Enhanced Analytic System for Smart University Assistance

A Project Ideation Report

Submitted to

Career Advisory and Augmentation School
Kalinga Institute of Industrial Technology Deemed to be University
Bhubaneswar

In partial fulfilment of the requirement for the Award of
Bachelor’s Degree in Computer Science and Communication Engineering.

By

Navonaya Brahmachari	1729037
Rahul Bordoloi	1729048
Ritwik Das	1729054
Saptarshi Mazumdar	1729058
Suranja Bakshi	1729228

UNDER THE GUIDANCE OF:

Prof. Rajdeep Chatterjee

April, 2020

Table of Contents

1. Chapter 1

2. Chapter 2

3. Chapter 3

4. Chapter 4

Chapter 1

1.1 Introduction

Often after higher secondary results students find themselves in a turmoil in deciding what stream of engineering is best suited for them. BEFRIEND aims to be a guide. It will provide students an easy and user friendly platform available in both web and mobile application formats where students can enter their marks and the entrance exam rank. Implementing Data Analytics on the input, it will provide the best choice for the student.

Moreover, the pre-final and final year students face difficulty in opting the right field or domain for their career paths to grow. BEFRIEND will help them make this decision.

The classical process of allocating rooms to the borders is completely manual and it takes a lot of time and effort to provide the confirmed rooms to borders due to which the students face a lot of problems. BEFRIEND simplifies the process. Here the students can enter their preferences (2/3 bedded, AC/Non-AC, Attached/Non-attached washroom) and based on the availability of rooms, hostels will be allocated to them.

Its main aim is to be a 24x7 guide for students. To facilitate this, the portal will have an event scheduler where a student can keep track of his/her due academic projects, assignments, quizzes and also non-academic activities. In this way, they can efficiently manage their time between the two. Along with a lot of other functionalities, it will also contain a notice board displaying daily notifications and important announcements so that students can keep track of the latest happenings around the campus.

1.2 Mission Statement

In student life, time management plays a crucial role. With rapid changing needs of a dynamic world market, a student must have lateral development. However, due to lack of planning and relevant information, the student loses track in vast overflowing data present all around him/ her. Being new to college, the first year students are unable to cope up with the unfamiliarity of the new surroundings. This leads to improper utilization of their full potential as a good amount of time is wasted on building faith and checking for the relevance and validity of the information source.

Few years back a computer engineer's task was to manage and deal in hardware and software components. However, with passage of time and advancement of technology, the task has diversified. Due to the presence of varied domains in the IT sector, many final year students get deviated and are unable to decide on which domain is best suited for them to pursue as a career.

1.3 Mission Objective

Our aim is to build a complete self-adapted system that deals with several problems together without manual interference. Using all sub-systems integrated in a single platform will make it more robust and efficient both in terms of technology and time management. The auto-correlated system we aim to build provides a solution by taking output of a sub-system as an input to the other one.

1.4 Project Goal

- ➢ Suggesting freshers the branch that is most suitable for them
- ➢ To simplify the process of allotment of hostel to students
- ➢ A virtual static Mentor Bot to reduce workload.
- ➢ Career recommendation to under-graduate engineering students for higher education
- ➢ To-do list for assignments and other tasks
- ➢ Self-monitoring system- to check progress and learning curve after each semester
- ➢ Notify students about all latest notices and events hosted by KIIT and KISS
- ➢ Daily schedule to keep up the learning pace of students, includes class routines, class tests and quizzes.
- ➢ Voice detection to ensure the students emotional state is stable.
- ➢ Creation of platform where alumni of KIIT can be participate in discussions with their batch mates.

1.5 Features

1. Completely self-adapted system.
2. Multiple utility platform.
3. Secure and reliable.
4. State-of-the-art tools and platforms are used to get consistent and accurate results every time.
5. User-Friendly interface.
6. Available in both web and mobile application interface.

Chapter 2

2.1 Literature Survey

2.1.1 Rise of Automation

Smart assistants like Siri and Alexa were in every home. Making tasks easier by grouping the photos, scheduling your daily commute, weather etc. The possibilities were just endless. Suddenly the large influx of powerful smart devices and bandwidth of data, we had more data created over this decade than we ever had in the whole human life-time. This was the boom required for automation. Moreover, the fear that automation would take away jobs is gone, in fact more and more jobs are being created to use this massive data and make our lives easier and discover new ways.

