IAP PORTAL FOR TIET

Capstone Project Report

MID SEMESTER EVALUATION

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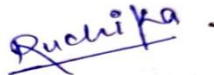**July 2022**

ABSTRACT

In each school/college, students go through a half year of industrial training in their pre-last or last year of Bachelor of Engineering. All the records need to be maintained by the college about the students, organizations in which they are going through training and furthermore the input from the business cycle. For all of this work a dedicated software is used to keep track of student's progress and mentor's evaluation on their performance. The IAP portal is one such software. The portal used by TIET was initially hosted on external servers. The primitive portal was also highly manually driven. Mentors needed to download the student reports and manually evaluate and score them. The prime objective of this developed IAP portal is to host the software on the university servers, so as to make its access more economical. The enhanced features also include the automation of the evaluation process and introduction of a plagiarism detector.

DECLARATION

We hereby declare that the design principles and working prototype model of the project entitled IAP Portal for TIET is an authentic record of our own work carried out in the Computer Science and Engineering Department, TIET, Patiala, under the guidance of Dr. Jasmeet Singh during 6th semester (2022).

Date: 26-08-2022

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Lastly, we would also like to thank our families for their unyielding love and encouragement. They always wanted the best for us and we admire their determination and sacrifice.

Date: 26-08-2022

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LIST OF ABBREVIATIONS

S. No	Abbreviation Used	Full Form
1	IAP	Industrial Attachment Program
2	TIET	Thapar Institute of Engineering and Technolgy
3	AI/ML	Artificial Intelligence/Machine Learning
4	UI	User Interface
5	ISO	International Organisation for Standardisation
6	IEC	International Electrotechnical Commission
7	IEEE	Institute of Electrical and Electronics Engineers
8	SRS	Software Requirement Specifications
9	NLP	Natural Language Processing
10	RNN	Recurrent Neural Network
11	CNN	Convolutional Neural Network
12	LSTM	Long Short Term Memory
13	DL	Deep Learning
14	BERT	Bidirectional encoder Representation
15	QA	Quality Assurance
16	ROUGE	Recall-Oriented Understudy for Gistinct Evaluation
17	IRI	Information Refuse and Integration
18	QWK	Quadratic Weighted Kappa
19	SICK	Sentences Involving Compositional Knowledge
20	MSE	Mean Square Error
21	SVR	Support Vector Regression
22	BLRR	Bayesian Linear Ridge Regression
23	NLTK	Natural Language Toolkit
24	NIC	Network Interface Card
25	ANN	Artificial Neural Network
26	DFD	Data Flow Diagram
27	ER	Entity Relation
28	SR	System Response
29	AA	Actor Action
30	GUI	Graphical User Interface

INTRODUCTION

1.1 Project Overview

Industrial training is a key component for students of today as it allows them to experience the corporate world under the guidance and assistance of mentors before stepping into it. The Industrial Attachment Program (IAP) is a program that provides students with opportunities to have such experiences in the form of internships while simultaneously assessing them on certain set criteria to evaluate their "corporate readiness" and pinpoint the areas they need to work upon. Thapar Institute of Engineering and Technology has established its own IAP cell which envisages a select batch of students to undergo a training internship for a semester of their educational program in order to hone their skills in accordance with the present industrial standards.

The cumulative total duration of the attachment should be no shorter than six months, which can be taken place during term-time (i.e., January - June). IAP provides a student with work related to a small project, as well as specific tasks such as research, production, administration, or day-to-day operation which serves as excellent opportunities to the students.

The project aims at creating a system for assisting the IAP Cell in its operations. This is an advancement of the currently existing IAP portal that is responsible for facilitating proper interaction between the students opting for the Training semester, the faculty, and the mentor assigned to them. This allows for smooth communication as well as keeping track of the progress made by the students in their training. This leads to centralization of operations of the IAP cell and streamlining of the evaluation process of the students which further increases efficiency.

The idea is to somehow create the portal in – house so as to decrease the outsourcing cost and providing a better experience whilst incorporating the new advancement in technology. Moreover, the current portal is not responsive which hinders the end user's experience.

This is basically a web-based application that consists of three panels, namely

- Student,

- Faculty, and

- Mentor

There is also an Admin panel to control the overall functioning of the portal.

The students are required to login and fill in all the details regarding their internship and upload various documents timely during the internship phase that keeps the record of testifying the authenticity of their training. Also, during the training period, reports must be submitted at specified intervals signifying the progress and goals of students which are evaluated by the faculty.

The faculty needs to be pre-registered on the portal so that the faculty can be tagged to a student. The tagged faculty serves as the coordinator of the student throughout the internship period. The communication regarding the upload of the documents and the weekly reports will be done on the IAP Portal itself.

A company mentor is suggested to provide supervision and feedback to the students. TIET attachment coordinator will follow through the attachment period.

The admin that looks after the smooth functioning of the process is responsible for tagging the faculty to a student and checking the authenticity of the end user. The tasks such as opening/ closing of a phase of uploading a report that previously was done by the admin will now be automated which decreases the burden on the admin as well.

In advancement to the previous work done this project will also incorporate various Machine Learning/ Deep Learning techniques to facilitate the evaluation process of the submitted reports such as:

- Plagiarism Detection,

- Text Summarization, and

- Automatic Scoring

Earlier these tasks were supposed to be done by the faculty assigned to the particular student, but with the advancement of technology these tasks are now being automated. Each student will be scored via these AI/ML techniques.

While these tasks are being automated there still is an option available for the faculty to cross check the marks so as to know whether or not the marks uploaded are correct as per the norms of faculty or not. By doing so the model developed will be trained on its own and its performance error will decrease simultaneously increasing the accuracy.

This will include certain techniques to assist the faculty members and decrease their burden as well as act as an integrity check on the submitted reports. With these AI/ML advancements the delay in the processing/scoring of a student will be highly decreased while there will be a high increase in efficiency.

1.2 Need Analysis

IAP portal is a web application that is being used extensively by the IAP cell for efficiently managing the records and submissions of the students opting for the Training Semester. It provides the students and teachers with the facility of submission, guiding, feedback, and grading them online. The project will be an improvement to the currently existing portal wherein some of the shortcomings of the existing portal will be fixed, along with the addition of some new features that will make the user experience more efficient.

The biggest issue being faced in the existing system is that it is a proprietary application, which basically means it has been developed externally and is hosted on external servers only. This results in a lack of control for the IAP cell. Moreover, it leads to unnecessary expenses as the university has its own web servers on which the application can be hosted. Further, the present web application lacks certain checks and constraints like domain restricted access which hamper the uniformity of records, delaying the process of verification. Also, the technology used in the development of the portal is a little outdated for the present time. A big example is the lack of responsiveness for small screen devices.

Also, integration of Machine Learning/ Deep Learning techniques will result in various new features to reduce the burden of the evaluation process of various submissions. This includes modules like Plagiarism Checker, Text Summarization, and Automatic Scoring of reports based on specified rubrics which will act as an integrity check as well as provide assistance to faculty members to efficiently review and grade the submitted reports. This will ensure uniform grading, as well as speed up the evaluation process as most of it, will be automated, thereby reducing the arduous load of the faculty members. The speed boost will further be beneficial for the students too as they can receive their feedback in a timely manner and hence can improve. This leads to an overall improved performance, thus fulfilling the very basic objective of the Industry Attachment Program to make the students "corporate-ready" more effectively.

1.3 Research Gaps

1)   The current system in use is set up on external servers and hence lacks control from the administration side along with being an added expense.

2)   The current system fails to provide measures for ensuring integrity of documents.

3)   The current system requires the mentor to read all the documents manually.

4)   The current system has no proper standardization measure as each mentor evaluates to his/her own preference.

5)   The current system lacks a user-friendly UI which is not in accordance with other systems implemented by the institute.

1.4 Problem Definition and Scope

The existing system uses manual interference for report evaluation hence is only just a medium for communication between different stakeholders. It lacks use of state of the art machine learning technologies to convert it into a smart system. Also it is hosted on external servers which is an additional expense to the university while simultaneously providing lesser control over the system.

The website is currently being prepared for Thapar University's project semester students of all branches. But it can be extended to any college or university that works under the same structure. It would ease the process of maintaining and accessing performance records of students undertaking 6 month industrial training. It will also ease the process of evaluating student's performance by the faculty members and mentors and help in reducing human error. The proposed system will keep all the data in place avoiding the risk of loss of any kind and act as future reference for the students.

1.5 Assumptions and constraints

Table 1 and 2 show the various assumption and constraints for the proposed solution.

