RESEARCH ARTICLE OPEN ACCESS

A Review of IOT-Based Flipped Learning Platform for Medical Education

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ABSTRACT

A survey of Case-Based Learning (CBL) has turned into a viable instructional method for understudy focused learning in therapeutic training, which is established on constant patient cases. Flippped learning and Internet of Things (IoTs) ideas have increased critical consideration lately. Utilizing these ideas in conjunction with CBL can enhance learning capacity by giving genuine developmental medicinal cases. It additionally empowers understudies to assemble trust in their basic leadership, and effectively improves collaboration in the learning condition. We propose an IoT-based Flip Learning Platform, called, where an IoT foundation is abused to support flipped case-based learning in a cloud domain with cutting edge security and protection measures for customized restorative information. It likewise offers help for application conveyance in private, open, and crossover approaches. The proposed stage is an expansion of our Interactive Case-Based Flipped Learning Tool (ICBFLT), which has been produced in view of current CBL rehearses. ICBFLT details outlines of CBL cases through cooperative energy amongst understudies' and medicinal master information. The ease and decreased size of sensor gadget, support of IoTs, and late flipped learning headways can upgrade restorative understudies' scholarly and down to earth encounters. With a specific end goal to show a working situation for the proposed stage, constant information from IoTs contraptions is gathered to create a genuine case for a therapeutic understudy utilizing ICBFLT.

Keywords:- Medical Education, Flippped Learning, Teamwork, Educational.

I. INTRODUCTION

Different showing techniques have been connected in therapeutic training. Among them, Case-Based Learning (CBL) is viewed as a successful learning strategy for restorative understudies [1,2]. It is a mutual learning approach for little gatherings of understudies to distinguish and tackle the patients' concern [3]. In CBL, real cases are utilized for clinical practice [4] and a facilitator's part is more dynamic [5] contrasted with conventional learning strategies. Furthermore, CBL encourages understudies to research reality based information and gives a chance to watch hypothesis by and by [6]. Nonetheless, in CBL, formal learning exercises are performed straightforwardly, and understudies have a tendency to delay to effectively take an interest because of the absence of past experience, elucidation of issues, and information. Late patterns demonstrate that expanding consideration is being paid to web based learning situations [3] and flipped learning approaches for boosting learning capacities [7,8]. As of now, CBL is ordinarily performed without misusing the upsides of the flipped learning approach, which has noteworthy confirmation supporting it over customary learning techniques [8,9]. As characterized by Kopp [10], "Flipped learning is a procedure in which a teacher conveys online directions to understudies earlier and outside the class and aides them intelligently to elucidate issues. While in class, the educator bestows learning in a proficient way". Concerning with flipped learning ideas, we have outlined and built up an Interactive Case-Based Flipped Learning Tool (ICBFLT) for restorative training [11] to empower therapeutic understudies to pick up CBL encounter, ICBFLT was planned and created in light of current CBL rehearses at the School of Medicine in the University of Tasmania, Australia. Keeping in mind the end goal to help social insurance changes, huge work has been performed to procure data through IoT gadgets. However there is as yet an absence of frameworks and structures for effectively misusing IoT information and utilizing it for the reasons for learning extraction, producing information with fractional contribution of field specialists, and utilizing the procured learning to give ongoing patient care and treatment. For learning creation and securing, different learning models exist for the constant extraction of significant data from IoT gadgets and the sharing of data between parental figures, patients, and specialists/specialists [12,13]. At present, CBL does not have an improvement system for genuine clinical cases utilizing an IoT foundation and there is a want to abuse existing IoT assets and framework for improving medicinal instruction. Because of these certainties, our inspiration was to plan a stage that can be utilized for medicinal learning, and in addition viable learning in different areas. We propose a viable stage called the IoT-based Flipped Learning Platform, which coordinates the highlights of existing IoT assets. The endeavors IoT framework to help CBL in a flipped learning condition. The ICBFLT needs bolster for getting certifiable patient cases, which can be accomplished utilizing IoT ideas. This stage bolsters flipped case-based learning in a cloud situation with best in class security and protection measures for customized information and conveyance of uses in private, open, and half breed approaches. Similarly as with any framework, keeping up security of data, giving on-request administrations, and sharing information between associations are viewed as essential objectives [8,14].

