

AutoAttend

by

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ABSTRACT

According to research done by IEEE (2016), “recording attendance is inefficient and takes up too much class time especially with larger groups of students,” and if attendance takes 5 minutes of a 45 minute period, that means that 10% of class time is lost taking attendance. Another research report completed by UC Berkley (2017) stated that time in class is when students are most productive. Important class time is wasted taking attendance, so being able to remove the amount of time taken by attendance would be beneficial to students. AutoAttend assisted with this issue by using a fingerprint scanner to sign students into the classroom. AutoAttend saved time taking attendance, which helped improve student performance.

1. PROBLEM STATEMENT

1.1 INTRODUCTION

How many of you have taken attendance? It is a pretty strenuous process, especially if you are not that great at pronouncing names. We have all seen the Key and Peele skit known as Substitute Teacher. On the student side, attendance takes too much time from the classroom. How many of you have spent the first part of your classes taking attendance? Almost all of my classes started by taking attendance and announcing name after name...after name...after name.

1.2 PROJECT DESCRIPTION

Teachers and professors spend too much time taking attendance, which hinders students' time in class, which is when students are the most productive. Our application, AutoAttend, seeks to enable students to have more time in the classroom, thereby improving their performance by removing the time that would be spent taking attendance.

AutoAttend seeks to remove the problem of taking attendance by using a fingerprint scanner to sign students in, removing the need to take attendance. AutoAttend will allow a teacher to register their student's fingerprints by adding them to a classroom on the AutoAttend website. After that, the website will automatically log the student in after they scan the registered finger into the fingerprint scanner. A server and database will host the website and hold all the data, respectively. Using AWS for the front-end, AutoAttend will be a website

that both the teacher and students can go to. The teacher will get an attendance breakdown, and the students will be able to change their registered fingerprint from their account. This puts AutoAttend in the same vein as applications such as MyClass Attendance and Chalk Attendance, but AutoAttend seeks to be a step above the normal attendance app by being completely automated and needing little to no work from either the teacher or the students.

1.3 PROBLEM

Teachers and professors spend too much time taking attendance during class, and that ends up taking time away from the students. This class time is valuable to the students because according to research by UC Berkeley, the most productive time in any course is the time actually spent in the classroom. There is no easy or accurate way to take attendance in classrooms. The teacher has to either pass around a sheet of paper or call out individual names. It is troublesome to call out and use a sheet of paper.

Current applications allow teachers to do things such as create groups to send messages to students, or create class lists that hold their student's names, which allow teachers to mark their students as absent or present. There are also websites such as Google that allow users to create surveys or forms that use QR codes that can take classroom attendance. While these websites somewhat enable attendance taking, there is still a lot of work that needs to be done by the teacher. Forms and surveys need to be created, teachers need to remember to bring up

these forms and QR codes or send them out, and students still need to be marked as present or absent. All of this can take away time that could be better suited to teaching in the classroom.

1.4 SOLUTION

Don't want to take attendance in class? No worries. AutoAttend takes away the trouble of taking attendance by using fingerprints to "check-in" students when they use the fingerprint scanner in the classroom. AutoAttend will implement an attendance check-in via fingerprint readers to ensure accurate attendance is taken on campuses. The application will be automated so the teacher can verify the student has checked into the classroom using the website after the student has signed in using the fingerprint scanner.

This will be accomplished by assigning the scanner in the classroom to the teacher within AutoAttend. Students will be able to register their fingerprint on the first day of class. Then whenever the student walks into the classroom, AutoAttend will require the student to place their finger on the fingerprint scanner to mark them as present for the teacher to see from their dashboard. When a fingerprint is registered, AutoAttend will store the student's name as well as some biometric information. That way AutoAttend can mark them as present whenever it scans their fingerprint in the classroom scanner. AutoAttend will be able to be accessed by the teacher in the classroom. The teacher will get an attendance breakdown, edit any existing or new students fingerprints, and view dashboards.

Originally the project was supposed to sign students in much the same way that your laptop automatically connects to wifi when in range, but this idea was scrapped when it became apparent that it would be too complicated to set up in the time required. In addition to a database, a network would have also needed to be created.