S. No	Assumption
1	Students regularly input valid information into the system
2	A general knowledge of basic web browsing and system use will be required to use the product.
3	Active internet connectivity is mandatory as it is a web based application.
4	At a particular time even at peak usage no more than 200 people will visit the site
5	The ML/DL model results will be overlooked by the faculty.

Table1. Assumptions

S. No	Constraints
1	The platform needs to be available across different platforms, be it PC or smartphones. Hence the platform needs to be light so that it can be easily handled across multiple devices.
2	The users will require the services instantly, quick response time is needed.
3	The front-end interface should be easy enough for the different types of users to understand and operate.
4	The database should also be very efficient, scalable and robust to maintain a very huge volume of students and their data.
5	Every user record should be maintained in systematic manner so that the searching process will be easy
6	The machine learning techniques will have functionality for only a basic level of evaluation.

Table 2. Constraints

1.6 Standards

ISO/IEC 9126

This standard deals with the following aspects to determine the quality of a software application:

● Quality model

● External metrics

● Internal metrics

● Quality in use metrics

This standard presents some set of quality attributes for any software such as −

● Functionality

● Reliability

● Usability

● Efficiency

● Maintainability

● Portability

830-1998 - IEEE Recommended Practice for Software Requirements Specifications

Replaced by ISO/IEC/IEEE 29148:2011. The content and qualities of a good software requirements specification (SRS) are described and several sample SRS outlines are presented. This recommended practice is aimed at specifying requirements of software to be developed but also can be applied to assist in the selection of in-house and commercial software products. Guidelines for compliance with IEEE/ EIA12207.1- 1997 are also provided.

To achieve harmonization of the content definition for software life cycle process results among the IEEE software engineering standards and with related international standards. This will help users to produce results consistent with the international standard for software life cycle processes, ISO/IEC 12207

1.7 Approved Objectives

- To study the existent techniques/systems already being used in our problem domain.

- To design an updated, state of the art portal which will act as an interface between industry and students who undergo industrial project semester training.
- To include relevant NLP features like text summarization and plagiarism detection using Deep learning.
- To integrate the whole system and deploy it.

1.8 Methodology

The portal is mainly divided into three sections namely student panel, mentor panel and faculty panel which will be monitored and controlled by the admin panel. The students will be uploading various reports which have to be verified and evaluated. Moreover, there will be some Natural Language Processing tools to detect plagiarism and add-on features like auto grading systems.

PHASE-1 FRONT-END DEVELOPMENT

Designing of various panels like student panel, mentor panel and faculty panel. Students have to fill forms being given in the student panel which are being verified and evaluated by the admin under various constraints. There will be a registration and email verification system to log-in to the system. The student panel will have forms which are timely enabled by the admin.

PHASE-2 BACKEND DEVELOPMENT AND INTEGRATION

A NoSQL database MongoDB will be used along with other technologies like Mongoose, Nodejs, Javascript/TypeScript, PassportJS and multer. There will be multiple collections and documents containing the data of training semester students and faculty who have registered to the portal. Certain rights are only granted to a particular user and they are verified before execution via backend queries.

PHASE-3 PROTOTYPE MODELING AND TESTING

After the front-end and back-end are integrated using JavaScript, the whole model is deployed on a local/developmental server and is tested using black box testing and white box testing.

PHASE-4 TRAINING AND EVALUATING ML/DL MODELS

To enhance the performance of the portal, some additional non-functional requirements will be introduced such as, Plagiarism detection, text summarization and auto-grading system. The models used for Plagiarism detection are deep learning (RNN) and multi-perspective sentence similarity modeling using CNN. Certain evaluative metrics used are cosine and Jaccard. LSTM along with CNN for automatic scoring. Text summarization using pre-trained encoders and various ML/DL methods.

PHASE-5 INTEGRATION OF MODELS WITH PROTOTYPE

The NLP models, namely, text summarization, plagiarism detector and automatic scoring based on specified rubrics, are integrated into the main portal using flask in a way that the documents are checked for plagiarism, summarized and scored automatically as soon as they are uploaded.

PHASE-6 TESTING AND DEPLOYMENT OF FINAL SYSTEM

The full-scale testing of an integrated system is performed using both black box testing and white box testing. After complete verification, the final project is hosted on the commercial servers, first for a controlled load and then on full capacity.

1.9 Project Outcomes and Deliverables

In this work, we will design an interface between industry and students who will undergo project semester integrated by various NLP and deep learning tools.

1. It will provide students, mentors and industry people a secure, efficient and smart system for communication, evaluation and verification of various documents.

2. Will check plagiarism, text summarization and automatically grade documents.

3. Use these advanced concepts for less human intervention.

1.10 Novelty of Work

The system offers minimal human intervention by using advanced machine learning and deep learning algorithms like Plagiarism detection, text summarization and automatic grading. These features differentiates it from the existing system which only acts as a portal for document submission by the students. The system acts as an integrity check, preventing potential cases of plagiarism. Also, as the documents are checked by the automatic grading system, the system establishes a degree of standardization in checking.

REQUIREMENT ANALYSIS

2.1 Literature Survey

2.1.1 Theory associated with problem area

Industrial training is a key component for students of today as it allows them to experience the corporate world under the guidance and assistance of mentors before actually stepping into it. The Industrial Attachment Program (IAP) is a program that provides students with opportunities to have such experiences in the form of internships while simultaneously assessing them on certain set criteria to evaluate their "corporate readiness" and pinpoint the areas they need to work upon. Thapar Institute of Engineering and Technology has established its own IAP cell which envisages a select batch of students to undergo a training internship for a semester of their educational program in order to hone their skills in accordance with the present industrial standards.

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2.1.2 Existing System and Solutions

IAP Portal TIET -

The existing system being used consists of mainly 3 panels, project semester students, university faculty and industry mentors. The students undergoing 6 months industrial training need to upload reports and feedback at specified intervals to the university. Admin verifies the student logging into the system. Admin manages the documents uploaded by the students, the mapping of faculty with the students and overall profiles of the associated

users. The portal acts as a medium for smooth communication between faculty and students. The uploaded reports are then downloaded by the faculty and evaluated manually. The final score is then again uploaded to the website by the university staff. Industry mentors can also submit feedback about student performance.

2.1.3 Research Findings for Existing literature

Table 3 shows the various research findings and work done by other researchers in this particular field.

S. No.	Roll No.	Name	Paper Title	Tools/Technology	Findings	Citation
1	101903 122	Shivangi Singla	Text Summarizati on with Pretrained Encoders	BERT	The model demonstrated that a two-staged fine-tuning approach could further boost the quality of the generated summaries. Extractive summarization gave a score of 58.9 for the CNN/Daily mail dataset and a score of 41.9 for the New York dataset whereas Abstractive summarization gave QA Evaluation 56.1 and rank evaluation 0.17	Liu, Y., & Lapata, M. (2019). Text summarization with pretrained encoders. arXiv preprint arXiv:1908.083 45. [1]

					on CNN dataset, QA Evaluation 41.8 and rank evaluation -0.07 on NYT dataset	
2	101917 040	Jaskirat Singh	Comparison of Statistical, Machine Learning and Deep Learning Methods for Text Summarizati on	TF-IDF, seq2seq model based on RNN, ROUGE (Recall-Oriented Understudy for Gisting Evaluation) metrics	The best performance was observed in the ROUGE-1 result of keep stop words but the three results of RS results had the higher similarity in one case. The machine learning model predicted the correct vectors with an accuracy of 82.47%. The deep learning model failed to converge which meant it needed adjustment in its structure, loss function, optimizer, and dropout.	Day, M. Y., & Chen, C. Y. (2018, July). Artificial intelligence for automatic text summarization. In 2018 IEEE International Conference on Information Reuse and Integration (IRI) (pp. 478-484). IEEE [2]

3	101917 042	Alwinder Singh	Deep Learning (RNN) for Plagiarism Detection (Two Phase)	Word2vec, Document Similarity calculation using Cosine and Jaccard Similarity	The overall accuracy using the above technique on Persian PAN2016 dataset resulted in a plagdet of 0.906, a granularity of 1.000 precision of 0.959, and recall 0.858.	Gharavi, E., Bijari, K., Zahirnia, K., & Veisi, H. (2016). A Deep Learning Approach to Persian Plagiarism Detection. FIRE (Working Notes), 34, 154-159. [3]
4			Recurrent Neural Networks (LSTM) along with Convolution al Neural Network for Automatic Scoring	LSTMs with Mean over-Time Pooling and Hierarchical CNN	ASAP competition official criteria were used along with QWK as an evaluation metric. CNN performed well for modelling sentences whereas, LSTMs were relatively more effective for modelling documents. The results were statistically significant with $p < 0.05$ by one-tailed t-test.	Dong, F., Zhang, Y., & Yang, J. (2017, August). Attention-based Recurrent Convolutional Neural Network for Automatic Essay Scoring. In CoNLL (pp. 153-162). [4]

