

CHAPTER 1

INTRODUCTION

Tequed Labs is a research and development centre and educational institute based in Bangalore. The company's primary focus is on providing quality education on latest technologies and develop products which are of great need to the society. They also involve in distribution and sales of latest electronic innovation products developed all over the globe to their customers. They run a project consultancy where they undertake various projects from wide range of companies and assist them technically and build products and provide services to them. They are continuously involved in research about futuristic technologies and finding ways to simplify them for their clients

Research and development includes activities that companies undertake to innovate new products and services. It is often the first stage in the development process. The goal is to take new products and services to market and add to company's bottom line.

The research and development is typically not performed with expectation of immediate profit. Instead it is expected to contribute to the long-term profitability of a company. Companies that set up and employ R&D departments commit substantial capital to the effort. They may lead to patents, copyrights and trademarks as discoveries are made and products are created.

CHAPTER 2

OVERVIEW OF THE ORGANIZATION

2.1 BRIEF HISTORY

Tequed Labs Private Limited is a Private incorporated on 22 January 2018 . It is classified as Non-govt company and is registered at Registrar of Companies, Bangalore. It mainly focuses on providing quality education on latest technologies and develop products that are of great need to the society.

The principals of Tequed labs are as follows:

- Zeal to excel and zest for change.
- Integrity and fairness in all matters.
- Respect for dignity and potential of individuals
- Strict adherence to commitments.
- Ensure speed of response.
- Faster learning, creativity and team-work.
- Loyalty and pride in the company.

2.2 BUISNESS SIZE

Tequed labs is focused on providing quality education on latest technologies and develop products which are of great need to the society. They also involve in distribution and sales of latest electronic innovation products developed all over the globe to their customers. They run a project consultancy where they undertake various projects from wide range of companies and assist them technically and build products and provide services to them.

Tequed labs is a firm held under private ownership. This company issues stock and have shareholders, but their shares do not trade on public exchange and are not issued through an initial public offering.

Tequed labs is a private incorporated on 22nd January 2018. It is classified as non-govt company and is registered at registrar of companies in Bangalore. Its authorised share capital is Rs 500,000 and its paid-up capital is Rs 500,000. Its business size is up to six crore per annum.

2.3 PRODUCT LINES

In the quest to be world-class, TEQUED LABS pursues continual improvement in the quality of its products, services and performance leading to total customer satisfaction and business growth through dedication, commitment and team work of all employees.

They have developed a smart headgear which can give the location of accident when the rier has experienced threshold force. This work was awarded state's best innovation in IOT domain. This project was the world finalist in the international innovation challenge called MASTERPIECE in Dubai. It has been exhibited in NASSCOM Product Conclave and has received great appreciation from IT giants. This product has been patented bearing a patent number -201741034208.

They have developed a women's safety device which sends the location of the woman in distress to the nearby police station. This work was highly appreciated by the police department and the market ready product is going to be launched soon. This product won the best ICT category project award in a state level exhibit and was exhibited at NASSCOM PRODUCT CONCLVE 2017.

Their other research work includes development of a device for blind which can recognize objects and convert it into speech. This innovation has a lot of potential in helping the blind people.

Their other products include: -

- Automation of production line and remote quality control monitoring system.
- Development of mobile app and website for sales of artistic and antique products.
- Development of an energy conservation system for paper machineries.
- Development of an analytic tool for software based vehicle condition analysis for resales.

2.5 BRIEF SUMMARY OF ALL THE DEPARTMENTS:

Tequed Labs help enterprises harness the power of the Internet of Things (IoT) and advanced analytics using world-class assets, capabilities and global resources of their combined organizations. Specifically, they draw on Tequed Lab's transformative horizontal and industry-specific IoT solutions integrated with the Microsoft Azure IoT Suite to provide their clients with turnkey IoT Solutions-as-a-Service, along with the enabling cloud infrastructure and software stack. According to Tequed Lab Research, executives believe the IoT will impact many areas of their business in the next three years.

