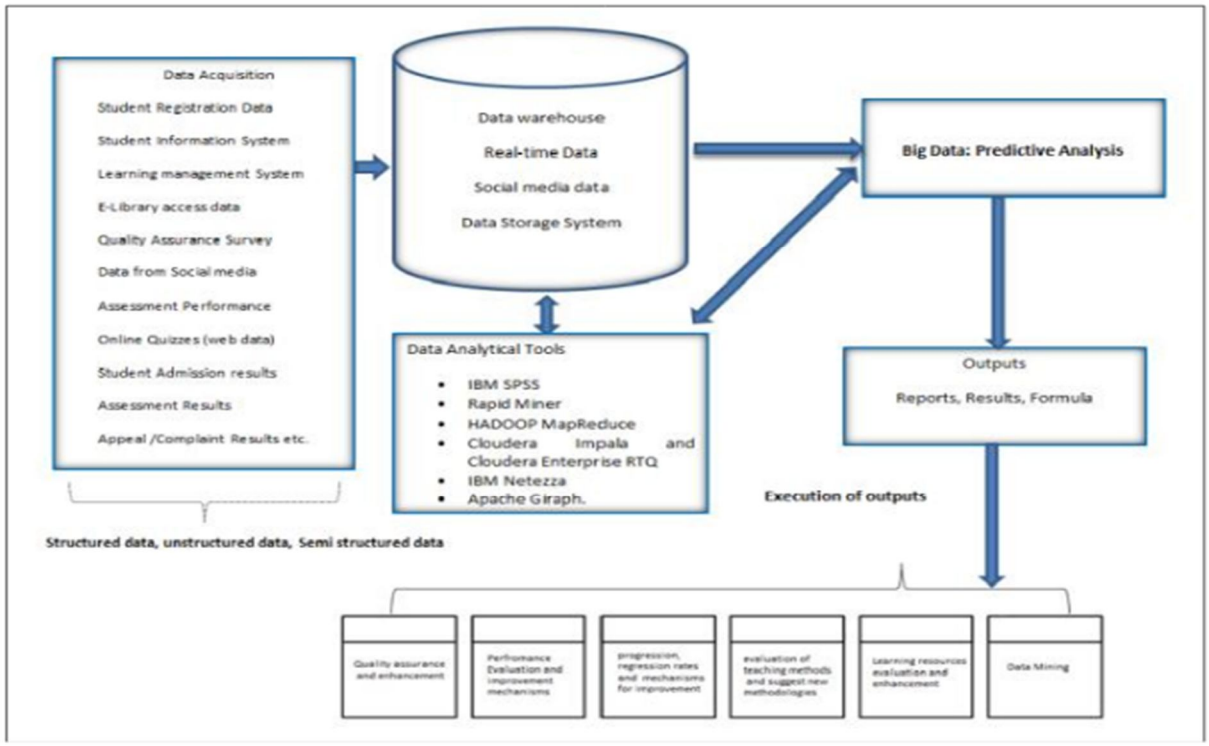
cycle. Various information systems are used in higher education institutions. Learning Management systems (LMS) is used for learning and teaching, Student Information System used for registration of courses, online payment etc. There are systems designed with mobile interfaces also. The collected data can be in the form of structured, semi structured or unstructured data. The collected data will be stored using appropriate data storage mechanisms. The collected huge data will be stored as real time data for immediate processing and results and historical data will be stored in data warehouses for future uses.



Data analytical tools can be used to analyze the stored data. For rapidly growing datasets, there can be a need to analyze data as it arrives to get the maximum value due to its time sensitivity. Lastly, the validity of the data needs to be considered whether the derived information from the analysis can be trusted [9].

IV. CONCLUSION

The proper use of big data analytics could accomplish the radical development on the education sector. Bigdata analytics can signify customized learning environments to the learners, can reduce potential dropouts and can develop long term learning plans. All these are possible through the effective development and use of big data analytics in the educational institutions. Institutions should recognize suitable big data analytics tool to yield the benefits from the huge amount of data , to take decisions and drive the institution towards benefiting from the data.