5	101917 130	Ruchika Aggarwal	Multi-Perspective Sentence Similarity Modelling with Convolutional Neural Networks	Word2vec, Convolutional Neural Networks with different Pooling strategies, Cosine and Euclidean Distance for Comparison	On MSRP dataset: it gave Accuracy of 78.6% and F1 score of 84.73%. On SICK dataset, it gave a recall of 0.8686, precision of 0.8047, and MSE of .2606 indicating good performance. The problem of level representation of the analyzed data was encountered. The use of CNN for treating the similarity between the list of words posed several problems like the loss of semantics level of the sentence construct.	He, H., Gimpel, K., & Lin, J. (2015, September). Multi-perspective sentence similarity modeling with convolutional neural networks. In Proceedings of the 2015 conference on empirical methods in natural language processing (pp. 1576-1586). [5]

			Convolution al Neural Network (CNN), Baselines: Bayesian Linear Ridge Regression (BLRR) and Support Vector Regression (SVR)	CNN, ML-p	CNN, In-Domain: Neural Model performed well with a p-value less than 10^{-5} at the confidence level of 95%. Cross-Domain: It had been noticed that the CNN model outperformed ML-p (a technique used previously to overcome the discrete feature patterns) on almost all pairs of adaption experiments.	Dong, F., & Zhang, Y. (2016, November). Automatic Features for Essay Scoring-An Empirical Study. In EMNLP (Vol. 435, pp. 107-77). [6]

Table 3. Research Findings for Existing literature

2.1.4 Problem Identified

- The IAP portal is an efficient system to keep track of data of project semester students and is necessary for almost all technical universities. So such dedicated software is needed by the university, hosted on its local servers, to cut overhead expenses.

- The existing portal merely holds the data of students and acts as a medium of communication between the university and students. But a more advanced and intelligent system is required to manage such huge volumes of data.

- Although the existing UI is easy to use, it doesn't integrate well with other university platforms. Also the UI is not responsive and hence limits the website use on PC.

2.1.5 Use of existing Research in the proposed solution

Plagiarism detection: Through studying and analyzing about the above research papers it has been noticed that Word2vec, Convolutional Neural Networks (Deep Learning RNNs) with different pooling techniques, has given a good accuracy including an enhanced count of granularity, precision and recall.

Text Summarization: BERT outperforms in text-summarization, as it demonstrated the two-staged-fine-tuning approach, that boosted the quality of the generated summary whereas the best performance was observed in the ROUGE-1 result of keep stop words, but the three results of RS results had the higher similarity in one case while using TF-IDF, seq2seq on RNN.

Auto Scoring: Recurrent Neural Networks (LSTM) along with Convolutional Neural Network for Automatic Scoring will be used as LSTMs are relatively more effective for modelling the documents, producing significant results with $p<0.05$ by one-tailed t-test.

2.1.6 Survey of Technologies and Tools used

Table 4 explains the various tools and technologies used to develop the solution.

S.No.	Tool/Technology	Description
1	MongoDB	The database system being used here is MongoDB which is a NoSQL database. This allows for more flexibility and easy scalability while simultaneously being robust.
2	Bootstrap API	Bootstrap is a free and open-source CSS framework with inbuilt templates directed at responsive, mobile-first front-end web development.
3	Node.js	Node.js is an open-source, cross-platform, back-end JavaScript runtime environment that is cost effective, easy to learn and adapt and offers easy scalability.

4	Express.js	Express.js is a back end web application framework for Node.js that offers standard in built modules for easy and quick server development.
5	Typescript	TypeScript is a free and open source programming language that is a strict syntactical superset of JavaScript and adds optional static typing to the language
6	Twilio SendGrid	SendGrid is a customer communication platform for transactional and marketing email.
7	NLTK	The Natural Language Toolkit, or more commonly NLTK, is a suite of libraries and programs for symbolic and statistical natural language processing for English written in the Python programming language.
8	Scikit-Learn	Scikit-learn is a free software machine learning library for the Python programming language. It features various classification, regression and clustering algorithms

Table 4. Tools and Technologies Used

2.2 Software Requirement Specification

2.2.1 Introduction

2.2.1.1 Purpose

The document serves as a manual for complete description of the project, the parameters involved as well as the goals. It gives a perspective to the developers, testers and other stakeholders as to what all is expected from the project. This document describes the project's target audience and its user interface, hardware and software requirements.

2.2.1.2 Intended Audience and Reading Suggestions

The document is intended for requirements engineers, domain experts and developers. Before reading this document it is highly recommended to know about the current system in use as well as some basics of machine learning to get an overview of the product.

2.2.1.3 Project Scope

The website is currently being prepared for Thapar University's project semester students of all branches. But it can be extended to any college or university that works under the same structure. It would ease the process of maintaining and accessing performance records of students undertaking 6 month industrial training. It will also ease the process of evaluating student's performance by the faculty members and mentors and help in reducing human error. The proposed system will keep all the data in place avoiding the risk of loss of any kind and act as future reference for the students.

2.2.2 Overall Description

2.2.2.1 Product Perspective

The Industrial Attachment Program is a mandatory tool for all technical universities having project semesters in the final or pre-final semester. The university needs to keep track of performance of students in their industrial training via periodic evaluations and industrial mentor's feedback. For this, students need to upload the required documentation and reports timely.

With an increasing number of students undergoing project semester, the volume of their data is also increasing exponentially. An efficient dedicated system is required to store this data in an organized manner for convenience of users. Since every university needs such a portal, it would be a bonus to host it on its local servers to cut the expenses.

Manual evaluation of all the uploaded reports is a tedious task, hence a system that evaluates and grades the students reports automatically will prove to be a handy tool to reduce the manual effort immensely. Concepts of Natural Language Processing and Deep Learning can be put to a great use by embedding features like plagiarism detection and text summarization to the system. It may reduce any potential faults in the reports and can grade them more reasonably.
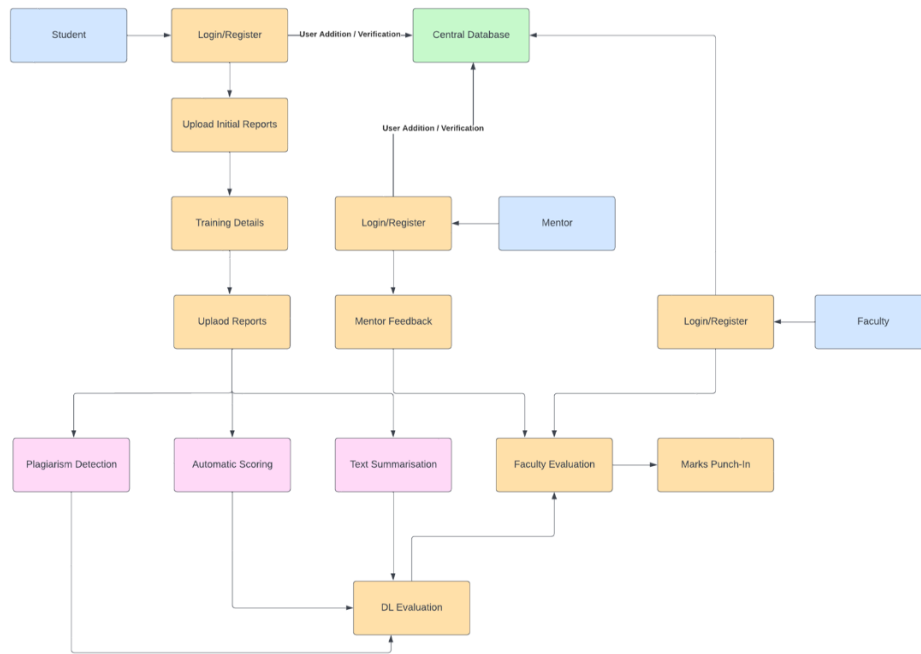
Fig. 1 Block diagram of IAP Portal

As shown in Fig. 1, the student first needs to register to the portal and upload the required documents like fee receipt and initial training letter. The uploaded information is then stored in the central database. The students then will move to phase 2 and will add training details which will tag them with respective faculty. Then they upload various reports and feedback. Simultaneously the mentors will login and give their feedback. All this will then be collectively evaluated by the deep learning models as well as manual evaluation by faculty after logging in through their respective system credentials.

2.2.2.2 Product Features

- The portal will have mainly 3 panels(Student, Mentor and Faculty).
- Admin can verify the users/Students registering on the website and controls the availability and accessibility of the documents to be uploaded.
- Portal is divided into 2 phases, and enables the students to upload the documents according to the progress in the project semester.
- Portal also has an inbuilt report evaluation and plagiarism detector.