II. RELATED WORK

With a specific end goal to viably plan the IoT, we led a writing audit over different research areas, including IoT, CBL, and flipped learning. This area for the most part talks about how IoT innovation has been utilized as a part of the restorative space and how CBL in a flipped situation has been connected to medicinal instruction. IoT is currently a develop idea and it has increased huge consideration as of late [15]. As per the Gartner study1 26 billion gadgets could speak with each other by 2020 with an expected worldwide monetary increment of 1.9 trillion dollars. IoT has changed the scene of the virtual world for correspondence, data trade, accessibility, and convenience. The ideas of gadget to-gadget availability is depicted by IoT. In the social insurance field, IoT has been abused for purposes extending from health applications [16] to treatment and patient care, for example, utilizing sensors for checking and continuous status discovery [12]. Notwithstanding wellbeing applications, IoT has been utilized for restorative treatment, conclusion, aversion, and distinguishing proof of inconveniences. IoT has additionally been abused to beating challenges in existing social insurance and clinic data administration frameworks [17,18]. IoT demonstrates awesome potential in the in social insurance field, particularly to reduce the cost of care [19]. Because of the minimal effort and decreased size of sensor gadgets, IoT can assume a vital part in upgrading the learning ability of therapeutic understudies by giving genuine developmental restorative cases. At present, numerous IoT stages exist with different arrangements of highlights. This is on the grounds that wellbeing is an essential worry of society and strongly affects all partners. IoT in the human services space not just can possibly enhance medicinal services for society, but on the other hand is valuable for macroeconomic conditions. CBL is a standout amongst the best methodologies in understudy based teaching method. Jones et al. [20] talked about how CBL emerged from look into showing that students who endeavored to take care of issues before comprehend their fundamental standards had achievement equivalent to or more prominent than those accomplished students utilizing a conventional approach. CBL is depicted as dynamic learning strategy that is centered around a clinical, shared, or logical issues. Learning starts with an issue, inquiry, or question that the student endeavors to understand. The student can endeavors to take care of a particular issue while procuring learning on the most proficient method to take care of different comparative issues. In view of these preferences, a few specialists have connected CBL to medicinal training. Fish et al. [21] states that Samford University got a concede to apply CBL in undergrad instruction. CBL was incorporated into some nursing courses. This was fruitful and, therefore, CBL was executed over the whole educational modules. CBL was utilized viably in grown-up wellbeing, psychological well-being, pediatric and obstetrical nursing courses. CBL was likewise utilized viably in non-clinical courses, for example, pathophysiology, measurements, and research. Besides, understudies examining prescription at the University of Missouri that graduated in the vicinity of 1993 and 1996 experienced a customary educational programs, while understudies graduating in the vicinity of 1996 and 2006 experienced a CBL educational modules [22]. As a major aspect of both educational modules understudies, must pass a 'stage 1' test in their third year examine before advancing to their fourth year. They should finish a 'stage 2' test keeping in mind the end goal to graduate. Since the presentation of the CBL educational modules, these scores have risen altogether and stayed at the hoisted level. With a flipped learning condition, the viability of CBL is particularly made strides. The flipped classroom is an educational system in which the customary address and task components of a course are flipped or turned around [23]. Understudies can increase important learning before the class session, while in-class time is given to activities and dialog revolved around applying the information. Ali et al. proposed the Interactive Case-based Flipped Learning Tool [11], which covers the definition of CBL in the flipped learning condition. The assessment comes about demonstrates that the level of client fulfillment was amazingly high at around 70%. Aazam et al. [24] exhibited an asset administration and valuing model for IoT by means of mist processing. The creators accentuated the handiness and significance of client history while deciding the measure of asset required for each kind of administration. In any case, how their asset administration can be mapped to flipped learning isn't examined. It is an indistinguishable case from another investigation by similar creators displayed in [25], where a brilliant portal engineering is talked about. The creators proposed a few kinds of administrations that require brilliant and realtime basic leadership, which can be performed by a middleware entryway. Our proposed work coordinates highlights from [24,25] and includes these highlights by giving a design to IoT assets and framework that can be utilized as a part of restorative training. Moreover, different stages and frameworks are connected to gain constant information through IoT gadgets, for example, Masimo Radical-7, the Freescale Home Health Hub reference stage, Remote Patient Monitoring [19], the IoT-empowered versatile e-learning stage [26], and the Remote Monitoring and Management Platform of Healthcare Information (RMMP-HI) [27]. These framework have been proposed or executed in particular areas for applications other than flipped learning or CBL in therapeutic training. Gilboy et al. [8] demonstrated that understudies unequivocally favored flipped learning over conventional educational systems. Likewise, as per Street et al. [9], "The flipped classroom could be a helpful and fruitful instructive approach in restorative educational program". With the innovation accessible today, understudies take in more through direct communications rather than inactively viewing a teacher. The present absence of such frameworks is one of the significant inspirations for our proposed flipped learning plan for restorative instruction.

III. IOT-BASED FLIPPED LEARNING PLATFORM

This area depicts the engineering of the proposed IoT stage, portrays functionlity of its layers. The IoT incorporates highlights from existing stages and can be utilized as a part of restorative instruction, and in addition different spaces. Fig. 1 outlines eight layers, which are uniquely isolated into 2 obstructs based on correspondence and assets. The pieces are known as the neighborhood and cloud handling squares. The initial four layers including: Data Perception, Data Aggregation and Preprocessing Local Security, and Access Technologies handle correspondence and assets locally. The four outstanding layers include: Cloud Security, Presentation, Application and Service, and Business work at the cloud level. These layers cover numerous critical highlights including information interoperability for taking care of information heterogeneity, savvy portal correspondence for diminishing system activity load, mist calculation for asset administration to maintain a strategic distance from delays in data sharing, different levels of capacity and correspondence security, mistake taking care of while transcoding, application conveyance arrangements, and business strategies. Also, these layers give cutting edge security and protection measures for customized information, and in addition offering help for application conveyance in private, open, and half breed approaches. The full subtle elements of each layer are examined beneath.

