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Machine Learning for Data Driven Decision and Prediction for M-Learning in Cloud Environment

[1]Silviya Nancy J, [2]D. Uma Nandhini, [2]D.Latha Tamilselvan

[1]*Department of Computer Science and Engineering, Saveetha School of Engineering, Saveetha University, Chennai - 602105, India*
[2]*Department of Information Technology, B.S.Abdur Rahman University, Chennai- 600048, India*

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ABSTRACT

Smartphones- the phrase itself creates a magical vibration in the society of this age. The increasing researches in Information Technology given rise to many authentic inventions. One among the irreplaceable technologies is the handheld devices (mobile phones) which stamps its own reputation by becoming smarter (smartphones). The new mission and challenges faced by today's open learning and distance education have joined hands with the developments in technology, which transferred the education to the superior class of learning called M-learning. The cloud has placed its impression in education too, by providing its elasticity to showcase the M-learning as a service. The main proposal of this work is to define the embodiment of M-learning with cloud which defines the integration of Mobile Cloud Computing (MCC).Therefore, the learning process in mobile phones becomes big data. Today the data mining and machine learning goes hand in hand, by providing a good learning environment for data driven decision and prediction.

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INTRODUCTION

We are aware that, the evasive growth of mobile devices is reaching an extreme height which is unimaginable. Especially the smartphones play an eminent role in the hands and works of the people. A survey reveals that the shipments of smart phones are 487.7 million exceeding the personal computers which is merely 414.6 million. So, it can be clearly identified that, over 90% of the total population are behind the exemplary features held by the smartphones. It is also obvious that most of the people belonging to this modern community access internet or data connection through mobile phones which grasps the importance in specially defined features like portability, flexibility, simplicity. Again the massive advancements in computing technologies have led to the evolution called cloud, which means "everything, everywhere, everytime". It also has paved way for the emergence and development of elastic services in cloud.

The cloud can be defined as the computing and software resources that are delivered on demand, as a service. Cloud computing is the model for enabling available, convenient, on-demand network access to the shared pool of computing resources that can be rapidly provisioned and released with service provider interaction. The integration with cloud is supported because; N. Mallikharjuna Rao *et al.* (2010) the recommendation (M-learning) considered here have a big pool of data exceeding Exabyte. This is of course cannot be normally accepted by the mobile phones alone due to their less storage capacity. So, the cloud as well as the mobile device would provide a better entailment of output in the perspective of M-learning, which ends up in the decision of introducing cloud computing services in mobile devices (smartphones) to some reliable extent, because still the mobile devices lack resources compared to the desktops, which proposes interaction with cloud. This collaboration of mobile with cloud is defined as Mobile Cloud Computing (MCC).

Mobile Cloud Computing is considered as the potential technology for mobile services. It is the combination of mobile web and cloud computing for the mobile users who access various applications and services on the internet. This can be effectively achieved by using cloud which can be offered by the cloud service providers. The focus is on the deployment of E-learning or M-learning in cloud, as a service. Mobile learning is one of the special constituent of E-learning. The type of learning which is widely been used by industries, academicians',

Corresponding Author: Silviya Nancy J, Department of Computer Science and Engineering, Saveetha School of Engineering, Saveetha University, Chennai, India.
Tel: +91 9487752343 E-mail: jsilviyanancy@gmail.com

commoners as well as the students. The standards of E-learning leaps ahead to M-learning (Mobile Learning), which localize the learning on move for all the mobile users whose rate is drastically increasing. The proposal of the paper includes mining of the data in cloud which includes the finding of data patterns and relationships. Since the data sets are very large many patterns and relationships are possible, machine learning techniques are used. It produces adaptive changes in the system that makes the system to improve the performance of data which is basically referred as data driven decision and prediction.

Mobile learning (m-learning):

Despite its hype, cloud computing with its elasticity, scalability and dynamic virtual resources it is been widely deployed by several organizations for various applications. It is envisioned that cloud will be the near future, having significant impact on education and learning institutions which enables learning at reasonable cost. On the other hand mobile devices are becoming the learning area for the people due the growth of mobile social networks.