2.2.3 External Interface Requirements

2.2.3.1 User Interfaces

The interface provides a variety of options to the users. It allows the following features:

1. Student Interface: It opens up after a student logs in from the General Audience Interface. It will contain the following major panels:

- Login Page: Meant for opening up administrator, faculty, mentor and student interface
- Training details: options for editing the details of the training undertaken by the student.
- Documents: options for uploading the joining report, emergency details, goals report
- Profile: options editing the profile page of the student.

2. Administrator interface: It opens up after the administrator logs in from the General Audience Interface.

- Student Verification: Admin verifies the students registering to the website.
- Faculty-Student mapping: Admin can push the faculty-student mapping on the website.
- Document enabling: Admin enables the documents to be uploaded periodically.

3. Faculty Records: It opens up after the faculty member logs in from the General Audience Interface.

- Student Records will be visible to the faculty for evaluation.

 4. Mentor panel: Mentors can post student performance feedback.

2.2.3.2 Hardware Interfaces

IAP portal is a website that can be accessed from any device be it a computer desktop, laptop, tablets, phones or any other device having a NIC (Network Interface Card).

- Input Device – Keyboard and Mouse
- Output Device – Mobile Phone or PC

- System – Windows, IOS, Android
- Net Bandwidth – 12Mbps or more

2.2.3.3 Software Interfaces

The project is a website hence can be accessed from any device. It does not require any particular operating system to execute. All it needs is just a modern web browser (like Safari, Firefox, and Google Chrome etc.)

2.2.3.4 Functional Requirements for Various Components

1. Landing Page

Purpose	Allows User to select his/her role in order to redirect them to the appropriate panel.
Input	The User shall select his/her role from one of three types: Student, Faculty, Mentor
Processing	The backend is queried and appropriate panel is sent as a response.
Output	The login screen for the appropriate panel will appear in accordance with the role selected.

Table 5. Functional requirement for Landing Page

2. User Registration

Purpose	This Screen will require user to register on the portal by providing required information and will save the credentials in the database.
Inputs	The User shall enter his/her credentials in order to register with the portal.
Processing	The credentials will be processed and verified by email.
Output	Upon successful verification the user's information gets stored int the database and user is prompted with the login screen.

Table 6. Functional requirement for User Registration

3. Student Authentication

Purpose	This screen will query the input, user credentials in order to authorize and authenticate the user so that he/she can use all the functionalities of the portal.
Inputs	The user will be asked to enter his/her username and password.
Processing	The input credentials are queried into the database to verify their correctness.
Output	Upon successful authentication the user is prompted with main screen where he/she can use all the functionalities of the portal.

Table 7. Functional requirement for Student Authentication

4. Document Uploads

Purpose	It will require the user to submit the specified documents to the university in a particular format with time constraints.
Inputs	The user shall provide the path to various documents he/she is required to upload.

Processing	The Files are checked for various properties like, file type, file size etc. and if found correct, the files are stored onto the server and their path on server is stored in the database.
Output	The User is prompted with successful upload and the files can be further processed by designated party.

Table 8. Functional requirement for Document Uploads

5. Feedback forms

Purpose	The User can input his/her feedback which will then be forwarded to the concerned authorities.
Inputs	The user will be required to fill the specified input fields with their feedback.
Processing	User responses are stored to the database.
Outputs	The User is prompted with successful submission.

Table 9. Functional requirement for Feedback Forms

6. Faculty Login

Purpose	The user must enter his/her credentials for authentication in order to view the allotted students and the submissions made by them.
Inputs	The user will be asked to enter his/her email and password.
Processing	The input credentials are queried into the database to verify their correctness.
Output	Upon successful authentication the user is prompted with a screen where he/she can view
	all the students allotted to them and hence evaluate their performance.

Table 10. Functional requirement for Faculty Login

7. Report Summarization

Purpose	This module uses ML/DL techniques to summarize the report in order to ease the evaluation process for the faculty.
Inputs	The report is fed to the model.
Processing	The input report is summarized on the basis various text summarization modules.
Outputs	The summarized report is prompted on the screen.

Table 11. Functional requirement for Report Summarization

8. Plagiarism detection

Purpose	This module uses ML/DL techniques to check the plagiarism in the student report for fair evaluation
Inputs	The report is fed to the model.
Processing	The input report is checked on the basis various plagiarism modules.
Outputs	The verified report is prompted on the screen.

Table 12. Functional requirement for Plagiarism Detection

9. Automatic report scoring

Purpose	This module uses ML/DL techniques to automatically score the report submitted by the student based on various factors like plagiarism detected, semantics etc.
Inputs	The report is fed to the model.
Processing	The input report is scored on the basis various automatic scoring modules.
Outputs	The final score is prompted on the screen.

Table 13. Functional requirement for Automatic report scoring

10. Student tagging

Purpose	The admin needs to tag the authenticated students with allotted faculty and mentors.
Inputs	The admin uploads a csv file containing the tagged student and faculty.
Processing	The csv file is decoded and the database entries regrading each student and faculty member are updated.
Outputs	The admin is prompted with the successful tagging.

Table 14. Functional requirement for student tagging

2.2.4 Other Non-functional Requirements

2.2.4.1 Performance Requirements

- Reliability: Auxiliary storage devices must be available for backing up the data. The internet connection in the college must be stable most of the time.
- User Interface and Human Factors: The training for using the admin panel is required to be provided so as to prevent him/her from making errors.
- Availability: The website shall be available, up and running for 24*7 throughout the year except due to the routine maintenance activities.

2.2.4.2 Safety Requirements

There are no specific safety requirements associated with the proposed system. The portal executes on well-known and commonly used hardware which does not cause any safety hazards.

2.2.4.3 Security Requirements

- A validation link will be sent to the registered users.
- The password details that are stored in the database should be in encrypted format so that the data cannot be read directly.
- Only a registered user should be able to access the account and perform various tasks such as updating the training details, editing user profiles etc.
- Various security attacks like CSRF, session forgery and cross server scripting attacks should be prevented.

2.3 Cost Analysis

- We have used Mongo DB Atlas servers to store the data of students as documents. Considering the data/student be 100MB and total number of students undergoing project semester be 1800, we need to store around 180 GB of data. For this, we need Mongo DB dedicated server which costs around Rs.4500/month ie., Rs. 54000/- The server provides 10GB to 4TB storage.
- The application uses user verification via email authentication (Twilio Sendgrid). The service costs about Rs1600/month ie., Rs. 19200/-
- Testing server for the application costs about Rs. 1000/- It is a one time cost.
- A security and maintenance team will be needed for proper functioning of the project costing us around another Rs. 50000/-
- Overall cost of the project sums to Rs 1,24,000/-

2.4 Risk Analysis:

The project faces the following risks:

1) Connectivity issues: This is a situation that can prove to be a disadvantage because the whole system is based on ready availability of the portal. But the risk is minimal due to increased advancements in the telecom sector.

2) Privacy Concerns: Privacy concerns may hinder the people from using the service. But enforcement of strict privacy policies will minimise this risk.

3) Overload: Excessive consumers can cause overload of servers which may lead to delay in service. But the project scope will be expanded in a phased manner by carefully observing and analysing the number of potential consumers that need to be catered which will minimise the risk.

4) Less Reliability of AI/ML Modules: The automatic scoring and plagiarism detection might be less reliable if used solely. But options for manual checking will be provided to minimise this risk.

Methodology Adopted

3.1 Investigative Techniques

1. Comparative study

Table 15 compares the existing system with the new proposed solution.

Existing IAP Portal	New IAP Portal
Hosted on external servers; The current system is hosted on external servers thus generating additional expense while simultaneously lacking a certain degree of control.	Hosted on university servers; The new system will be hosted on university servers, thus reducing the cost while simultaneously providing full control over the application.
Non - responsive UI; The UI of existing websites is specifically designed to work with PC/desktop and hence lacks native mobile support.	Responsive UI; The new UI can be seamlessly accessed across various devices.
Manual checking and scoring of reports; The current system is just a document collection system with no use of any smart AI technologies.	AI based automatic report evaluation; The new system is a smart system with options for automatic evaluation, hence reducing the burden of faculty members.
No integrity check; The existing system doesn't provide any option for ensuring the integrity of documents thus allowing unfair means like plagiarism.	Integrity Check; The new system enforces strict integrity check by scanning the documents for potential cases of plagiarism.
No provision for summarization; The faculty members have to read the complete report after downloading for finally evaluating it.	Provision for text summarization; The faculty members have the option to read the summarized version of the report, hence reducing the time and effort of evaluation.
SQL database; The database used is a structured relational database which prevents it from being flexible.	NoSQL database; The database used is a semi-structured database that allows flexibility according to need.

