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Feedback System for Pedagogy Refinement in Lectures

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***Abstract*: In spite of the best efforts of educators to introduce active learning techniques, classrooms still remain largely instructive in nature. As teachers usually take feedback at the end of the semester, their efforts whether have been fruitful or not remains unanswered at times. Learning is a process of every lecture, which is why we have developed a unique audience response system to improve the feedback in such a large instructive classroom. We have built a feedback system for teachers which enables them to get the cognitive state as well as the affective state of students during a lecture. The android app allows students to voluntarily indicate the understanding of the lecture on four key parameters -difficult, easy, boring and engaging in real-time.**

***Keywords*: Audience response system, pedagogy refinement, affective states, cognitive states, android, feedback, large classroom, active learning.**

1. Introduction

Although active learning seems to be had been implemented in many learning-based institutions, still a lot of it has been found to be biased towards passive learning. Passive learning makes use of the same lecture-based strategies like reusing the same presentations slides, figures, etc. Many a time educator might use different teaching strategies without knowing the actual problem might be not in the entire teaching technique, but only a part of it can be taught in many ways. So, if the educator can pin-point the exact topic or subtopic which might be getting tough for the learners they might be able to apply some different techniques for the same topic or subtopic and can obtain different results. Like feedback for every topic taught would be useful. This can bring a drastic improvement in the results of the learners as well as educators. Hence, we intend to develop a Mobile Application which would help convey real-time feedback for the educators.

1) Active Learning

An approach to instruction that involves sincerely engaging students with the course material through role-plays, case studies, problem-solving, discussions, and other methods are called as Active learning. The activities in active learning may be in length from a few couple of minutes to entire class sessions or can also take place over various class sessions. The principles of active learning are

- Intentional: the relevant-ness of the task which would solve the student's problems.
- Absorbing: it reflects the engagement level of the student's in the lecture.
- Reflective: reflection of students on what was learned during the lecture.
- Complex: comparing learning task complexities with real life by students.
- Situation-driven: this includes applying knowledge according to different situations.
- Negotiated: this includes negotiating goals of learning by both students and teachers.
- Critical: student's applying critical ways for learning different content.

The remainder of this paper is organized in the following way: in section II, survey on related work is reviewed. In section III, detailed explanation of proposed methodology along with system flow diagram and analysis is described. In section IV, results are displayed. In section V, overall understanding and outcomes are summarized and concluded.

2. Related Work

This section reviews various research done in order to detect and prevent phishing websites. Many researchers have applied different methods and algorithm in process to make their system more accurate. We have reviewed various work and gathered information which could help our system to result in more accurate results. In [1] they have presented two reviews that help instructors and teachers irrespective of their position. In the first part, the different advantages, disadvantages, and features for 6 different clicking systems have been distinguished and compared. In the second part, they have summarized some of the best practices for clicker use that have emerged from educational exploration. A great potential lies with clickers to improve classroom learning. Overall in short both the students and instructor found it stimulating, engaging and helpful. In [2] an interactive teaching technique which is well suited for large class is the use of electronic voting.

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Traditionally what used to happen was the lecturer used to ask questions and the students used to answer using a handheld device but it is not feasible to purchase and distribute these devices to everyone. Therefore, they have designed an mb-click voting system that returns individual feedback to users based on the answer given. Like when a user responds to question, they will get to know if they have given a right or wrong answer. In [3] they have designed a system for accomplishing effective discussions and interaction in lectures with many participants. Only a partial solution is provided by most in class e-learning systems. Therefore, have developed a microblogging system, MiRa which offers the various possibility of communicating both inside and outside of the classrooms. They have created a discussion forum as well which can be accessed by students and teachers.

3. Proposed Work

1) Overview of our approach

The overall approach of our system is depicted in the figure. 1. It begins with the teacher starting the topic in the lecture, which enables the options for the students. The feedback is taken in the pair of two which helps to determine the cognitive and affective state. The student can give feedback after some time intervals and hence would not distract them from the on-going lecture. The feedback ends when the topic is closed by the teacher, and the overall feedback is calculated with the help of an algorithm which also takes into consideration the previous topic relation with the current topic as well as the attendance of the student. It also takes into account the attendance of students concerning the current chapter. Our system uses Naives Bayes algorithm.