There is no denying that the future looks to be automated and in fact it’s up to all of us to use this new found knowledge to advance the human civilization to their greatest peak ever. The future is exciting and we have no idea how far the smart and interactive AI can further take us, but we shouldn’t forget the small but important history of automation.

2.1.2 Machine Learning

Machine learning is the study of computer algorithms that gives computers the ability to perform tasks without explicitly programming them to do so. This is a somewhat basic definition of it. Tom Mitchell provides a more modern definition: "A computer program is said to learn from experience E with respect to some class of tasks T and performance measure P, if its performance at tasks in T, as measured by P, improves with experience E."

Example: playing checkers.

E = the experience of playing many games of checkers

T = the task of playing checkers.

P = the probability that the program will win the next game.

Machine Learning is broadly classified in two types

1) Supervised Learning: In supervised learning, we are given a data set and already know what our correct output should look like, having the idea that there is a relationship between the input and the output. It is further divided into two parts,

Regression: we try to predict results within a continuous output, meaning that we are trying to map input variables to some continuous function.

Classification: we try to predict results in a discrete output. In other words, we are trying to map input variables into discrete categories.

Example

(a) Regression - Given a picture of a person, we have to predict their age on the basis of the given picture

(b) Classification - Given a patient with a tumor, we have to predict whether the tumor is malignant or benign.

2) Unsupervised Learning: Unsupervised learning allows us to approach problems with little or no idea what our results should look like. With unsupervised learning there is no feedback based on the prediction results. It is also divided into two parts,

Clustering: Structure is derived by clustering the data based on relationships among the variables in the data.

Non-Clustering: We can derive structure from data where we don't necessarily know the effect of the variables.

Example

(a)Clustering: Take a collection of 1,000,000 different genes, and find a way to automatically group these genes into groups that are somehow similar or related by different variables, such as lifespan, location, roles, and so on.

(b)Non-clustering: The "Cocktail Party Algorithm", allows you to find structure in a chaotic environment. (i.e. identifying individual voices and music from a mesh of sounds at a cocktail party).

The use of ML algorithms is widely used nowadays and is one of the fastest growing and lucrative careers now. Fraud detection, Spam detection in mails, Anomaly detection, Prediction of weather, prices, insurance, market stocks. The list is endless. Be it your phones or laptops or even the street lights. ML has brought automation to the forefront.

Relevance of ML in this project

Machine Learning tools and algorithms are becoming more and more powerful day by day giving us faster processing time and more accurate results. This project aims to utilize this enormous computational capability for the benefit of students.

When a student inputs his/her marks in the various subjects in his +2 and entrance exam rank , The algorithm will first check if he/she fulfills the basic criteria for admission(For example PCM > 65). If they do, then the algorithm will check their marks in various subjects and will relate to the relevance of each subject for a stream and based on that, the best suited stream will be displayed to them. Moreover their rank in the engineering entrance exam will also carry a weightage. A higher rank will indicate a higher probability of getting a more demanded stream (like Computer Science, Electronics etc.)

Similarly for final year students, analyzing various factors like Logical Ability, Aptitude, expected pay, GPA in various semesters, interests etc., it will try to provide them the best suited domain for them to pursue as a career.

2.1.3 Android Application

Android software development is the process by which new applications are created for devices running the Android operating system. Android apps can be written using Kotlin, Java, and C++ languages using the Android software development kit (SDK), while using other languages is also possible. All non-JVM languages, such as Go, JavaScript, C, C++ or assembly, need the help of JVM language code that may be supplied by tools, likely with restricted API support. Some programming languages and tools allow cross-platform app support (i.e. for both Android and iOS). Third party tools, development environments, and language support have also continued to evolve and expand since the initial SDK was released in 2008. The official Android app distribution mechanism to end users is Google Play. It allows staged gradual app release, as well as distribution of pre-release app versions to testers.

ANDROID SDK

The Android software development kit (SDK) includes a comprehensive set of development tools. These include a debugger, libraries, a handset emulator based on QEMU, documentation, sample code, and tutorials. Android applications are packaged in .apk format and stored under /data/app folder on the Android OS (the folder is accessible only to the root user for security reasons). APK package contains .dex files (compiled byte code files called Dalvik executables), resource files, etc.