Table 15. Comparative Study between the existing and New IAP Portal

2.   **Experimental Study**

- We will obtain our Dataset from past analysis through the internet.
- Then we will construct our model with various ML algorithms and train it with the help of our dataset to give appropriate outputs for the documents and we will communicate with the user with a Web App.
- This Trained model will then be able to predict the score of any user with the help of certain inputs given by the faculty on the report.
- The model will also test the plagiarism based on a certain threshold value provided by the user.
- The model performance will be tested based on various NLP evaluation parameters like ROGUE Score etc., along with testing on previously evaluated documents.
- Another model will also use various NLP based techniques in order to summarize the long documents making it easier for the faculty members to get the crux of the whole document.

3.2 Proposed Solution

The proposed solution is an extension to the current system in use. It is an attempt to update the current system to newer state-of-the aet technologies while adding some new features that can be of great help for the users.

Following is the work-flow of our newly developed IAP Portal:

1. The portal starts with display of a main page with options to choose between student panel, faculty panel and mentor panel. The user must choose the panel according to his/her role.
2. In case of student panel, the system asks for login credentials of student which includes their roll number and password along with options for registering for the panel as well as retrieving the password in case the user has forgotten it.
3. For registration, the student is asked his/her personal details like roll number, branch, email, mobile number, company name, company city and password twice for confirmation.

4. The password needs to be handled securely and hence is encoded using Bcrypt hashing.

5. On clicking register, the whole of user data is converted into Java Web Token and an email is sent to the user email address with this token asking for verification. The user must click on the verify button within 10 minutes for successful verification.

6. On successful verification, the user data is stored in the MongoDB database and user is prompted with login window.

7. The user must now login. After filling in the correct user credentials, user is now prompted with a screen asking for uploading fee receipt and initial training letter.

8. After uploading, the user must wait till the admin approves the user and allows him/her access to the system.

9. On successful approval, the student can now enter his complete training details, upload documents, give his/her feedback to the faculty, mentor as well as ABET.

10. At any time, if the user forgets his/her password, they can reset it by entering their roll number using which an email will be sent on their respective email address with a link to change the password.

11. On the faculty panel, the faculty members must login. For that, they first need to be registered with the system. They can do so using the register button.

12. On clicking register, they are prompted with a screen asking for registration details like Name, Email address, Phone number, Department, Designation and password twice for confirmation.

13. On successful registration, the details are stored in the database and they can log in and view the students allotted to them.

14. The database maintains the details regarding the various students and faculty members registered on the system. The admin can export those details in the form of a CSV file.

15. He/She can then upload another CSV containing the details regarding the students tagged with each faculty member.

16. The CSV uploaded is automatically scanned and the students are hence tagged with the respective faculty.

17. The faculty members can view the details of each student, which includes the feedback of students, the fortnightly reflections as well as the uploaded documents.

18. The faculty members have the option to get the summarized form of the document, the plagiarism percentage and the predicted score based on some certain set rubrics.

19. The faculty members can analyse the results of these various DL techniques to give the student their final score.

20. The mentors can also login through the email id's submitted by the students for their mentor. But for that they first need to generate the password. After successful login they can give their feedback.
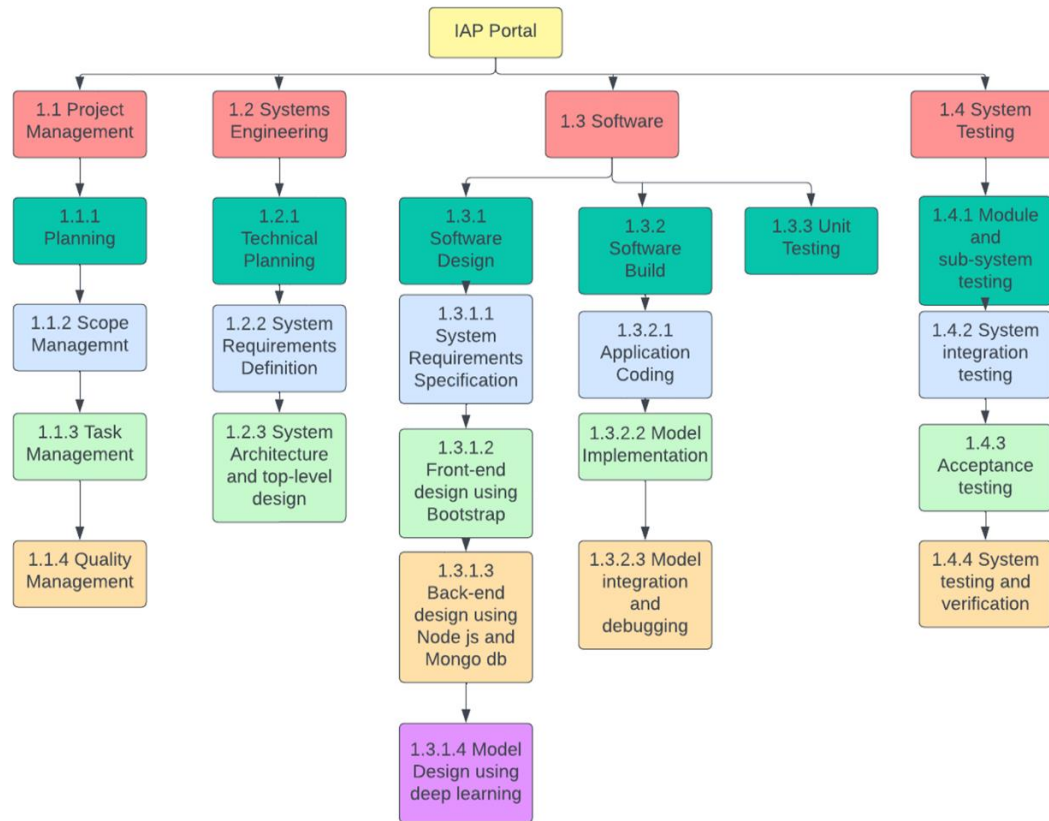
3.3 Work Breakdown Structure

Fig.2 Work Breakdown Structure for IAP Portal

As shown in Fig 2. The Work structure of the portal began with Project Management. The first phase was the planning phase to get the vague idea about the whole project structure,

the prerequisite knowledge required, various milestones and goals, available resources and dependencies of modules. Then the next step was to set a boundary line on the scope of the project according to the analyzed cost, effort and time required. It helped us better understand the functional requirements that are the most crucial and feasible within the time and cost span. After deciding upon the functional requirements and use cases of the project, the next move was to efficiently manage the tasks. The modules were divided among team members such that preliminary knowledge required is specific to a certain domain so as to reduce the individual workload and have the most optimal output in all modules. Various Non-functional requirements were taken into strict consideration. We intended to send data to/from the database in an enveloped form instead of line by line. The user credential security needed to be ensured. Sessions should be maintained for individual users. The server technologies used should provide more scalable and coherent middleware.

In the system Engineering part, the major challenge was to decide upon the technologies that should be used to implement aforementioned requirements. Data updation and retrieval was implemented via Java Web Tokens and user privacy was ensured using Bcrypt Hashing. Simultaneously user sessions were maintained with express sessions. Node js and express js were used to implement server technologies. We used a NoSQL MongoDB database for more flexible entries. We used neural network models like ANN, CNN, RNN, LSTMs and auto encoders for implementing plagiarism detection, text summarization and auto scoring.

We discussed the modular structure of the portal under the software designing phase. Major modules include- Student Panel, Faculty panel, Mentor panel and Admin Panel. Then all the functional requirements were listed out. They were then divided into two categories, ones that were common to all the panels like sign in and others that were specific to the panel based upon the modular structure. Furthermore, we decided upon the theme of the website such that it goes well with the university's identity. Bootstrap API was used to create a responsive UI. The intelligent AI system was built using neural network technologies and deep learning models.

The next phase was to put the theory into practice. We started by building front end pages of the Student Panel. After that we switched to building the back-end for the same. Then came the integration part. All the other panels were designed in the same manner. The deep learning were separately trained and tested and later were integrated into the system. Between the integration of panels and ML models, manual unit testing was done at each step. As we tried to follow the agile model from the beginning, we intended to reduce the errors as much as possible before deployment.

