

## CHAPTER TWO

### LITERATURE REVIEW

#### 2.1 REVIEW OF RELATED WORK

[Attendance monitoring system](#) means computerized software along with special devices to capture attendance data such as arrival time, duration of absence from the section. Attendance management keeps track of your students. It is the system you use to document the time students attend lectures and the [time they take off](#). Attendance management can be done by recording names and Matriculation number on paper, using spreadsheets, punching time cards, or using online attendance software for your institution. Every organization should have an attendance management system for students. Your system needs to comply with the Fair Labor Standards Act timekeeping requirements, regardless of how you implement it (Anjola, 2023).

Attendance management systems allow you to calculate the lectures attended by students accurately. This is especially beneficial if you have students running away from lectures. Attendance management also lets the department keep track of how many days off students use without attending lectures. Sometimes, clubbed with an attendance management system is also a leave management system, which, together with attendance management software, delivers the inputs for the department (Pascua & Dellosa, 2021).

Coming back to the various attendance management software available in the market today, here's a quick outline:

A biometric attendance system essentially verifies the identity of the students and captures their time of entry and exit using his or her fingerprint. Such systems are very popular today and for good reasons. This prevents any chances of buddy punching, which leads to time leakages that can affect the productivity of an organization as a whole.

Muhammed (2019) opined that biometric systems are usually integrated with other systems to convert the data into lucid reports. This can be done easily. Such systems have also been found to be extremely cost-effective as there are no-cost heads apart from the actual biometric [machine itself](#). Adding or removing student too can be done easily, quickly and with minimum inconvenience.

Many institutions or types of organizations feel the need to track the duration of breaks taken by employees/students as the case may be. For them, break-time tracking software is just the key. With such software, employees can punch in and punch out multiple times throughout the day. The first punch-in is treated as the employee's entry into the company premises. Thereafter, every punch out and subsequent punch-ins are treated as a break from work. The time phase between each punch-out and punch-in is treated as one break. Such systems find use particularly in companies where the time spent on projects is critical.

A timekeeping system that offers a web login facility is generally known as online attendance management software. These functions use cloud technology to ensure that one's attendance data can be accessed and logins and logouts performed from virtually any location with an internet connection. Logins and logouts can also be performed with ease at the simple click of a button a convenience many employees expect in our digital age. Such systems also come in handy when you have a large part of the workforce that's working remotely, at client locations or in outbound sales roles (Anjola, 2023).

Biometrics uses unique behavioural and physical traits in humans to identify individuals. This usually involves acquiring an image of the individual's unique physical trait and comparing it with the previously stored templates in a database. This has made it possible to use biometrics in a wide range of applications and the field keeps evolving. The face, voice, fingerprints and many other physical traits have found use in a diverse range of applications. The iris is surrounded by the pupil and sclera. It is one of the most reliable physical traits that can be used for individual identification. The stable, invariant and unique nature of the fingerprint is in a special class of its own. It is a more stable biometric trait in comparison to others. The fingerprint is so unique that it is different for the left and right of the same individual (even twins) (Adams, 2023).

Biometric based attendance systems attracted the user because of its accuracy. It is found in many real time applications. The development of the fingerprint-based attendance system is usually done using Linux platform. In this approach, the attendance system using Linux based Raspberry Pi has been proposed since Linux can support complex programming or working. The process is initiated with the database creation through fingerprint reader and proceeds with the recognition and authentication using the given system. The entire process is done on raspberry Pi platform. This paper presents the standardized fingerprint authentication model which is able to extract the finger print of the individual and test it with the stored database. Also, it provides daily and monthly attendance to the teachers and sends monthly attendance and marks to parents.

Srinidhi (2022) proposed the main purpose of this paper is to develop a safe and secure web-based attendance monitoring system using Biometrics and Radio Frequency Identification (RFID) Technology based on multi-tier architecture, for both computers and smart phones. There is a functionality of automatic attendance performance graph in the system, which gives an idea of the student's consistency in attendance throughout the semester.

Bolle (2022) proposed the task of extracting knowledge from the given palm. They provide the identification method from fingers.