Android powers hundreds of millions of mobile devices in more than 190 countries around the World. It's the largest installed base of any mobile platform and is growing fast. Every day more than 1 million new Android devices are activated worldwide. Android has been the best-selling OS worldwide on smartphones since 2011 and on tablets since 2013. As of May 2017, it has over two billion monthly active users, the largest installed base of any operating system, and as of January 2020, the Google Play Store features over 2.9 million apps.

Relevance of Android application in this project

Carrying a laptop on every occasion is not feasible as well as practical. In today’s world, almost everyone carries an android smartphone in their pockets. Hence to increase mobility and efficiency of our project, an android app based version of BEFRIEND will be implemented along with the web version. The android application would act as a frontend component giving students a user-friendly and GUI-based platform to work upon. This will allow students to keep track of their activities on-the-go with just a simple tap on their smartphones.

2.1.4 Web Technologies

Web development is the work involved in developing a website for the Internet (World Wide Web) or an intranet (a private network). Web development can range from developing a simple single static page of plain text to complex web-based internet applications (web apps), electronic businesses, and social network services. A more comprehensive list of tasks to which web development commonly refers, may include web engineering, web design, web content development, client liaison, client-side/server-side scripting, web server and network security configuration, and e-commerce development.

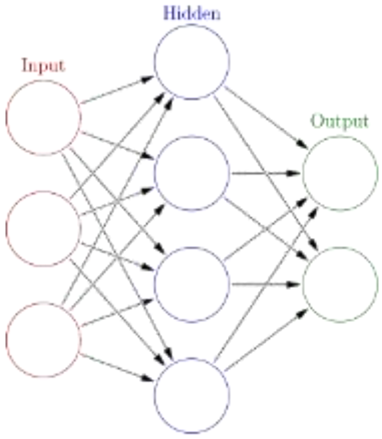
Among web professionals, "web development" usually refers to the main non-design aspects of building websites: writing markup and coding. Web development may use content management systems (CMS) to make content changes easier and available with basic technical skills.

For larger organizations and businesses, web development teams can consist of hundreds of people (web developers) and follow standard methods like agile methodologies while developing websites. Smaller organizations may only require a single permanent or contracting developer, or secondary assignment to related job positions such as a graphic designer or information systems technician. Web development may be a collaborative effort between departments rather than the domain of a designated department. There are three kinds of web developer specialization: front-end developer, back-end developer, and full-stack developer. Front-end developers are responsible for behavior and visuals that run in the user browser, while back-end developers deal with the servers.

Relevance of Web Technologies in this project

Since web is the most convenient and user friendly method for providing a useful interface, and it's compatible with most of the other technologies which pace up the complete integration procedure and helps to achieve reliability, use of a dynamic website could be the ultimate solution binding every elements in front of user. That's what use of web was preferred over other interfaces for this project.

2.1.5 Deep Learning



This is a subset of Machine Learning. Here the algorithms are built by being inspired from biologically inspired neural networks of the brain. Compared to traditional ML models Deep Learning (DL) models are very flexible and without the need to program for any task specific activity they can perform many operations. They learn to perform tasks by considering the examples (data) given to it without the need for output hard code. Neural Networks are the underlying backbone and architecture of Deep Learning. No matter what task the model is to perform, it will use a neural network. Each layer consists of nodes (just like synapses in a brain) and are connected to the other layers. The data is fed into these layers along with underlying weights and other parameters. The weights modify and change themselves to better adapt to the data to give a result that we wish to train the network to using differential calculus and integration. The model then gives an output on the data which we haven't seen earlier, after n number of times the model has been trained to better 'fit' or understand the data.

The type of deep learning model and neural network we use is referred to as architecture. Different tasks use different types of neural network architectures. As such there is no hard and fast rule which to use, but pertaining to accuracy and fitness of the task there are some commonly used Deep Learning Architectures.

Relevance of Deep Learning in this project

Along with Machine Learning, few built algorithms are also tested to achieve reliability on models used for prediction. In most of the cases we found similar accuracies for multiple algorithms in small number of epochs. For similar type of predictions and calculation of Fuzzy Vectors, Deep Learning is also used to get a comparative analysis.