Then came the final system testing. This was done in various phases; Module testing, sub-system testing etc. We used black-box testing. After validating all modules, we moved on to the testing in integration of the system. Some packages belonging to different modules were not aligning properly and hence to verify and rectify the issues we switched to the white box testing. Finally along with the functional testing we needed to verify the non-functional requirements of the system as well, such as stress testing (use cases that have max memory requirements), performance testing(checking several processor)

3.4 Tools and Technologies

1. **MongoDB:** The database system being used here is MongoDB which is a NoSQL database. This allows for more flexibility and easy scalability while simultaneously being robust.
2. **Bootstrap API:** Bootstrap is a free and open-source CSS framework with inbuilt templates directed at responsive, mobile-first front-end web development. It has been employed in the project to create reactive cross-platform front end pages.
3. **Node.js:** Node.js is an open-source, cross-platform, back-end JavaScript runtime environment that is cost effective, easy to learn and adapt and offers easy scalability. It has been used for development of the main IAP server.
4. **Express.js:** Express.js is a back end web application framework for Node.js that offers standard in built modules for easy and quick server development. It has been used for rapid development of the server.

5. **Typescript:** TypeScript is a free and open source programming language that is a strict syntactical superset of JavaScript and adds optional static typing to the language

6. **Twilio SendGrid:** SendGrid is a customer communication platform for transactional and marketing email. It has been used to send various emails during the verification process.

7. **NLTK:** The Natural Language Toolkit, or more commonly NLTK, is a suite of libraries and programs for symbolic and statistical natural language processing for English written in the Python programming language. It has been used for preprocessing the document content and extracting information from it.

8. **Scikit-Learn:** Scikit-learn is a free software machine learning library for the Python programming language. It features various classification, regression and clustering algorithms. It has been used to develop the various ML/DL: models.

4. Design Specifications

4.1 System Architecture

The architectural style chosen by our team for the project 'IAP Portal for TIET' is Three - Tier Architecture. Following is the explanation of the architecture:

Three-tier architecture is organizing the software into three logical and physical computing tiers:

1) The Presentation Tier, or User Interface;

 2) The Application Tier, where data is processed;

 3) The Data Tier, where the data associated with the application is stored and managed.

The explanation of each tier is as follows:

1. The Presentation Tier: The presentation tier is the user interface and communication layer of the application, where the end user interacts with the application. Its main purpose is to display information to and collect information from the user. In our project, the webpages that collect the login information for authentication purposes and displays the content and allows user to select the specified task required by them to complete, are part of the Presentation Layer.

2. The Application Tier: Also known as the Logic tier or Middle tier, it is the heart of the application. In this tier, information collected in the presentation tier is processed – sometimes against other information in the data tier – using business logic, a specific set of business rules. The whole 'IAP Portal for TIET' server that is responsible for authentication purposes as well as providing different services is the Application Tier.

3.The Data Tier: Sometimes called Database Tier, Data Access Tier or Back-End, it is where the information processed by the application is stored and managed. The databases used in our project, namely the Student Details, Faculty Details and Mentor Details are part of this tier.

4.2 Design Level Diagrams

4.2.1 Data Flow Diagrams

4.2.1.1 DFD (Level 0)

Fig 3. Shows the level 0 DFD which clearly depicts what data flows in an out of the system to and from the various external entities.
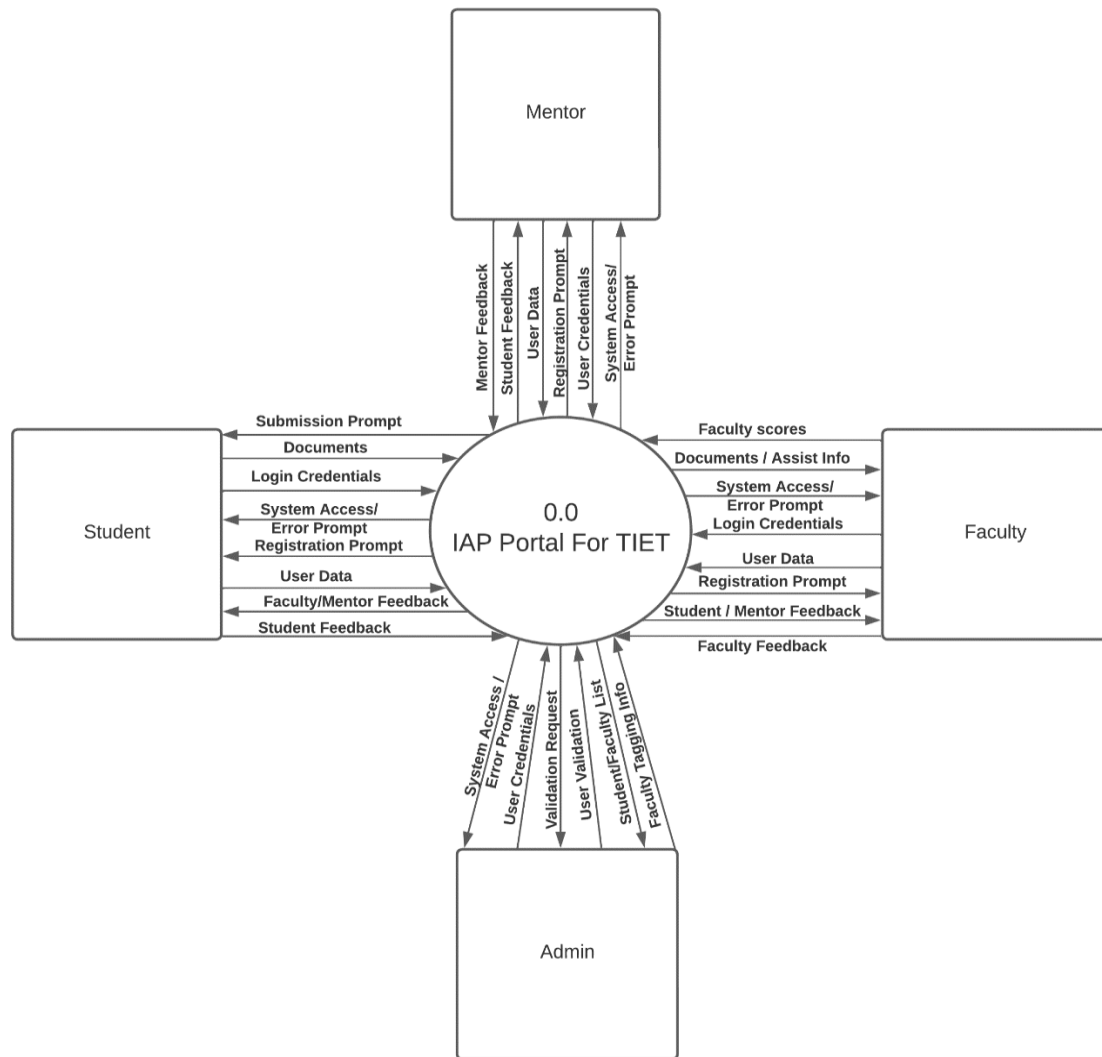

Fig 3. Data Flow Diagram for Level 0

4.2.1.2 DFD (Level 1)

Fig. 4 shows the level 1 DFD which depicts the overview of various processes involved within the system and how data flows among each of them.
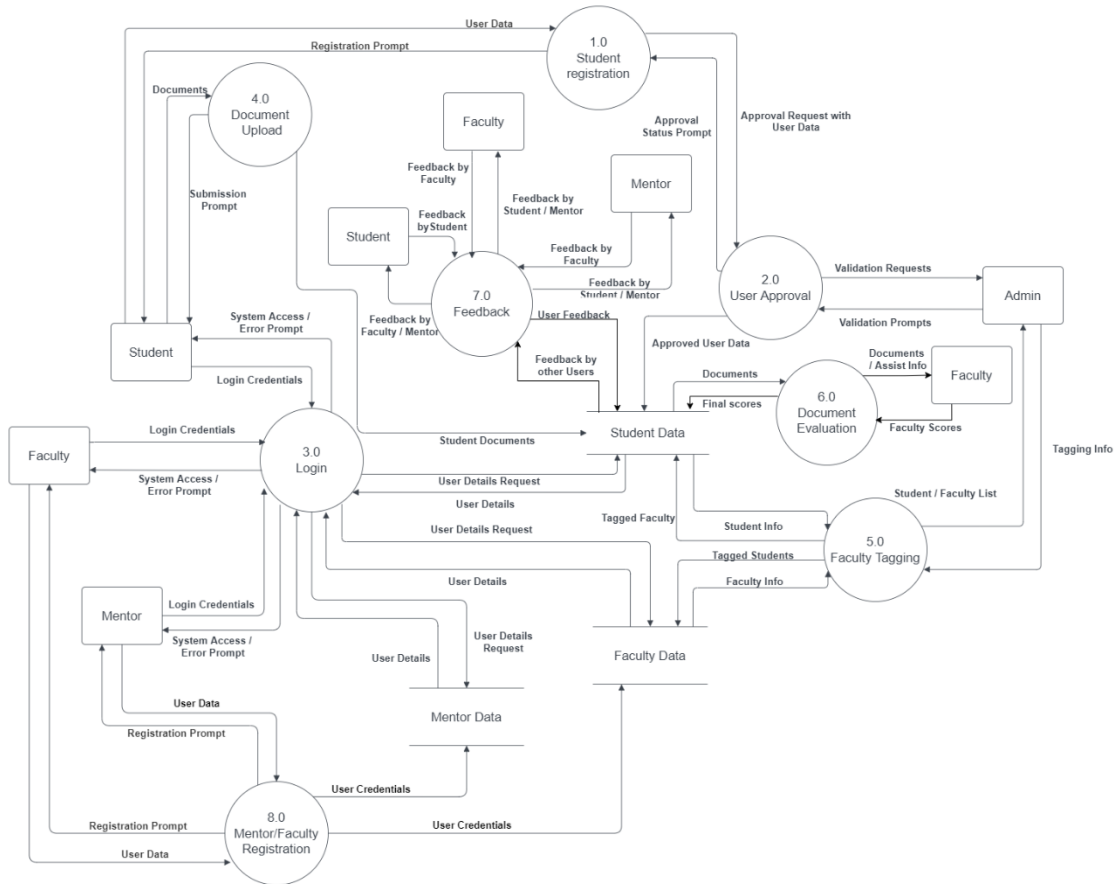