Their comprehensive solutions enable enterprises across a broad range of industries to realize the benefits of IoT through a proven, industrialized approach offering speed to market, security, and scalability.

- Connected Asset Management empowers enterprises across multiple industries including large industrial and manufacturing companies, oil and gas facilities, and OEMs—to proactively manage their assets, make quicker and more informed decisions and optimize business processes by unlocking digital content, specialized analytics and prescriptive actions and insights.
- Connected Mine helps mining companies connect operations from mine-to-market, maximize existing assets and investments and reduce operating costs.
- Connected Fleet enables enterprises to track an entire fleet in real-time, manage logistics, improve driving behaviours, increase operational efficiency and help maximize the total value of the fleet lifecycle through the power of telematics.
- Connected Campus helps enterprises, hotels, hospitals and other large venues improve their facility management processes by combining and integrating multiple functions into a single, integrated solution with preconfigured digital services, including management of office space and buildings, access and security, value added services (e.g., taxis, parking), wayfinding, energy and sustainability as well as and health and safety.

Tequed Labs is very keen in developing IOT products because they believe that IoT-enabled products will soon touch every aspect of our physical lives. They work with a thought process that today we already have sensor-equipped industrial equipment powered by AI.

Medical devices that self-diagnose and send alerts to their operators. Automobiles that engage new features and improve efficiency by updating their software. And very soon refrigerators that help you figure out what you could have for dinner and ovens that know how to cook it.

They keep in mind that whatever your industry and whatever customers you serve, the key to succeeding in the new world of digital is getting your best ideas to market that connect you with the physical world. That means understanding how to engineer a connected enterprise built on human and business insights to identify opportunities for the greatest return and then build the robust architecture, processes, and governance models required to realize that return.

Tequed Lab's IoT advisory approach, combined with digital and engineering experts, helps companies seamlessly bridge the physical and digital worlds to create connected solutions at scale.

Their innovative applications and state-of-the-art mechanization tools leverage Internet of Things (IoT), Big Data, Cloud, Mobility, and Data Analytics to improve Agri- supply chain parameters, including milk production, milk procurement, cold chain, animal insurance and farmer payments. Their IoT router and in-premise IoT Controller acquire data via sensors that are embedded in Milking Systems, Animal Wearables, Milk Chilling Equipment & Milk Procurement Peripherals, and transmit the same to Big Data Cloud Service Delivery Platform (SDP) where the suite of applications analyse and crunch the received data before disseminating the Analytics & Data Science outcome to various stakeholders over low-end and smart mobile devices. The patent pending hardware and software is designed to scale horizontally across other industry verticals.

CHAPTER-3

PLAN OF THE INTERNSHIP PROGRAM

3.1 BRIEF INTRODUCTION OF BRANCH OR DEPARTMENT WHERE I PERFORMED MY INTERNSHIP:

I did my internship at Tequed Labs Private Limited is a Private incorporated on 22 January 2018 . It is classified as Non-govt company and is registered at Registrar of Companies, Bangalore. It mainly focuses on providing quality education on latest technologies and develop products that are of great need to the society.

3.2 THE STARTING AND END DATES OF THE INTERNSHIP:

It was a one-month internship programme. It started from **07 January, 2020** and went on to complete by **06 February,2020**. During this course of time, I was allotted a team with a project to work on.

CHAPTER 4

TRAINING PROGRAM

4.1 Duties and responsibilities performed:

During my internship, I was allotted a project to work within a team. Since it was an integrated work of Face Recognition Based Attendance Management System, I was working on with my teammates. Initially, we did a survey on the requirements. We then proceeded to the outline of the development, collection of the required data and a study on the algorithm required during the first week of week. During the next week, I did a study on gradle and components of android studio and focused on the front end while my teammates worked on the back end. After that, the work proceeded with the design phase which lead to the development of the home page by the end of the second week.