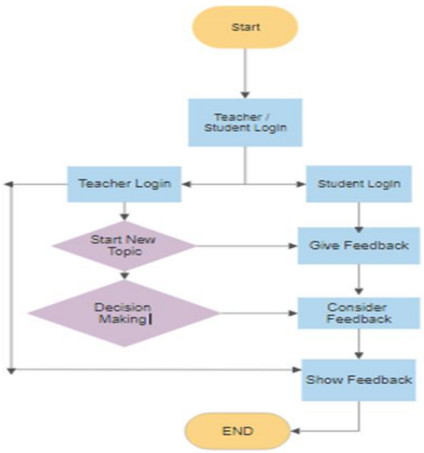

Fig. 1. Architecture

B. Requirement Analysis

In order for the system to work smoothly the user's machine should satisfy the following software and hardware requirements.

1) Software Requirements

- *Android:* Android is an operating system (mobile) which is an improvement of the Linux based kernel and other software that was open-sourced. It is designed primarily and mainly in touchscreen in mobile devices, which include smartphones and tablets in the market. Google is the main contributor in this domain and it is the one who commercialized Android. It is the most commonly used mobile operating system.
- *Android studio*: Android studio is the main Integration development environment or the IDE for creating or developing applications on it. It also makes use of different activities, xml, to define the functionality of the applications. It also has Gradle, emulator and GitHub integration.
- *Firebase*: Firebase is backend-as-a-service that has grown to be the app development platform on google platform.
- *Java*: Java is the most commonly used programming language and is also used in Android Studio to create different activities.

2) Hardware Requirements

- Hard disk with minimum of 250 GB.
- Minimum four GB RAM.
- Windows 10/8/8.1/7
- System Type: 32-bit Operating System and above.
- Android version-4.1 or higher.

C. Design Phase

1) Design Goals

- The system created should not be dependent on features specific to a target.
- To reduce the didactic nature of the lectures.
- To improve the active learning in the classroom by taking response from the student.
- To help educators obtain real time feedback for every topic.
- To obtain feedback not from the educator's point of view.
- Develop a low-cost feedback tool.

2) Design Choices

- The system made is totally for teacher-student interaction.
- The system uses student's feedback for each topic to evaluate the final feedback.
- The created system also relies on the outliers, where it takes into account the unusual responses and mitigates the differences.

4. Architecture and Implementation

The system is developed as a separate Android application which works on all Android devices.

The teacher and student both have their separate login facility with the added features. Both of them need to be logged into their account. The teacher has the ability to end or start a new lecture, or carry on with the remaining previous lecture. Once the teacher starts the new lecture, then each and every student can give feedback. And if, continues with the previous lecture then the attendance of the student is taken into consideration for the student giving the feedback.

The background working of the application is done through the naive Bayes algorithm with the help of following functionality:

- *Cognitive States*: Cognitive State is the state of mind. It is how it affects cognition, i.e. how we process information. In our system we have given two main points for the cognition level as in "Boring" and "Difficult". It helps to understand the student's understanding for the particular topic. Cognitive states can be improved with the implementation of new teaching techniques.
- *Affective States:* Affective state refers to the feeling underlying emotional state. These can include the long term and short term goals as well as the understanding of the topic for the current lecture.

1) User Interface

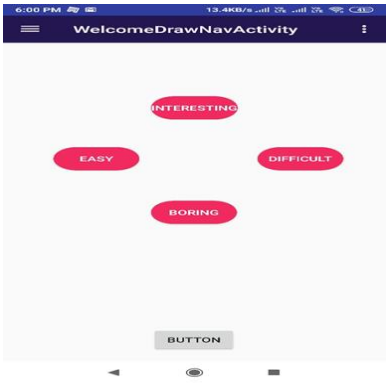

Fig. 2. User Interface

The above user interface is used to check the give output to the teacher for the particular feedback. Students can select any one from each particular option and the buttons are then disabled for a specific amount of time.