Fig 4. Data Flow Diagram for Level 1

4.2.1.3 DFD (Level 2)

4.2.1.3.1 Student Registration (1.0)

Fig 5. Shows the level 2 DFD for the student registration process and how the data flows between the various sub-processes.
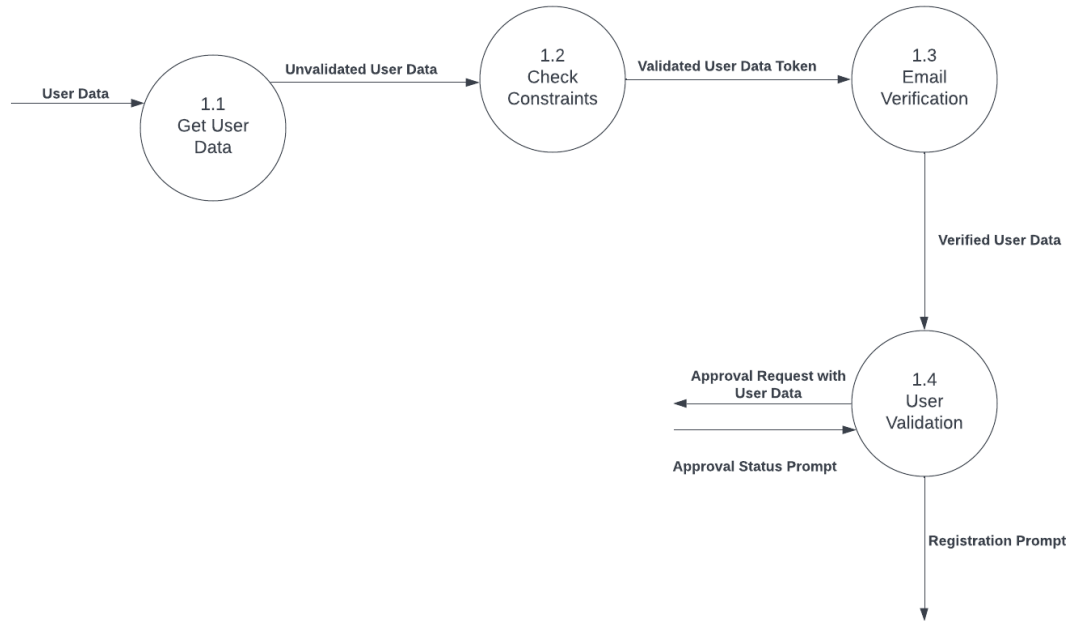
Fig 5. Data Flow Diagram (Level 2) for Student Registration

4.2.1.3.2 User Approval (2.0)

Fig 6. Shows the level 2 DFD for the User Approval process and how the data flows between the various sub-processes.
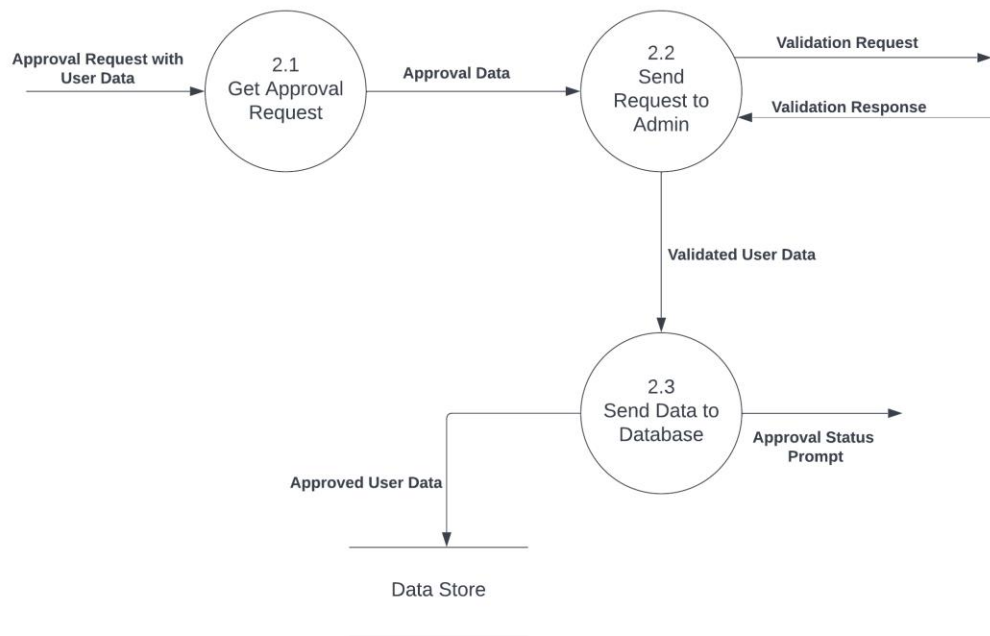
Fig 6. Data Flow Diagram (Level 2) for User Approval

4.2.1.3.3 Login (3.0)

Fig 7. Shows the level 2 DFD for the Login process and how the data flows between the various sub-processes.
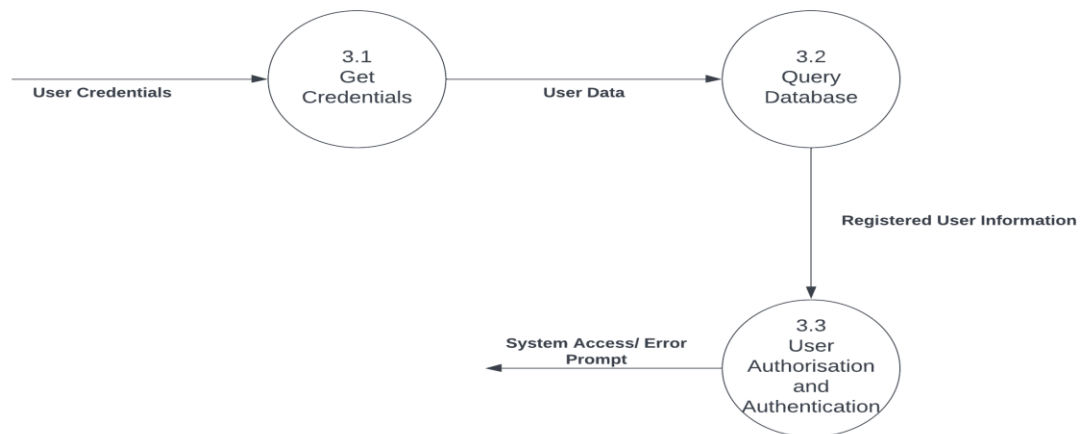