The adoption of mobile learning is due to the increase in number of App stores, rapid evolution of wireless devices, growth of mobile learning tools and platforms. M-learning exposes itself differently from E-learning with the following features like spontaneous, private, portable, context-aware, lightweight and informal respectively Jalel Akaichi and Firas Saidi (2012). Mobile learning is prominently defined as "knowledge in hand". It is a methodology of learning that is mediated through mobile technology. It is viewed as the subset of E-learning, but creates a sensation and holds its place by learning "anywhere, at anytime". This is because the network connection and internet is available all over which provides a better reliability of services. This revolution has changed the day to day lives of the people, providing effective learning experience. Further the mobile learning provides properties depending on the user, user environment and network connection. It helps to consume information in a productive and creative way. It is very time-constrained task and context-oriented. It is the combination of the technology of M-learning with mobile communications. The main idea is to integrate the learning with mobile applications and provide learning and performance at anytime and anywhere dynamically. So, the learning is no longer restricted within halls or classrooms, instead the learners can be continuously connected and monitored which provides an environment for practical experimentation and discussion.

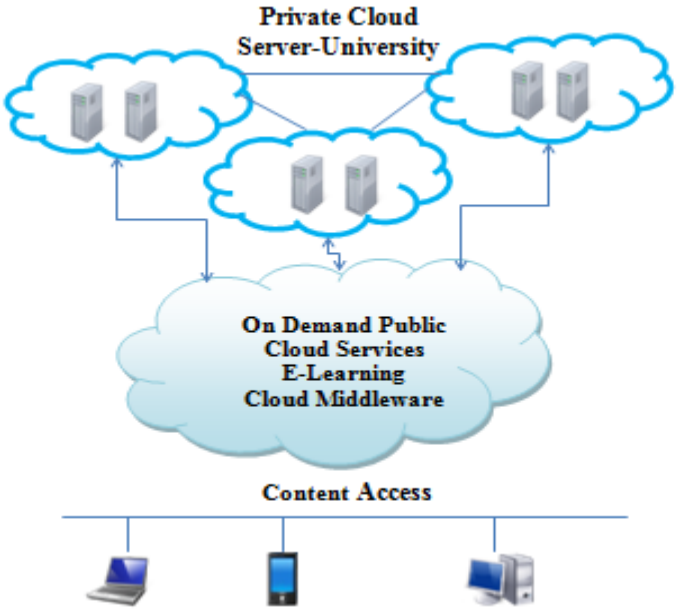

Fig. 1: Cloud Based E-learning Model.

Related works:

Normally the users of M-learning produces large amount of data either by directly feeding it through systems such as Learning Management Systems (LMS) or by interacting with the various contents they are learning. This flow of unstructured data is called as big data. The storage of these large amounts of data is defined as big data storage, and the analysis is proposed as big data analytics.

Big data is becoming increasing important in research areas, corporate, marketing and commercial applications in a wide range Fernando Ribeiro *et al*. (2010). This goes in hand with evolution of handheld devices technology where mobile phones are highly used for learning purposes, which offers students and

other people with new genre of data. Starting from forming social relationships with the social networks, information about current events, and vast majority of us are engaged in activities where there is quick and easy access of data. So, the data from mobile technologies holds an important place in discussion which creates new possibilities and challenges in analysis and use.

Normally people use mobile phones for knowing the details on climate, to find places with virtual maps and GPS, for a search of data containing audio and video content. This also involves communication, sharing, buying, and many others. Collection of these large extraordinary sets of data from various sources and in different formats is also referred as BIG DATA. The convergence of mobile technologies and the big data offers tremendous opportunities. This helps in decision making in various angles in this modern society. With ubiquity of technologies and data, the way that gets intertwined with peoples' lives, it is essential that big data literacy is increasing essential for students including various communities who yearn for learning. Under these circumstances, with dramatic improvements in mobile technologies and their tools would be a better platform to sense and use the large sets of data in an efficient manner. To inculcate this motivation needs the best storage place for holding larger amount of data which is provided by the cloud as a service. So, with the gadgets like smartphones applications like M-learning can be effectively carried out in the cloud environment. This is in scale by bringing the big data content optimization SAAS in the small screen in addition with smart product recommendation, predictive search in mobile phones.

Mobile learning (M-learning) analytics is the hot topic in today's society, who wants to create a better performance in their learning environment. It is data mining combined with analysis providing way for checking out learning patterns and predictions and respond to the best. According to the proposal here mobile learning analytics applies the context of big data in mobile learning. Let's say for an example here, consider a scenario which is some ten years back, where a car is sent for repair. The mechanic would analyze the car for a day or two to jot out the real status of the car. But now with improvised technology the gadget in the car reports the nature of faults and enables quick identification of solution and offers a solution in reasonable time.