During the third week, I focused in the section of student module where I primarily worked on the code development for the registration and login. This is an important and useful feature from the student point of view where our aim was to make it easier for the students to view their academic and personal details. As we all know that keeping track of academic details is useful for the students, the feature has been made as easier as possible for the students to deal with. Simultaneous work was also carried out for the faculty and HOD login, faculty module as well as designing the menu. In the last week, I finally worked with my teammates for connecting front end and backend.

CHAPTER 5

LEARNING EXPERIENCES

- a) **Knowledge acquired:** The knowledge I have gained in our training is about Machine Learning. I have learnt many things on Computer Vision as well. While working on technologies related to machine learning, it really enriched my knowledge about Jupyter note book and programming languages like python. It has been a great technical learning experience as it taught me a lot about various algorithms in machine learning and appropriate use of it and really improved my technical knowledge and skills.

- b) **Skills learned:** I have learned to work well as a team. Another side that I learned throughout my internship is to never be afraid to ask doubts. By asking questions I got answers. I learnt to read the use-cases and understand the need and analyse the problem and find solution to it. I had worked projects in group and group discussion helped me a lot in finding the solution because team work helps to get more ideas. Internships give students that hands-on experience they need. I feel that worth internships are essential to develop key skills. It helped support my knowledge of responsibility, focus, energy and motivation.

- c) **Observed attitudes and gained values:** The value that I have gained is to always work hard even if the task is small and it seems unimportant. It helped me to build a good work idea, and the effort could be seen. Co-workers had a lot of experience and I have talked to them and asked some advice they have for me. I could learn a lot and get more ideas. I think this internship is extremely cherished to me. Internship enhanced my skill and ability to work in a team. Internship allowed me to gain experience and develop interpersonal skills which made me an attractive candidate.

- d) **The most challenging task performed:** The most challenge task was to learn to work with resilience and patience. While working on the logic of face recognition, I really felt that I might not be able to achieve with what I wanted to with the results but after tireless work, it has all been worth it. Also, to sit for hours without much break and to continuously work towards the development of the project was challenging as well but it moulded me in a better way.

CHAPTER 6

STRENGTH, WEAKNESS, OPPORTUNITIES, THREAT(SWOT) ANALYSIS

STRENGTH

From doing this internship, it helped me in identifying my strengths, weakness, the opportunities and the threats. It also means that we have learned many things. My strength in the internship is that I am a good team builder. We worked with the superior and the staffs. We worked in a team. As a member of team, I am responsible in group discussion and giving my own opinions. If there was anything that I am not able to understand I would ask, besides that I am a cooperative person. I can give cooperation to anyone. I am also approachable and an easily adaptable person because I can approach the branches staff and I am able to adapt with different situation easily.

WEAKNESS

My weakness during internship were, I was not comfortable to work under pressure. Before this, I thought I am someone that is competent to work under pressure. Since I am still new in the field, I am lacking in terms of planning, making decisions and business plan. I am quite weak in receiving information therefore I need to carefully listen to what guide briefs out to me and I need to take note immediately what has been assigned to me.

OPPORTUNITIES

The opportunities that I have gained from this internship are, I was able to gain more experience and knowledge, and also build a relationship with teammates. I am not a tough person but since I am working in internship, it demanded me to embrace myself in dealing with everyone. In fact, I think this is among the best things I had experienced. Moreover, I was able to increase my knowledge.

THREATS

Threats arises when conditions in external environment affects the reliability and profitability of the organization's business, they compound the vulnerability when they relate to the weakness. Threats are uncontrollable like unrest among employees, ever changing technologies, increasing competition leading to excess capacity, price wars and reducing industry profits. During this internship we decided to do project on java but due to change in technologies, we executed the project using web development technologies.

CHAPTER 7

PROBLEM IDENTIFICATION AND SOLUTION

7.1 Problem identification:

Attendance plays a very important role in educational organization.

- The problem arises when we think about the traditional process of taking attendance in class room which is time consuming.
- So the use of automatic attendance system using machine learning which can solve the above problem.
- The system can be also implemented during exam sessions or in other teaching activities where attendance is highly essential. This system eliminates classical student identification.

