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EMERGING TRENDS IN E-LEARNING

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ABSTRACT

Technology has rendered human lives with an amazing and reliant imprint. It has impacted many domains like healthcare, sports, politics and various banking and finance services. Education sector is also changing by utilizing some of these technologies. People are introduced to different innovative ways of learning and teaching; people are able to use these technologies to learn and to consume study materials in very different ways than conventional methods of teaching. Learning innovation will trigger a powerful learning cycle that can be extremely beneficial to learners and teachers around the globe. In this paper we will briefly address the different technologies and how they change the way we learn and communicate with these technologies; we are going to compare their usability and find their educational benefits. Some of these technologies are emerging while some of them have been around for quite some time, we will also shed some light on the limitations of these technologies that can be addressed in future research. We will focus on technology such as 5G, an emerging technological innovation in the field of mobile networking, cloud computing that has been largely incorporated into our lives in the form of web-based services like E-Learning, E-Commerce, MOOCs and much more. We will also discuss some relatively new technologies such as Augmented Reality in order to make learning more intuitive and to engage learners. Together, Big Data and Artificial Intelligence would revolutionize the way that learners across the globe are offered courses by presenting them with personalized syllabi.

KEYWORDS: Education, augmented reality, big data, cloud computing, 5G network, artificial intelligence.

INTRODUCTION

Technology is helping us find our way. E-learning is one such platform. The growth in ed-tech firms has been highest in all these years. Books are being replaced by digital devices such as tablets, e-books and smart wearables like AR headsets. E-learning has dramatically increased from an alternative facility to become the education system's lifeline. With the emerging trends, modern age-based technologies are evolving, allowing contactless teaching methodologies and empowering teachers to offer students with seamless learning experiences along with a powerful remote monitoring framework. Relying on technology as our medium through which we will carry on education or work will make us ponder that various technologies are present, but they are not seamless enough for us to integrate it into our lives. This demands new and robust solutions in technologies which will be utilized by aforementioned services and devices. In this paper we will be discussing some of the technologies in this paper such as 5G, Cloud Computing, Big Data, Augmented Reality and Artificial Intelligence, and how these technologies are in use by listing few real-life examples and prototypes. We will touch upon the limitations which these technologies have and how it is being tackled.

I. 5G NETWORK

1. About 5G Network

5G- The future of mobile network technology. This new communication technology is meant to deliver high-speed internet with minimal latency and enhanced capacity. This has enormous potential in society. Imagine several devices that are connected to each other and are sharing real- time information.

2. Benefits

- It is estimated that delivering capacity of 5G is 1,000 times more than 4G.
- It will enhance smartphone usage experience as well as aid in new immersive technologies such as AR (Augmented Reality) and VR (Virtual Reality) with lower latency and low cost.
- 5G is meant to seamlessly connect to various industrial IoT (Internet of Things) devices.
- Uninterrupted use of Augmented Reality and Virtual Reality will be possible due to high speed and ultra-low latency which could make remote meetings feel as if you are in the same room.
- It is being observed that data is growing exponentially every day hence with the help of 5G

transferring of vast amount of data will no longer be an issue

- 5G will help students in their education in the classroom as well as students who are at remote locations outside the classroom by utilizing high data transmission speeds and response times to their devices.

II. Cloud Computing

Cloud Computing offers computing resources which does not require human intervention. Sole requirement is a simple interface to get the required processing power, storage, and other services that are accessible from anywhere via the internet. Educational Institutions like schools and colleges do not need to install and maintain the server and other hardware or software requirements. They can simply use cloud computing to meet their requirements. Including the composure and security of their resources on the cloud.

1. Benefits

Reference[1] has listed several important benefits for education, such as.