Proposed system:

Basically data mining is used for extracting information from the unprocessed or unstructured data. Mining has a huge package of resources, whereas the cloud computing segregates the resources and provides a budget oriented access. The students and academicians' are the major users of the system. The conjunction of data mining and cloud provides benefits like no need of upgrading hardware and software; there is no need of worrying about hardware and internet failures, theft and power outages. The users can pay accordingly for resources they use, and service is available based on our time. As human we are familiar with initial way of learning.

We consciously learn about the good and bad. Learning implies the new way of understanding and which enables a new decision making perspective and involves the exercising of new skills. Normally learning can be achieved by acquiring knowledge from experts or through observation, experimentation and experience. Machine learning is generally related to same criteria of human learning mechanisms. Machine learning is the form of artificial intelligence that can be used to automate a large processing of big data. It can be used to characterize and discover the unknown function, creating the means of predicting the correct function outputs presented with previously unseen data. It adopts a self-customized way of prediction when it is been tuned with the datasets of particular application and helps to accomplish the difficult task that can be done explicitly due to data complexity Tanja Arh *et al*. (2010). Consider a learning store using machine learning technology; customer can make the store as a personalized one with the available service. Based on the pages and products viewed, a customer is provided with list of course materials/books would she/he would like to purchase. This is done by the machine learning engine spotting the correlations with the customer data with similar demographics who have viewed similar pages and recommending potential purchase from their history. As this is an automated system, the machine learning tool continues to learn the new trends among the customers; it makes recommendations based on having recognized the new patterns. This is the good example of how big data that can have impact an area near to the heart of learning with support of decision making with the recommendation engine. Many universities make this mobile learning (M-learning) into reality. Primarily it explores the audio, video and multimedia contents with flash animations, digitally rich contents. The University of Texas at Austin provides wide range of researches and projects in cloud with mobile learning Sharil Tumin and Sylvia Encheva (2010). Mostly the education system in Indonesia improvised the education system in college and schools with M-learning. If we aggregate all the universities by a cloud broker there will be than peta bytes of data, where cloud gives efficient service with the available big data.

Learning algorithm:

Machine learning helps us to navigate and process large volumes of data. It is nothing but the prediction of the known properties of the data. To define the predicative properties of data we go for the clustering algorithm which is the form of

unsupervised learning. Clustering may be directly defined as set of observations partitioned into natural groupings or cluster of patterns in such a way that the measure of similarity between the observations minimizes the cost function.

K-means:

The aim of this algorithm is to partition the *n* observations into *k* distinct clusters in which each of the cluster belongs to the nearest mean. In this proposal of mobile learning (M-learning), the k-means algorithm can be implemented in the following way. The work has various universal constraints which have to be predicted upon based on the current scenario. The algorithm clusters the needs into different partitions which would be taken care of by the recommendation engine to predict the possibility of the output.

Assign each object to the nearest cluster from the centroid. Means of all the clusters with the centroid is found. The k-means algorithm assigns each of the expected to the k cluster. The center of cluster is considered as the mere decision space. As the cluster of data gets divided the closest cluster is been identified to give the predicted data. Here in this scenario the M-learning perspectives like data, cost, quality, and feedback are sent for clustering through machine learning.

There after it is supplemented with the recommendation engine relating to the respective properties and the prediction is done Ruxandra Stefania and Petre (2012). In this scenario, the data, time, quality, cost, feedback are some of the perspectives that comes under learning through mobile. When the user analyses on this datum, the machine learning algorithm will provide a better clustering of all the information through the recommendation engine and predicts according to the user's history and specification.

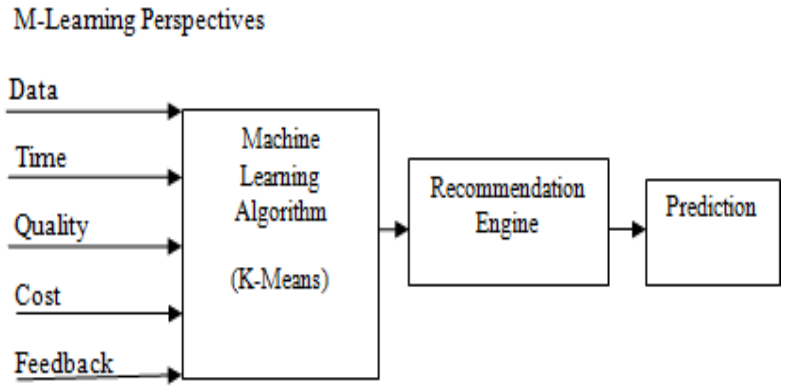

Fig. 2: Learning Algorithm (K-Means)