1.5 USER PROFILE

1.5.1 APPLICATION

AutoAttend

1.5.2 POTENTIAL USERS

- Teachers and Professors wanting to keep track of student attendance.
- Students who are scanning their fingerprints
- Administrators will have the access to all features as Students and Staff do as well as the ability to add staff to the system

1.5.3 EXPERIENCE WITH SIMILAR APPLICATIONS

- K12 Attendance
- MyClass Attendance

- Chalk Attendance
- TeacherKit
- Attendance Manager
- Attendink

1.5.4 TASK EXPERIENCE

Users open a web browser to navigate a web application. When visiting the webpage, the user selects teacher then is routed to the appropriate page accordingly. Teachers and professors will be able to view students that have scanned in, view attendance records, and edit classrooms. Students will be using the fingerprint scanners to check in to class.

Administrators will see a barebones backend version of AutoAttend where they can add accounts and view users, classes, and rooms. The administrators will be able to see the configurations.

1.5.5 FREQUENCY OF USE

This website is supposed to be for everyday use during school semesters and years for teachers and will only need to be used by students to scan their fingerprint, which will then automatically mark them as present in class. Teachers and professors will use this quite frequently, as this will be used as a tool for daily classroom attendance to mark students

absent, tardy, and present. This amounts to about 180 days a year for school students, college students, and teachers. Finally, the administrator will need to use AutoAttend to create, update, or delete any staff and remedy any back-end issues.

1.5.6 KEY INTERFACE DESIGN REQUIREMENTS THAT THE PROFILE SUGGESTS

- Quick setup guide
- Class templates
- Simple UI
- Quick effective attendance recording

1.6 USE CASE DIAGRAM

Figure 1 is the Use Case Diagram that visualizes the users involved in AutoAttend. The users include the students, staff, and the administrators.