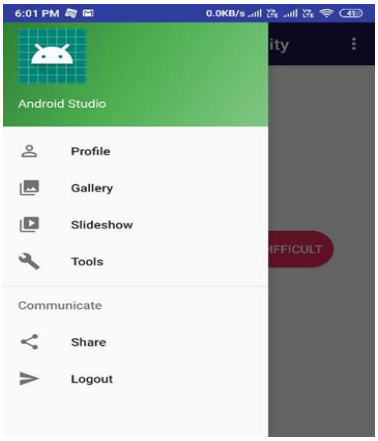

Fig. 3. Navigation Drawer

The navigation bar icon is the logo of the developed system. This icon is always present on the browser. The navigation drawer helps to navigate through different times.

2) Naive Bayes Algorithm

- Naive Bayes is one of the most popular machine learning classification algorithms. It is formed on the basis of Bayes Theorem for calculating probabilities as well as conditional probabilities. The basic functionality of Bayes theorem is it calculates the probability of an event given a probability of a different event already occurred can be stated mathematically as:
- P (C|D) =P (D|C) P(C)/P(D).
- Where C and D are events. P(C) is also called as priori of C and P (D|C) can also be called as the posterior probability. Naïve Bayes models can be classified into three types:
- Gaussian: It is assumed in normal distribution and can be used for classification.
- Multinomial: This is mostly used for non-continuous events. It can also be inferred as the count or number of iterations an outcome y has been observed.
- Bernoulli: This model is applied in case the vectors are of binary nature. Text classification is one such application of Bernoulli.
- We have used multinomial model to count the number of occurrences of easy/difficult or interesting/boring votes during the entire lecture

5. Result

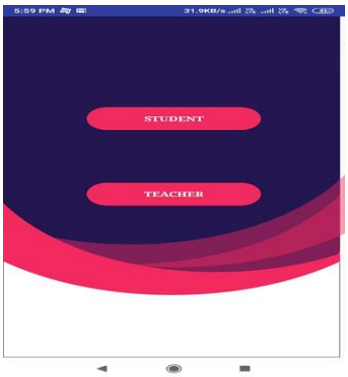

Fig. 4. Safe Website

Fig 4. Depicts the login page in the system for both student and teacher. Students and teachers can login or signup after selecting either student or teacher.

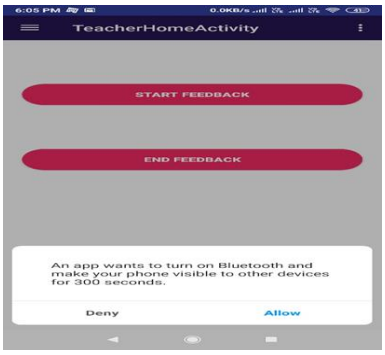

Fig. 5. Start/End feedback

Fig 5. Depicts the page for teacher to start /end the feedback for a particular topic.If the teacher clicks on start feedback it asks the permission of the user to switch on the bluetooth.

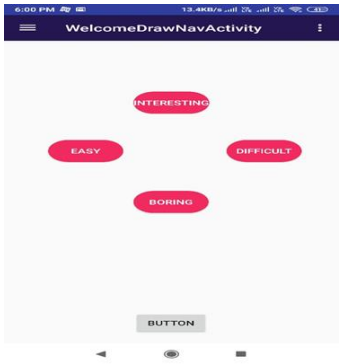

Fig. 6. Affective/Cognitive states

Fig 6. Depicts the page in which the student can select from interesting/boring and easy/difficult which represent the cognitive and affective states respectively.

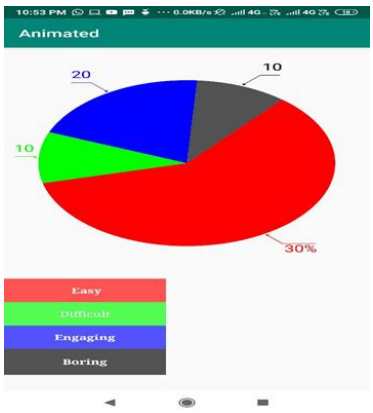

Fig. 7. Generated Feedback

Fig 7 depicts the generated feedback for all the students interacting with the system during the time which the lecturer took the feedback.

6. Conclusion

Teaching is a very important aspect in today's time. But teaching with improvements from previous methods can be a boon for many people. Our application tends to provide with the necessary feedback from which the areas or the techniques can be understood which have become obsolete, and new techniques can be made formulated so that the teaching process gets better every time. Thus our system helps to capture the affective and cognitive states of students and helps teachers to get feedback about their lectures.

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