- Infrastructure and managed services: Cloud computing provides various services where we need not worry about resources helping teachers/lecturers to build and maintain a virtual classroom environment and to keep track of individual learners to modify or individualize learning based on one's speed, performance, or unique learning style.
- Cost Reduction: The amount spent on the installation of the costly hardware and software requirements by the educational institutions can be cut down by making the required instance or virtual machine offered by cloud computing where resources are elastic which can be scaled up or down and the institution needs to pay only for those services which are active and running.
- Reduce threat and increase security: Cloud safety facilitates district IT teams of workers to lessen threat, which permits regular safety regulations and enforcement, updated risk intelligence, excessive scalability, and stepped forward performance.
- Redesign teaching & expand association: The premise of teaching is on a cloud-based teaching system wherein the portfolio of cloud service offers a rich yet interactive environment to the users for learning anywhere. These services will simplify administrative processes and economically train faculty and staff across the globe.
- Various services: Students can use various services like Iaas (Infrastructure-as-a- service: delivering a full computer infrastructure), Paas(Platform-as-a-service: delivering full or partial developed environment), or Saas(Software-as-a-service: providing an entire

software) via the internet which is easy to build into the applications for project completion. Several cloud-based services are available that promise to encapsulate and hide the hard part of AI, computer vision, text analytics, and speech recognition and that offer simple-to-use APIs that would help the student with little or no knowledge in the above domains to bring their idea to life.

2. Limitations

Despite various benefits of cloud computing, it is undeniable that it has some disadvantages too.[2]

1. All applications may not run.
2. There is always a possibility of an outside provider gaining access and control of the platform.
3. Requires high bandwidth internet connectivity-does not work well with slow internet speed.
4. Data security is always an issue.
5. There may be latency faced due to the distance between user and the physical datacenter.

3. 5G and Cloud Computing

Cloud computing when fully utilized with 5G will make up for some of the shortcomings of cloud computing discussed earlier and has enormous potential in revolutionizing how learning and education are done.

5G technology with its launch is all set to bring major developments to the cloud computing world. With the use of 5G & cloud- dependent platform technology innovation will be more efficient. 5G will improve the integration with low to zero latency, making the communication smooth.

III. BIG DATA

Another milestone that can be set in the e-learning industry is through big data. In the current scenario, everyone is learning through online communities like discussion forums, online chats, and many Learning Management Systems (LMS) like Moodle. In recent times, information generated by the online learning environments have conjointly begun to get sufficiently big raising the necessity for big data technologies and tools to handle them.

Now, to handle all this data generated by millions of learners around the globe, all of this is generally done by following:

- Regression: It is a method used to estimate values of a desired target quantity which is continuous
- K-Nearest Neighbor: KNN is a model that classifies knowledge points supported by the points that are most occurring. It uses test data to form an educated guess on what an unclassified point ought to be classified as.
- Clustering: It is a procedure involving data point grouping. Data points that are within the same cluster ought to have similar properties or features, whereas data points in different groups ought to have different properties or features. Clustering is a common technique for applied data analysis and utilized in several fields.
- Classification: It is a tool used to predict the given data points in a category. Categories are typically known as as targets/ labels or classes.

All this playing and processing of big data leads to some easy analytics for the peer and the guardian too which are reviewed in,[3]

- Performance Prediction- By evaluating the relationship of the students with each other and teachers in an educational setting. Reference[4] describes the successful implementation at the University of Kentucky of a Big Data analysis tool: "SAP's HANA". By tracking and analyzing the background data of the student, their system calculates a score for each student, called "K-Score". The rating reflects the students ' involvement in learning. A low rating reflects a student who is underperforming and needs attention.
- Discontinuity Prediction – By observing the actions of the student, the possibility of students withdrawing from courses can be identified and interventions can be implemented to hold students at the start of the course.
- Data Visualization - Findings on data sources are becoming much more complicated as the scale of data is growing. Data can be viewed using visualization tools to easily identify data trends and regularities by providing visual reports. SNAPP (Social Network Adapting Pedagogical Practice) is an instrument that detects the behavior of students during their learning and accordingly allows the creators to suggest the most relevant content.
- Behavior Detection - This can be done by recognizing the facial gestures of the learners to predict the interest, problems, and commitment during the course. Reference[5] provides a framework for identifying the students' facial expressions to predict students' interest, dissatisfaction, and learning outcomes after the sessions. And it uses algorithms for gesture

recognition and posture tracking to capture students behaviors and link them to learning patterns.

- Intelligent feedback Learning systems - It will provide learners with intelligent and timely feedback in response to their inputs, which will enhance their learning skills.
- Course Recommendation – By analyzing the activities of learners, online platforms can recommend similar courses so that they do not get misguided in choosing.
- Group formation on the discussion forum - This will help the e-learning platforms to have a clear idea about the engagement of various students relating to a particular course and then assigning different types of activities to them.