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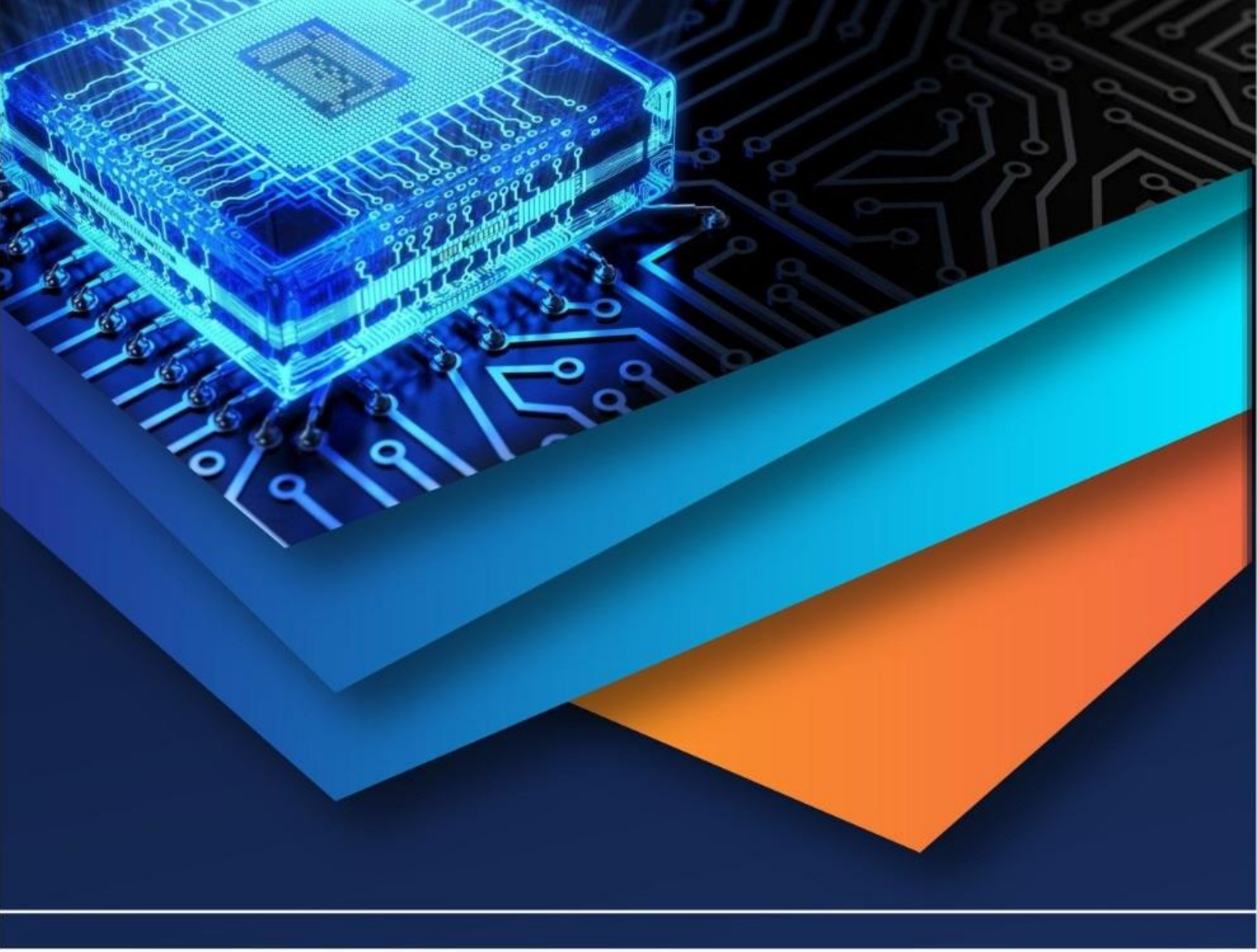

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