7.2 Consequences of the current problem:

7.2.1 Existing System

3.1 Fingerprint Based recognition system:

In the Fingerprint based existing attendance system, a portable fingerprint device need to be configured with the students fingerprint earlier. Later either during the lecture hours or before, the student needs to record the fingerprint on the configured device to ensure their attendance for the day. The problem with this approach is that during the lecture time it may distract the attention of the students.

3.2 RFID (Radio Frequency Identification) Based recognition system:

In the RFID based existing system, the student needs to carry a Radio Frequency Identity Card with them and place the ID on the card reader to record their presence for the day. The system is capable of to connect to RS232 and record the attendance to the saved database. There are possibilities for the fraudulent access may occur. Some are students may make use of other students ID to ensure their presence when the particular student is absent or they even try to misuse it sometimes.

3.3 Iris Based Recognition System:

In the Iris based student attendance system, the student needs to stand in front of a camera, so that the camera will scan the Iris of the student. The scanned iris is matched with data of student stored in the database and the attendance on their presence needs be updated. This reduces the paper and pen workload of the faculty member of the institute. This also reduces the chances of proxies in the class, and helps in maintaining the student records safe. It is a wireless biometric technique that solves the problem of spurious attendance and the trouble of laying the corresponding network.

7.2.2 Disadvantages of Existing System

- It is a manual and tedious process where the teacher makes the roll call for every student.
- It's a time-consuming process.
- It's also prone to proxy attendance in traditional way of taking attendance.

7.3 Solutions

7.3.1 Proposed System

The task of the proposed system is to capture the face of each student and to store it in the database for their attendance. The face of the student needs to be captured in such a manner that all the feature of the students' face needs to be detected. There is no need for the teacher to manually take attendance in the class because the system records a video and through further processing steps the face is being recognized and the attendance database is updated. The proposed system has two main tasks namely face detection and face recognition.

1.Face Detection.

Face detection is a technology capable of identifying a face of a person from a digital image or video frame. Here we make use of Haar cascade classifier for face detection.

Haar cascade classifier is based on Viola Jones detection algorithm which is trained with given some input faces and non faces .

Viola face detection algorithm

a. Haar features

It is similar to convolution kernels which is used to detect the presence of particular feature in an image. The features can be of three types namely edge features, line features, four rectangular features. When Haar feature is applied to face, each feature results in a single value which is calculated by subtracting white rectangle by black rectangle. It considers a 24*24 as a base window size and calculates about 1,60,000+ features. In order to avoid calculation of redundant features we use

b. Ada boost

It is used to remove redundant features and choose only relevant features. Each of the weak classifier is relevant detecting a part of face output of weak classifier binary. It calculates strong classifier as linear combination of these weak classifiers

$$F(x) = \text{summation}\{A_i * F_i(x)\}$$

A_i = weights of each weak classifier $F_i(x)$

c. Cascading

In 24*24 window, we need only 2,500 relevant features. The basic principle of Viola Jones detection algorithm is to scan the detector many times through the same image, each time with a new size.

2. Face Recognition

Face recognition is done using LBPH algorithm.

Local Binary Pattern (LBP) is a simple yet very efficient texture operator which labels the pixels of an image by thresholding the neighborhood of each pixel and considers the result as a binary number.

1. Parameters: the LBPH uses 4 parameters:

- Radius: the radius is used to build the circular local binary pattern and represents the radius around the central pixel. It is usually set to 1.

- Neighbors: the number of sample points to build the circular local binary pattern. Keep in mind: the more sample points you include, the higher the computational cost. It is usually set to 8.
- Grid X: the number of cells in the horizontal direction. The more cells, the finer the grid, the higher the dimensionality of the resulting feature vector. It is usually set to 8.
- Grid Y: the number of cells in the vertical direction. The more cells, the finer the grid, the higher the dimensionality of the resulting feature vector. It is usually set to 8.

2. Training the Algorithm:

First, we need to train the algorithm. To do so, we need to use a dataset with the facial images of the people we want to recognize. We need to also set an ID (it may be a number or the name of the person) for each image, so the algorithm will use this information to recognize an input image and give you an output. Images of the same person must have the same ID. With the training set already constructed, let's see the LBPH computational steps.