2.1.6 Cloud Technology

Cloud computing is the on-demand availability of computer system resources, especially data storage and computing power, without direct active management by the user. The term is generally used to describe data centers available to many users over the Internet. Large clouds, predominant today, often have functions distributed over multiple locations from central servers. If the connection to the user is relatively close, it may be designated an edge server. Clouds may be limited to a single organization, or be available to many organizations. Cloud computing relies on sharing of resources to achieve coherence and economies of scale. Advocates of public and hybrid clouds note that cloud computing allows companies to avoid or minimize up-front IT infrastructure costs. Proponents also claim that cloud computing allows enterprises to get their applications up and running faster, with improved manageability and less maintenance, and that it enables IT teams to more rapidly adjust resources to meet fluctuating and unpredictable demand, providing the burst computing capability: high computing power at certain periods of peak demand. Cloud providers typically use a "pay-as-you-go" model, which can lead to unexpected operating expenses if administrators are not familiarized with cloud-pricing models.

The availability of high-capacity networks, low-cost computers and storage devices as well as the widespread adoption of hardware virtualization, service-oriented architecture and autonomic and utility computing has led to growth in cloud computing. By 2019, Linux was the most widely used operating system, including in Microsoft's offerings and is thus described as dominant. The Cloud Service Provider (CSP) will screen, keep up and gather data about the firewalls, intrusion identification or/and counteractive action frameworks and information stream inside the network.

Relevance of Cloud Technologies in this project

Mainly focusing on the accessibility of the complete system from any point of the world, a cloud system is most important aspect for a project. Moreover, not being a standalone system in terms of technology, clouds can work as a bridge for all components.

2.2 Requirement Engineering

Requirement engineering is known as the process to gather the software requirements from the client, analyze and document them. The end goal of requirement engineering is to develop and maintain a sophisticated and descriptive 'System Requirements Specification' document as per the guidelines.

2.2.1 Requirement Analysis

Prerequisite investigation is a product building task that makes a scaffold between framework Engineering and framework plan. It might likewise include an increasingly overwhelming criticism instrument to the requesters, calling attention to where a specific framework may accomplish economies in the event that it could utilize progressively basic prerequisites. Furthermore, prerequisites examination has the product offering degree as one of its sources of info, an ancient rarity that does not exist outside the product offering setting. Necessities examination incorporates a shared trait and fluctuation investigation (a procedure utilized as often as possible in area examination)

2.2.2 Requirements Elicitation

Necessities elicitation for a product offering must catch foreseen varieties unequivocally over the predictable life of the product offering. This implies the network of partners is most likely bigger than for single-framework prerequisites elicitation and May well incorporate space specialists, advertising specialists, and others. Prerequisites elicitation centers on the degree, expressly catching the foreseen variety by the utilization of space examination methods, the joining of existing area investigation models, and the consolidation of utilization cases that catch the varieties that are relied upon to happen over the lifetime of the product offering. In this framework, we accumulate prerequisites about the existing Department and course offering Management System. We attempt to comprehend the client's needs and imperatives for the present framework. We investigate the present work process, discover the check focuses and process pecking order.

In this phase we do mainly two works:

1. Analyze the current process and its checkpoints.

2. Understand the existing system’s constraints and user hierarchy.

2.3 Market Research Study

This project can grasp several fields. Every year career fairs are being organized by several colleges to guide the students to choose the right track for their future. However, these fairs are in collaborations with some renowned companies which might give a biased opinion.

Many existing companies furnish the expert opinion on career guidance after completion of graduation. The analysis provided often charges a large amount of money. The BEFRIEND application ensures that the university has to least invest on such analysis without compromising on its quality.

Moreover as per the present scenario allotment of hostel rooms has become an unwanted overhead. Which could be easily solved by the system with least errors.

Chapter 3

3.1 Software Requirements Specification

Purpose: The principle reason for setting up this report is to give a general knowledge into the examination and necessities of the current framework or circumstance and for deciding the working qualities of the framework.

Scope: This Document assumes an elementary job in the improvement life cycle (SDLC) and it portrays the total prerequisite of the framework. It is created for use by the designers. Any progressions made to the prerequisites later on should experience formal change in the agreement process.

3.2 Developers Responsibilities Overview

+ The developers are responsible for:

> Developing the framework, which meets the SRS and understanding every one of the necessities of the framework.

> Demonstrating the framework and introducing the structure at customers' areas after the acceptance testing is effective.

> Submitting the required client manual depicting the framework interfaces to deal with it and furthermore, the archives of the framework.

> Managing any client preparing that may be required for utilizing the framework.

> Keeping up the framework for a time of one year after installation.