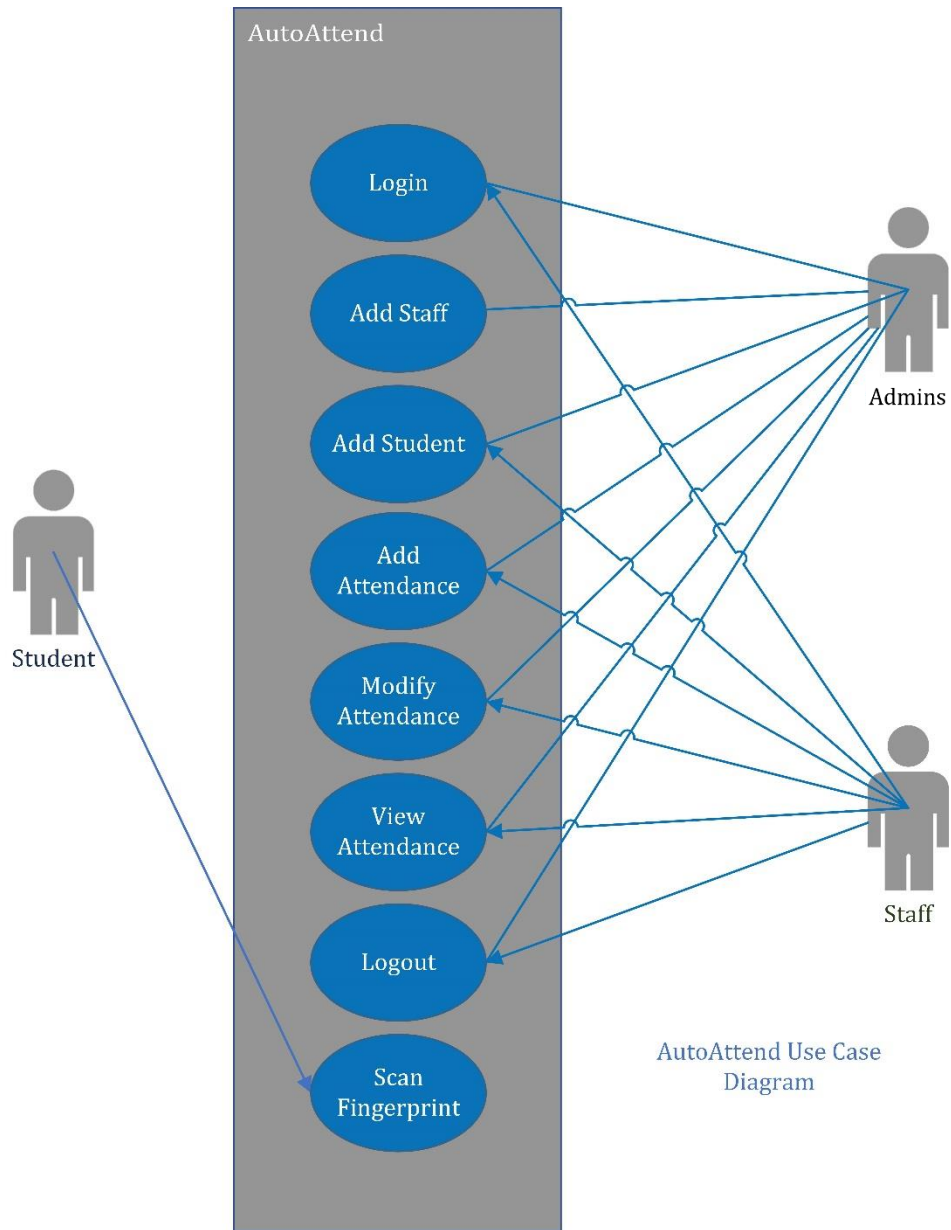


Figure 1 Use Case Diagram

1.7 REPORT OVERVIEW

The remainder of this report outlines in detail how the project was completed. The report includes the following sections: design objectives, methodology, budget, timeline, problems encountered, and future recommendations.

2. PROJECT MANAGEMENT

2.1 OBJECTIVES AND DELIVERABLES

Figure 2 is a table displaying both the Fall and Spring project deliverables and milestones. The left-hand columns show the phases and objectives the team met within the semesters. On the right-hand side is the deliverables we met for the Project Management course.

Major Project Milestones			
Fall 2019 Milestones			
Ideas and Brainstorming	9/2/2019	Team Contract Signed	9/23/2019
Project Name Determined	9/2/2019	Project Abstract Drafted	10/14/2019
Research Phase	10/28/2019	User Profile Drafted	10/21/2019
Design Phase	10/21/2019	3 Minute Elevator Speech	11/21/2019
Development Phase	11/18/2019	Fall Presentation	11/25/2019
Spring 2020 Milestones			
Testing Phase	2/3/2020	Preparation for Expo	4/6/2020
Implementation	2/3/2020	Tech Expo	4/14/2020

Figure 2 Objectives and Deliverables

2.3 BUDGET

Table 1 and **Table 2** are the Project Budget. Table 1 displays the Total Cost of Materials throughout the project. It presents the real-world costs of \$626.83, but totals to \$146.83. Table 2 shows the Simulated Total Cost of throughout the project. It presents the real-world costs of \$117,000, but totals to \$0.00, as this is a simulation.

Total Cost of Materials		
Item	Cost	Actual Cost
Fingerprint Scanner	\$74.99/unit	\$74.99/unit
AWS EC2 Instance	\$71.84/yr	\$71.84/yr
Ncheck (biometric technology)	Free	\$480/yr
Total	\$146.83	\$626.83

Table 1 Project Budget Total Cost of Materials

Simulated Total Cost of Labor for 26 weeks		
Item	Cost	Actual Cost
Programmer	Free	\$42,000
Business Analyst	Free	\$28,000
Security Analyst	Free	\$47,000
Total	Free	\$117,000

Table 2 Project Budget Simulate Total Cost of Labor

3. TECHNICAL ELEMENTS

3.1 TECHNICAL ARCHITECTURE

To have a successful application it must be based on a sound and solid design. A good design will ensure that the function of the application is effective and runs in an efficient manner. Without a sound and solid design, you will not have an effective and efficient application.