3. Applying the LBP operation:

The first computational step of the LBPH is to create an intermediate image that describes the original image in a better way, by highlighting the facial characteristics. To do so, the algorithm uses a concept of a sliding window, based on the parameters radius and neighbors.

4. Extracting the Histograms:

Now, using the image generated in the last step, we can use the Grid X and Grid Y parameters to divide the image into multiple grids.

5. Performing the face recognition:

In this step, the algorithm is already trained. Each histogram created is used to represent each image from the training dataset. So, given an input image, we perform the steps again for this new image and creates a histogram which represents the image.

So to find the image that matches the input image we just need to compare two histograms and return the image with the closest histogram.

The dataset is managed using excel files and statistics by GUI. Dataset of our project consists of USN, name, date and time of student attending the lecture. File name is Subject name followed by Date and time of commencement of class. File is saved in .csv format.

7.3.2 Advantages of Proposed System

- The proposed system is an automated process.
- The entire attendance process will be completed in few seconds.
- Advanced data analytics helps predict and visualise students attendance statistics.

7.3.3 System Architecture

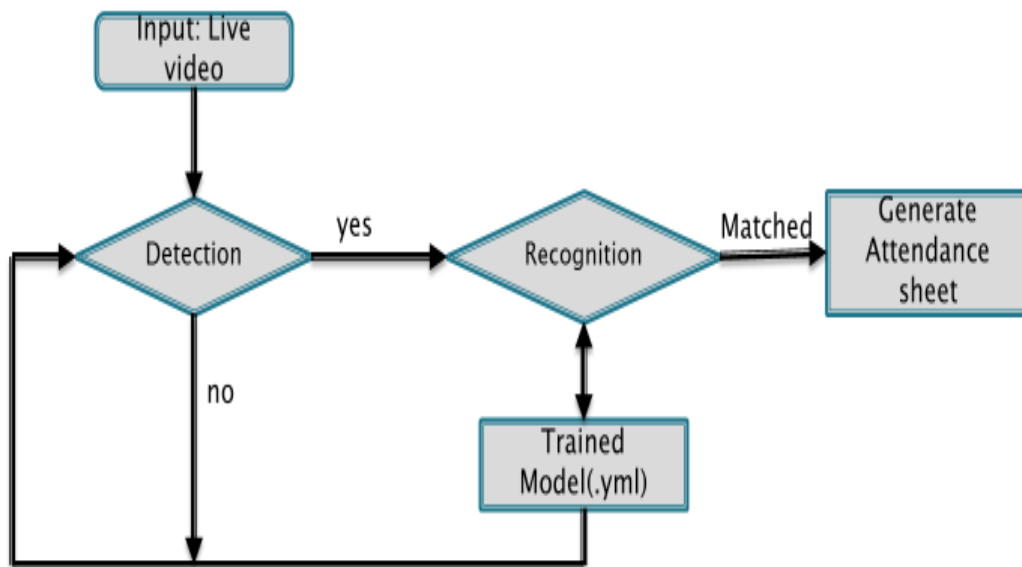


Figure 6.1: System Architecture

7.4 System Requirements

7.4.1 Hardware Requirements

System	:	Pentium Dual Core.
Hard Disk	:	120 GB.
Monitor	:	15'' LED
Input Devices	:	Keyboard, Mouse
Ram	:	1GB.

7.4.2 Software Requirements

Operating system	:	Windows 7.
Coding Language	:	Python 3
Packages	:	Open CV

CHAPTER 8

CONCLUSION

- Saving time, cost and resource are some of the main benefits we get through automated attendance system. It also reduces human efforts which helps teachers to get more time for teaching.
- Authorities can easily generate systematic reports on a weekly or monthly basis and take timely decisions.
- Technology updates like Artificial Intelligence and Machine learning is reshaping the world which helps you to have information at your fingertips.

CHAPTER 9

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