3.1. Data perception layer

The identification of devices is performed in this layer. Devices are used to monitor, track, and store patients' vital signs, statistics, or medical information. The devices include Google Gear,3

Google Glass,4 patient monitoring sensors, smart meters, wearable health monitoring sensors, video cameras, and smart phones.

3.2. Data aggregation and preprocessing layer

This layer is divided into Data Aggregation and Data Preprocessing modules. The Data Aggregation module deals with heterogeneous data interoperability, load balancing, and smart data communication issues , such as communicating only when required by either storing data locally or temporarily, or discarding it when it is not required. This data aggregation and preprocessing require resources that are not available in sparse sensor nodes and other perception layer devices. Therefore, fog computing is incorporated in this layer. Fog computing uses a small cloud that acts as an extension to the edge of the network [24]. In order to perform complex tasks and filter communications, which sensors and light IoT devices are incapable of, we use smart gateways [25]. Similarly, the Data Preprocessing module filters irrelevant data for faster communications and transcodes it via encoding, decoding, and translation.

3.3. Local security layer

Security of patient information is a serious ethical issue. Patients are always cautious about sharing their personal medical data with others. In order to secure temporary storage for fog to cloud communication, the Local Security Layer is introduced. This layer deals determines where security is required and which security techniques to use. Additionally, security policies are defined in this layer, as well as the decision of which operations must be encrypted. As far as where security is required, if the communication is local, temporary storages is used which require local security. Similarly, based on application requirements, it is determined whether communication will be fast or slow. For example, in the case of patient monitoring, where communication is urgent, security may not be affordable. Thus, this case requires fast communication. The security technique chosen for storage or communication protocols are determined based on application requirements. For storage security, we use the Message-Digest algorithm (MD5), Rivest-Shamir-Adleman algorithm (RSA), Digital-Signature-Algorithm (DSA), etc., while for communication security, we use the Wireless Application Protocol (WAP), Wi-Fi Protected Access (WPA), and Transport Layer Security (TLS).

3.4. Access technologies layer

Various access networks exist for communication with cloud resources, such as WiFi, WiBro, GPRS, LTE, etc. This layer selects an access technology based on the requirements and availability of service.

3.5. Cloud security layer

Once data moves from local processing blocks to cloud processing blocks, it becomes important to secure it from various types of cloudusers. Secured User profiling can also become an important issue. This layer handles storage security and user profiling. Security techniques are chosen based on user profiling.

3.6. Presentation layer

The main purpose of this layer is to perform encoding, decoding, and error handling during data transformation. This layer converts data into an understandable format, such as an ECG graph, pulse rate, angiography, prescription text, picture, video etc.

3.7. Application and service layer

In this layer, Application Delivery Policies are defined in terms of private, public or hybrid access. Delivery policies are chosen based on the service scope. Additionally, services are categorized based on requirements ranging from ordinary user access to admin user access. For example, one service may be separated into two parts. One part is accessible to every one, while the other part is restricted. The same categorization can be applied for medical center administration and medical institutes.

3.8. Business layer

This layer handles business policies and services packages in terms of free use, or subscription rates. The packages are offered based on the usage requirements.

IV. INTERACTIVE CASE-BASED FLIP LEARNING TOOL (ICBFLT)

This segment portrays the functionalities of the ICBFLT. The ICBFLT was intended to plan synopses of CBL cases through understudy mediation in conjunction medicinal mastery [11]. Moreover, it gives CBL administrations to therapeutic understudies through virtual patient cases. There are three sorts of clients that interface with the ICBFLT: Administrator, Expert, and Student, as appeared in Fig. 2. Utilizing this instrument, the Administrator oversees courses by indicating course points of interest, modules, and assignments. The Expert oversees CBL cases and their model arrangements, assesses understudy arrangements, and gives criticism to understudies. The Student defines case synopses (history, examination, and examinations) to unravel the CBL case, sees other accessible arrangements, and gets input from the Expert. The outputs of this tool are course information, real-world cases, summaries formulated by students and experts, assessments of students solutions, and expert feedback.

V. CONCLUSIONS

Because of minimal effort and diminished size of sensor gadgets, utilizing IoT for giving genuine developmental therapeutic cases and supporting late flipped learning ideas can improve medicinal understudy scholarly and down to earth involvement. Keeping in mind the end goal to abuse IoT framework to help flipped CBL in a cloud situation, we presented a reasonable IoT based Flipped Learning Platform, called IoT, with best in class security and protection measures for customized medicinal information. It additionally offers help for application conveyance in private, open, and cross breed approaches. The proposed stage coordinates highlights from existing stages and can be utilized as a part of medicinal training, and also different areas.

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