3.1.1 APPLICATION ARCHITECTURE

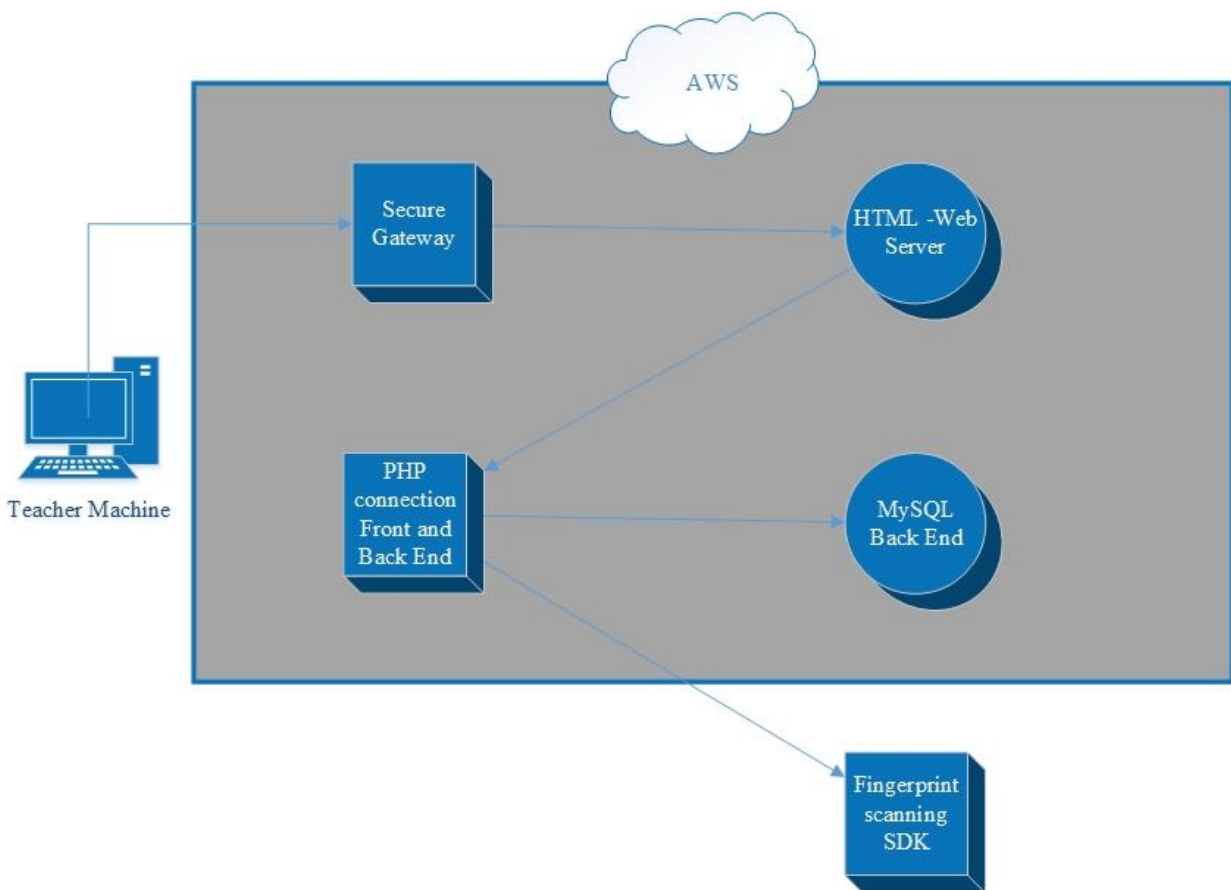


Figure 4 Application Architecture

Figure 4 shows the application architecture and software design for AutoAttend, below is a detailed breakdown of the application design.

3.1.2 WEB SITE

AutoAttend will be hosted on AWS as it is cost effective and will be easy to scale up in the future if needed. All group members were given administrative access to all elements hosted on AWS. We have purchased the domain “autoattendus.com” to point to our application. The web site is composed of HTML5 and CSS3 and uses PHP to connect to the database. All of the previously mentioned apps are hosted on an Ubuntu web server in an EC2 instance on AWS. The website includes full account capability for teachers allowing them to create an account, add students to the class with their fingerprint, change their password, and log out when they are done. Teachers will be able to view their class dashboard to see the attendance for the day as well.