IV. Augmented Reality

1. About AR

Augmented Reality (AR) is defined as 3-D virtual objects, which are integrated into a virtual environment in real-time according to.[6] Since its inception AR has had great potential in making the learning process more intuitive, interactive, and engaging. It enables students to indulge in real experience. Reference.[7] stated AR has application in several subjects including Medicine, Chemistry, Mathematics, Physics, Geography, Biology, Astronomy, and History. AR is an effective way of representing a model that involves visualization.[8]

2. Benefits of AR

The presentation and utilization of AR in teaching add fun and enthusiasm for students. Students become eager to learn. This builds the innovative ability of a learner in the learning cycle. This directly impacts learner's thought processing and thinking. In a review done by,[7] several advantages were listed in the table of most common advantages usually emphasized which is shown in Table I.

Table I: Advantages of using AR.

S. No.	Author	Advantages
1	[8]	Supports effortless interaction between real and virtual environments and permits the utilization of a tangible interface figure for object manipulation.
2	[9]	It will help teachers in making students understanding difficult topics by augmenting concepts with virtual captioning and demonstration.
3	[10]	Creates a learning expertise that's connected to the indoor classroom, so students will learn outside of class hours and institution boundaries.

3. Applications of AR in education

Several reviews were done by,[11] to list some prototypes that are using AR at its core to teach and the results were tabulated in the table.

Table II: Use of AR In Different Fields.

S. No.	Author	Year	Prototypes
1	[12]	2011	AR-based 3D digital media teaching materials for teaching Physical Science
2	[13]	2011	A game of GO, for self-learning
3	[14]	2011	2D and 3D models for learning computer graphics
4	[15]	2012	AR for architectural visualization
5	[16]	2012	Cultural and natural heritage
6	[17]	2012	Interactive flower garden with an interactive agent in the augmented picture
7	[18]	2013	Mobile software to enhance learning for OOP.
8	[19]	2011	An authoring tool for e-learning applications
9	[20]	2011	Game-based introduction to programming
10	[21]	2009	Interactive learning system for conservation of fish

4. LIMITATIONS

Reference,[22] numerous members in an AR learning exercise concurred that the AR devices are great, yet most members did not believe the devices to be as compelling as learning from books. They found using AR tools to obtain information was not as easy. This is because the AR tools utilized the 3G system to communicate with the Internet and the members had to wait for a short amount of time for the data to be sent back from the server.

V. Artificial Intelligence

1. Revolutionizing Through AI: E-Learning

With all the progression of the world, now it is very difficult to get a quality job even with a degree. Now when every student is trying to learn with online courses and workshops, the problem that every learner encounters is keeping track of what skills one has mastered and what skills need improvement. Here, Artificial intelligence comes in the picture where it can build different and personalized learning methods for every peer. It can be achieved by designing various learning models for different segments and then proposing acceptable methods of learning, assignments or tests. It reviews the past output of the learner and recognizes their learning style, and then makes some adjustments to the new learning material.

One of the things peers are facing on the e-learning platforms is the inability to clear their doubts in between the online learning sessions. Most of the time it can be due to being shy or the fear of looking stupid or the mentor not being available. But if they don't clear up their questions then it's going to be more difficult. Artificial intelligence can be embedded with online platforms and can act as a virtual tutor and answer the doubts or deploy online artificial intelligence chatbots. With the aid of Natural Language Processing, any student from any part of the world with whatever native language they are able to speak can clear their doubts in the language they prefer. Artificial intelligence can also help in creating fresh content for e-learning courses and making the task easier for instructors. Back in 2016, a short film 'Sunspring' was entirely written by an artificial intelligence bot.

VI. CONCLUSION

We briefly discussed various technologies that contribute to education directly as well as indirectly such as 5G, Cloud Computing, Big Data, Artificial Intelligence, and Augmented Reality. A lot of them are relatively new and upcoming and a lot of others have been around for some time, but have their share of shortcomings. We can make use of these technologies together to tackle these shortcomings. No technology is a direct solution to the problems which are being faced today in the field of learning and amid Covid-19. We need to develop these technologies, now, more than ever.

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