Muhammed (2020) proposed that how accurate our measurements can be with respect to resolution of the image taken. He proposed that hand biometrics have been developed by using different metrics Anjola (2023), in this research he proposed hand features that are extracted from a color photograph taken when the user has placed his hand on a platform designed for such a task. Different pattern recognition techniques have been tested to be used in classification and/or verification from Euclidean distance to neural networks

Unnati *et al.*, (2019) developed a student attendance management system using RFID and face recognition. The paper reviews various computerized attendance management system. In the system basic problem of student attendance management was defined which is traditionally taken manually by faculty. One alternative to make student attendance system automatic is provided by Computer Vision. In the paper they reviewed the various computerized system which is being developed by using different techniques. Based on this review a new approach for student attendance recording and management was proposed to be used for various colleges or academic institutes.

Saidot *et al.* (2018), in their study, biometric attendance monitoring system using raspberry PI and Fingerprint was proposed a biometric technology based on Internet-of-things (IoT) with the encrypted biometric information stored on the cloud using Raspberry Pi and authentication created through biometric services as the host on cloud.

Eze and Uzoechi (2019) worked on design of a biometric attendance system with online monitoring for a university system. The study developed a system that combines fingerprint Attendance system with remote monitoring for staff and students of institutions of higher learning. The system was also developed to be web-based with real-time remote monitoring interface with the capability to enable the management to view staff as they check-in and out of the system. The study emerged as a result of the absence of staff and students in classes resulting in the poor quality of graduates turned out.

Bhise *et al.* (2020) proposed an attendance system using NFC technology with an embedded camera on mobile devices. The need to provide a better means of evaluating student's attendance necessitated this study; the developed system was based on NFC technology and run on a mobile application. Adewole *et al* (2017) worked on the study development of fingerprint biometric attendance system for non-academic staff in a tertiary institution. The study identified the need to migrate from the manual means of taking attendance to an automated one to improve the productivity of the institution.

## **2.2 REVIEW OF RELATED CONCEPTS**

### **2.2.1 Palm Print**

A palm print refers to the unique pattern of ridges, lines, and textures on the inner surface of the human palm. It is a biometric trait used to identify individuals due to its distinctive features, which remain consistent over a person's lifetime. Palm prints are considered a reliable modality in biometric systems, as they contain abundant information such as principal lines, wrinkles, and texture patterns.

#### **2.2.2 Palm Print Recognition Techniques**

Palm print recognition involves several stages to identify and authenticate individuals based on their unique palm patterns. The process begins with image acquisition, where palm images are captured using devices such as cameras, scanners, or contactless sensors. This stage is critical to ensure uniform lighting, proper positioning, and a clear background for accurate results. Once the image is captured, preprocessing techniques are applied to enhance its quality. These include noise reduction, contrast adjustment, and segmentation to isolate the palm region from the background. Alignment methods are also used to address variations in palm orientation and positioning.

Feature extraction is the next step, where unique patterns such as principal lines, wrinkles, and textures are identified. Line-based methods focus on extracting major lines and ridges, while texture-based methods use wavelet transforms or Gabor filters to analyze the palm's surface texture. Statistical approaches, including local binary patterns and histograms, provide additional detail. Deep learning techniques, such as convolutional neural networks (CNNs), have recently been employed to automatically learn and extract complex patterns from palm prints.

#### **2.2.3 Palm Print as a Biometric Identifier**

Palm prints serve as a reliable biometric identifier due to their unique and stable patterns. Unlike fingerprints or facial features, palm prints provide a larger surface area, offering more features such as lines, ridges, and minutiae points for identification. These features are consistent throughout a person's lifetime, enhancing their reliability. Palm prints are also resistant to fraudulent replication, as their intricate patterns are difficult to forge. Additionally, the non-intrusive nature of palm print recognition makes it a user-friendly alternative, avoiding direct contact and addressing hygiene concerns.

Compared to other biometric modalities, palm prints offer significant advantages. They are less affected by external factors such as skin conditions or facial expressions and provide a balance of security and usability. This makes them suitable for applications where both accuracy and user comfort are priorities.

#### **2.3.4 Applications of Palm Print Technology**

Palm print recognition has diverse applications across various industries. It is widely used for attendance management in educational institutions and workplaces, where it automates the process and ensures accuracy. In access control systems, it enhances security by providing a reliable method for identity verification. The healthcare sector employs palm print technology for patient identification, reducing errors and improving service delivery. In banking and finance, it serves as a secure method for customer authentication, facilitating safe transactions.