3.1.3 FRONT-END LINK TO BACK-END

The main website is linked to the backend database through PHP. Both the database and web server are hosted on AWS to ensure reliable communication between the two. The website utilizes the database to store, update and retrieve any information collected through the website. Upon account creation, the database will be updated with their username as well as their salted and hashed password. The website checks with the database to ensure the login credentials exist before logging the teacher in, and will also update the password when a teacher decides to change their password.

3.1.4 DATABASE

The MySQL database, which is also being hosted on AWS, is being used to store account information as well as student fingerprint registration information passed from the website through PHP to the database. The website will reference it for the teacher's login as well as when students scan their fingerprint through the API to be marked for attendance.

3.2 USER INTERFACE

3.2.1 HOME VIEW

The home view of our website will have a description of the website and a summary of how it works. It will also include links for the teachers and students to get to their pages. This view will be simple and easy to navigate, as it will be available to all users. This will be the first page they see, so users can get an idea of how AutoAttend is set up, and what they need to do to get started.



Figure 5 Home View

3.2.3 TEACHER VIEW

The teacher view will include the same layout to keep the navigation simple and familiar for the users. From this view teachers will be able to login to create their class and view their attendance dashboard report. They will also have links to login, signup, and manage their account on any teacher page.



Hi, test. Welcome to AutoAttend.

- [View Attendance Dashboard](#)
- [Register Students to your class](#)
- [Reset Your Password](#)
- [Sign Out of Your Account](#)

Figure 6 Teacher View

1	First Name	Last Name	ID Number	checkinTime	checkoutTime
2	Nick	Stose	1	3/27/2020 19:26	3/27/2020 19:26
3	Nick	Stose	1	3/27/2020 19:56	3/27/2020 21:18
4	Nick	Stose	1	3/27/2020 21:18	3/27/2020 21:18
5	Nick	Stose	1	3/29/2020 18:33	3/29/2020 18:33

Figure 7 Teacher View Dashboard Report

3.3 TECHNICAL DISCUSSION

3.3.1 NETWORK

From the inception of AutoAttend we knew we were very likely basing most of the project in Amazon Web Services. AWS was an obvious choice based on the free tier use they supply as well as scalability for the future. We set out to create a simpler more efficient way to make attendance. This means we need a system that can be mobile enough to change class locations so obviously we need to either go with our own dedicated servers or a cloud option. Based on the size of our operation and cost factor AWS was the clear winner for our needs.

3.3.2 APPLICATION

The first idea was to take attendance through devices that were connected to the network in specific locations based off hubs. Upon further exploration we determined that would limit the reach of AutoAttend as it would make the application very network specific. We then decided to pivot to a biometric fingerprint scanner as our method to collect user's attendance. This allowed us to be much more mobile and adaptable to different systems and networks. It also helped us make attendance much harder to get around as students cannot easily fake a fingerprint as they do not have the ability to send it with a classmate like they would with something like an RFID card.

3.3.3 SECURITY

As far as security goes, we want to be as secure as possible to help prevent loopholes to cheat attendance as well as secure teacher accounts and all recorded fingerprints. For teacher account logins we are hashing and encrypting passwords to store in our database which can only be accessed by the developers. The fingerprints taken for student attendance stay on the system that the fingerprint reader is connected to locally to prevent their exposure to the internet as much as possible. Our web server and database are both hosted on AWS with the only access to them being out developer team and having all non-essential ports shut down. We have also acquired an SSL certificate to implement HTTPS for the website which we be added before the final build. As well as we plan to add two-factor authentications to teacher accounts through either biometrics or a two-factor authentication app.

3.4 TESTING

3.4.1 SCOPE OF TESTING

The scope of this testing engages the features of AutoAttend. The main features include signing into attendance with a student fingerprint, having the teachers login, and teachers previewing the attendance dashboard. The test strategy included testing each End User roles in the system used in a web browser.

3.4.2 OBJECTIVES

The Objective of AutoAttend is to replace the need of announcing student names and using pen and paper for taking attendance in class. The hope for AutoAttend is to make class time easier for teachers and professors alike when it comes to taking attendance. All test cases must be documented with pass/fail comments. Any fails must be addressed with a work item or defect report and eventually pass another test before final release.