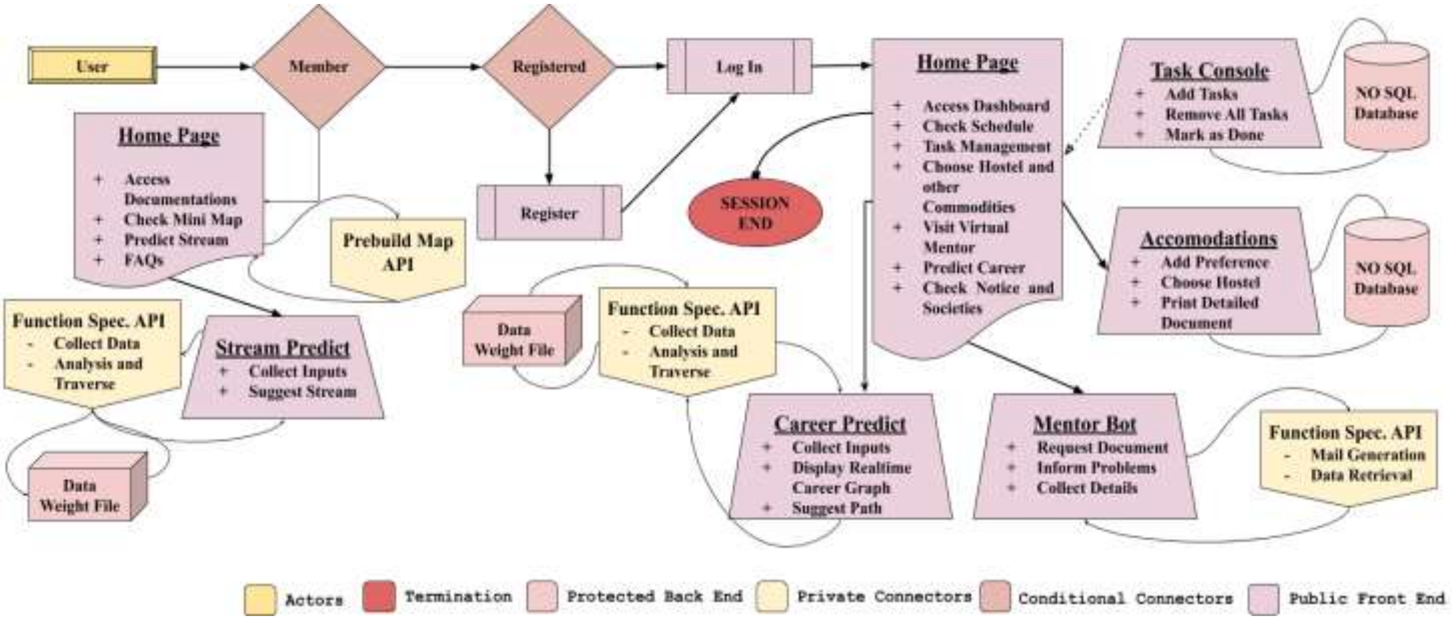
3.3 Environment:

The complete work is going to be developed in an open sourced but secure Linux system. For all deployment, same OS is going to be used.

3.4 Tools Used:

- Semantic Markup
- PHP
- CSS
- JavaScript
- Owl Carousal
- jQuery
- Bootstrap 4
- Geocoding
- Python 3.6.9
- Flask
- MongoDB
- Mongo Atlas
- Ajax
- XAMPP
- XML
- Java SE
- Flask & Dart
- Pickle Tool
- Defined Classifiers
- Tensorflow v1.8
- Event Control
- Heroku Toolbelt
- Heroku Cloud
- AWS IAM
- AWS EC2
- AWS S3 Bucket
- Canvas.JS
- Postman
- PuTTY
- PuTTY Gen
- WinSCP
- Chrome DevTools
- IP Fingerprint
- Particles.JS
- Express
- Docker & Procfile
- Socket.IO
- Android Studio
- Google Colab
- VSCode
- Git Bash
- Anaconda Environment
- AR.js

3.5 System Hierarchy



Chapter 4

4.1 Future Scopes

This project has the potential to become the official portal of the university. A lot more functionalities can be added (Bus routes and bus timings for day boarders etc.). Basically it could be an upgraded version of currently used product.

The connection established with alums can be tapped for future mentorship programs and guidance. For maintenance purposes, once a specification is being brought into action, it is valid for both Android and IOS environments. Further changes if required is needed only to be done once for a single environment it gets automatically incurred in other one.