Traditional learning to m-learning:

The early stage of learning was only through by teaching done by the experts. As the technology grew the way of learning changed accordingly. With the evolution of internet, people switched to learn through web-based learning mechanisms. This gave rise to E-learning method of learning which provided the resources through internet. This replaced the traditional learning systems.

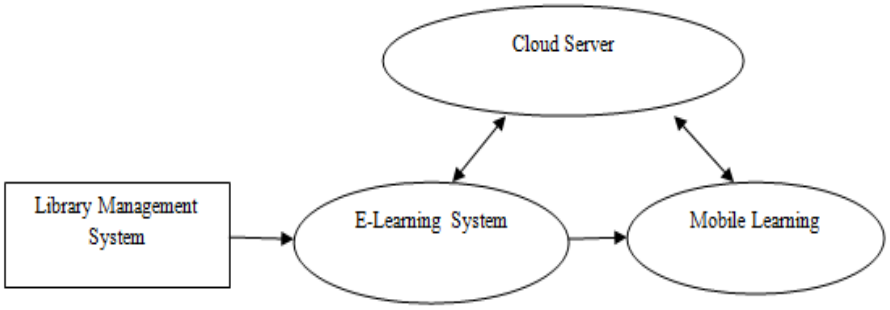

Fig. 3: Grading Of Learning Systems.

The system construction and maintenance created the problem and the capital cost was very high to maintain the resources at stack. Next the technology revolution moved up to the sky with the evasive functionalities of the mobile phones where the people totally relied on mobile phones for all the purposes. This sensation along with the cloud computing gave an impact of learning through

mobiles with the resources from cloud, and the organizations gave the administration to the cloud suppliers, where the new generation of learning systems run on wide range of hardware devices with the storage in cloud, which is the cause for the establishment of M-learning as a service (mLaas) in cloud and pay for use.

Proposed architecture:

M-learning system is been implemented for the purpose of education using cloud computing. The main objective of the proposal is that the user can acquire knowledge from any shared resources at reasonable cost, only paying the service we use, called as on-demand and pay-for-use service. It is the place where the user can learn without any need for storage in the device used. Services can be used in Mobile Cloud Environment (MCE) at anywhere and at anytime. Data mining and the cloud services provides a best way for Mobile Learning. It is a difficult scenario for the educational institutions and corporate organizations and also the entire population is in need to learn something. To widen the area of learning it is not affordable at a reasonable cost to maintain a server to provide the expected resources. So, this has been moved to cloud where the user can access the resources they want and pay for it. Since the mobile phones provide various functionalities for learning it can be confidently put for use in mobile devices. It is partially like a client-server model where the user request for the desired resource and the cloud service providers (CSP) initiates the service according to their needs.

Mobile-cloud environment:

Mobile learners usually move from place to place and access the data connection through the road network. Their activities may vary in moment based on the schedule. The preferred users can continue their learning according to their needs.

To start with the user has to register with the credentials' or can download the M-learning App in their mobile phones. On further access, reading or finding of documents can be done with internet connection and the user can download (if he/she has the memory space of the device or based according the users' wishes). If the user needs the details about the certification courses, their quality, cost, location, the user can obtain the details through the Mobile App with the help of cloud service providers through cloud administrator.