3.4.2 LOGGING TEST AND PROCEDURES

As mentioned above any and all results will be analyzed to further improve the application. Failure conditions can include login issues, fingerprint storage errors, etc. Fail conditions will be addressed as a reported defect and the item will be worked on. The failed condition will then be tested again before any final comments and pass. All team members are required to assist in quality testing the application including meeting weekly to discuss issues or comments. The team was able to work with actual teachers and students to test the web application.

3.4.3 TEST CASES

Teacher User Login	
Steps	Expected Outcome
1. Click Teacher link	User will be redirected to the main page, where they are able to see all the students in the class
2. Enter User Credentials	
3. Click Login	

Teacher User Signup	
Steps	Expected Outcome
1. Click Teacher link	User will be redirected to the create an account page.
2. Click Sign up now	
3. Fill out the form to create the login	

Teacher User View Attendance Dashboard	
Steps	Expected Outcome
1. Click Teacher link	User will be redirected to the dashboard, where they are able to view the students who have checked into the class
2. Enter User Credentials	
3. Click View Attendance Dashboard	

Teacher User Add Student	
Steps	Expected Outcome
1. Click Teacher link	User will be redirected to the add student page, where they are able to follow screenshots to add a student using the Ncheck Bio Attendance Control Panel
2. Enter User Credentials	
3. Click Register Students to you class	
4. Follow on screen directions to open Ncheck to Add User	

4. CONCLUSION

4.1 FALL SEMESTER 2019

We believe one of the lessons learned during the Fall Semester was how quickly time can fly by, especially for deliverables. We need to continue to work ahead and prepare better for due dates on deliverables and tasks.

The team has worked extremely hard over the month of October and November by coming together and reaching out to our faculty advisers and professors. Martin was able to learn additional project management skills by developing the Gantt Chart and deliverables. Nick learned how we could utilize Amazon Web Services to host our site. He learned how to code PHP for the web site, and MySQL for the database. Liz enhanced on research skills and communication between teammates. Liz also worked directly with the course professors on getting up-to-the minute feedback on our deliverables. The team really excelled in communication and staying alert on any questions we had using our Discord server.

For our solution, the team ran into difficulties with the networking part of the project and decided to go a different direction. We collaborated on different solution types for the user-facing part. We landed on fingerprints as the way students will check-in as they arrive for class. This impacted our draft reports, logos, and other deliverables. This project has shown us that we must adapt to any issues that may arise. As the project goes on, we must anticipate any other issues that could occur.

During Spring Semester 2020, we hope to maintain the current level of teamwork and diligence. The team will continue to improve and develop the AutoAttend interface, both user and back-end. The AutoAttend team will also be attempting to add new and improved features along with testing existing ones. Security and vulnerability will become a huge task in the Spring Semester. We hope that next semester brings more exciting work to complete the overall goal.

4.2 SPRING SEMESTER 2020

The team worked extremely hard during the course of the Spring semester by working on the different parts of the project and reaching out to faculty and advisors. Martin improved his skills at document and chart design. Nick improved on website and programming troubleshooting. Liz continued to improve her skills on communicating and research skills.

We experienced a few problems that either were not resolved or were resolved soon after this paper was written. We struggled to get an SSL key for our website, one of the key components of a secure site. Our database was disconnected after an update from Amazon, though we eventually fixed this issue. We were unable to use data from our database for our presentation and had to use a Google document to represent the database. Also, thanks to the COVID-21 pandemic, some of our presentations and other assignments had to be changed to accommodate the quarantine. We also struggled with other face to face communications and had to completely rely on online connectivity.

The team has mostly finished the project, but still needs to connect the database to the project and implement more security features for the project. We also updated the colors of

our project in addition to charts and diagrams. During the end of this semester, we hope to fully complete the project with all of what needs to be updated, and end on a high note.

S. M. Čisar, R. Pinter, V. Vojnić, V. Tumbas and P. Čisar, "Smartphone application for tracking students' class attendance," 2016 IEEE 14th International Symposium on Intelligent Systems and Informatics (SISY), Subotica, 2016, pp. 227-232.