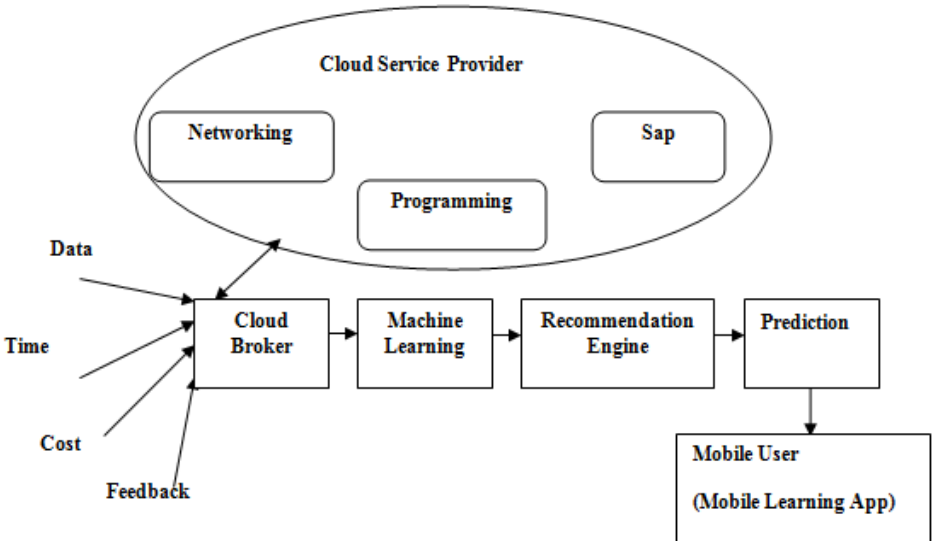

Fig. 4: Proposed Architecture for M-Learning in Cloud.

M-learning algorithm:

The algorithm abides by the proposed system which has certain recommendations and predictions. When the user is requesting for the course details, collect the previous history and analyze whether the course he desires is applicable for his qualification.

Consider an example, where W3 schools offer a certificate course in 99days at an affordable cost than any other competitive companies, the cloud broker can suggest the user about the details of the course in W3 schools. This is where the recommendation engine and prediction takes its task orientation.

```
Proposed _M-learning ()
If ((Available Learning MobileApp) or (Available
Data Connection))
{
M-learning access=true;
}
Foreach user
{
Find the request for the service ();
Analyze the user's previous history ();
Provide the user with cost, quality, and service;
If (Requested Service by user is suitable to
continue)
{
Provide the requested service;
}
Else
{
Give other recommendations based on the history;
}
```

Sample data analysis:

The analysis that is generated using the above algorithm predicts the user requisition based on their specification. For instance with the sample shown below, the recommendation engine collects the user data and history based on the pursued course. In turn the user request is been processed and gives the requested data or recommends the available data based on the history.

Table 1: Sample Data Collection and Prediction.

COURSES	TIME	NO. OF LESSONS	FEEDBACK	COST	RECOMMENDATION
Advanced Routing	Span (30days) Completed(10days)	10	Good	Paid	Opt for CCNA course
Advanced Java	Span (45 days) Completed (90days)	10	Poor	Paid	Opt for TESTING course

Conclusion:

In this paper, the proposal is to provide a cloud infrastructure which is designed for maintaining large data sets to provide efficient service to M-learning. Data mining (Ruxandra Stefania, 2012) discovery system is necessarily required along with the cloud computing for the better deliverance of services whose massive task is cloud storage of large data which is prescribed as big data, including the categorization of distributed data sets. The cloud service providers use the data mining techniques to acquire valuable information. This is a mere tool for enabling the knowledge driven decisions and to predict the future data along with machine learning. Cloud computing will be the near future; it gains popularity with its low cost functionality (pay-for-use), high reliability and tremendous availability.

REFERENCES

Mallikharjuna Rao, N., C. Sasidhar, V. Satyendra Kumar, 2010. Cloud Computing Through Mobile-Learning", (IJACSA) International Journal of Advanced Computer Science and Applications, Vol.1, No. 6.

Jalel Akaichi, Firas Saidi, 2012. Mobile Life Long Learners on the Cloud", DIVAI 2012 - 9th International Scientific Conference on Distance Learning in Applied Informatics.

Fernando Ribeiro, Jose Metrolho, Monica Costa, 2010. A Bluetooth-based Interactive System to Improve Relationships Between Actors in Educational Environments, WSEAS Transaction on Advances in Engineering Education, 7(2): 33-42.

Tanja Arh, Matija Pipan, Mojca, Debevc, Blazic, 2010. Fostering the Integration of Web 2.0 Technologies and E-learning in Vocational Education and Training, WSEAS Transactions on Information Science and Applications, 7(2): 241-251.

Sharil Tumin, Sylvia Encheva, 2010. A Multi-Purpose Web-based Contractual Management System, WSEAS Transactions on Information Science and Applications, 7(6): 819-829.

Ruxandra Stefania, Petre, 2012. Data mining in cloud computing, Database Systems Journal Issue 3. vol.3.