Fig 7. Data Flow Diagram (Level 2) for Login

4.2.1.3.4 Document Upload (4.0)

Fig 8. Shows the level 2 DFD for the Document Upload process and how the data flows between the various sub-processes.
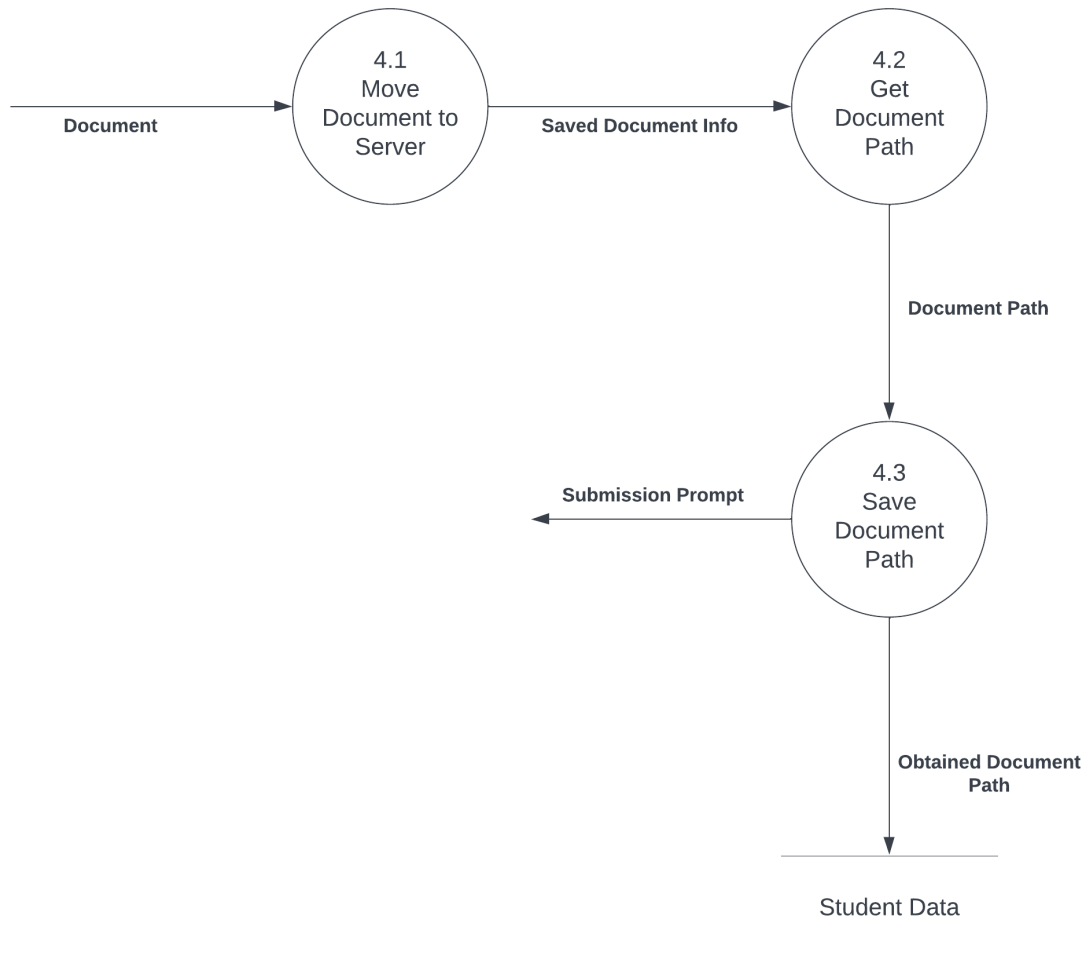

Fig 8. Data Flow Diagram (Level 2) for Document Upload

4.2.1.3.5 Faculty Tagging (5.0)

Fig 9. Shows the level 2 DFD for the Faculty Tagging process and how the data flows between the various sub-processes.
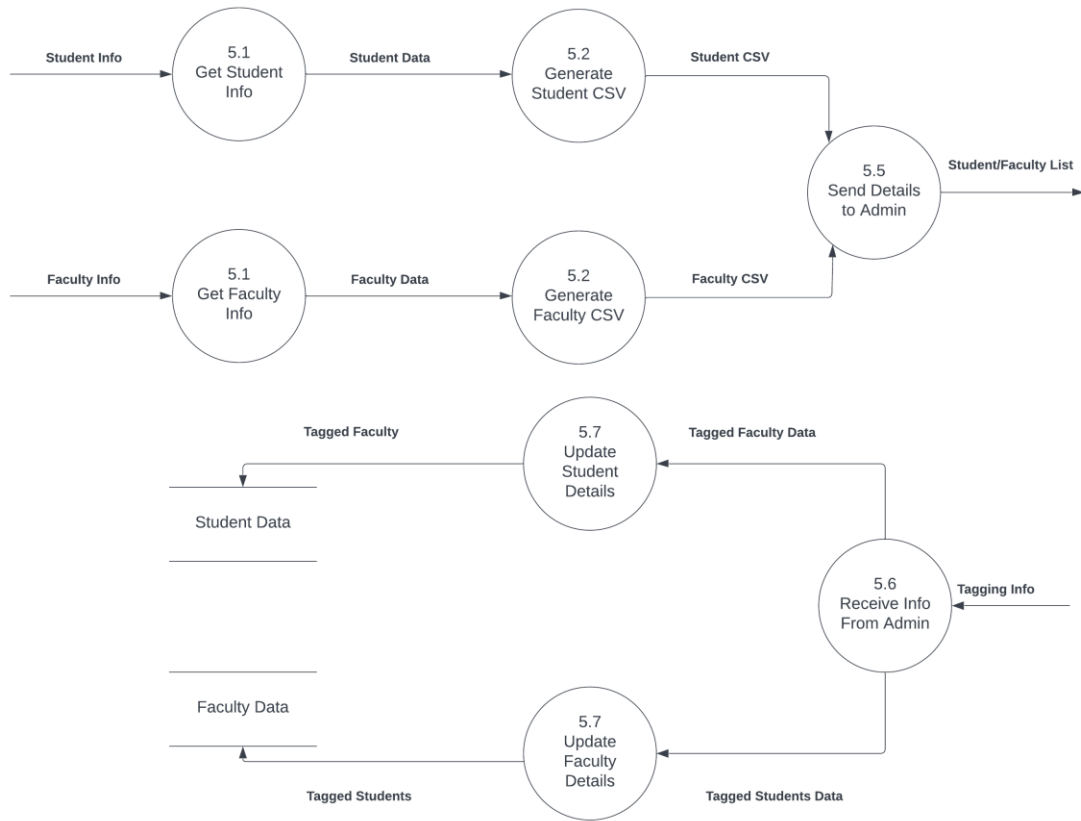
Fig 9. Data Flow Diagram (Level 2) for Faculty Tagging

4.2.1.3.6 Document Evaluation (6.0)

Fig 10. Shows the level 2 DFD for the Document Evaluation process and how the data flows between the various sub-processes.
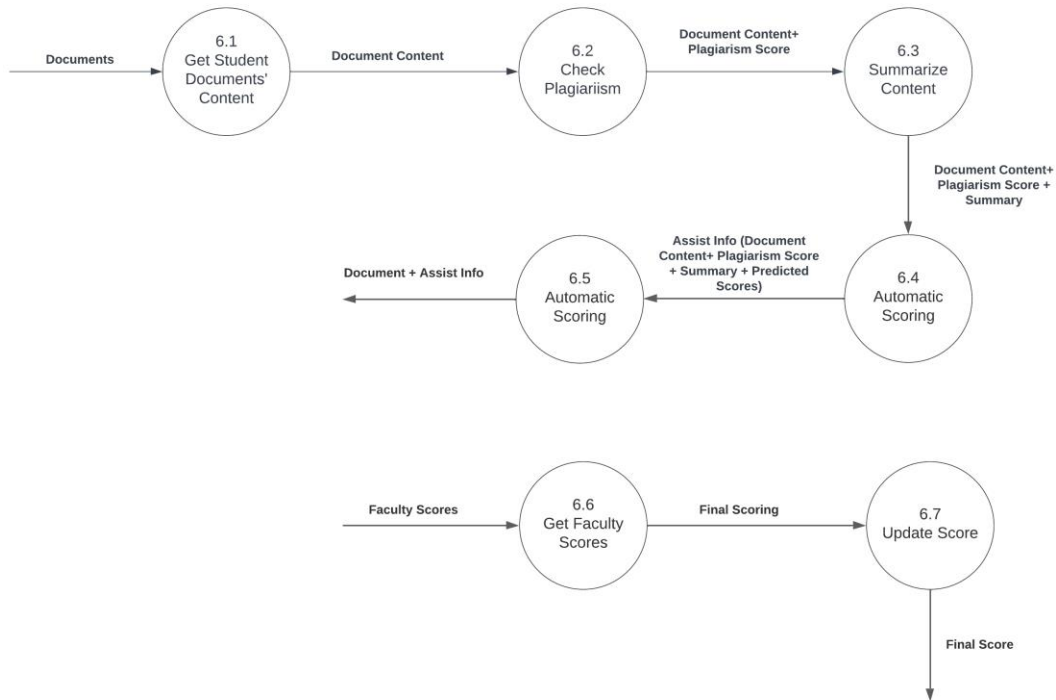

Fig 10. Data Flow Diagram (Level 2) for Document Evaluation

4.2.1.3.7 Feedback (7.0)

Fig 11. Shows the level 2 DFD for the Feedback process and how the data flows between the various sub-processes.
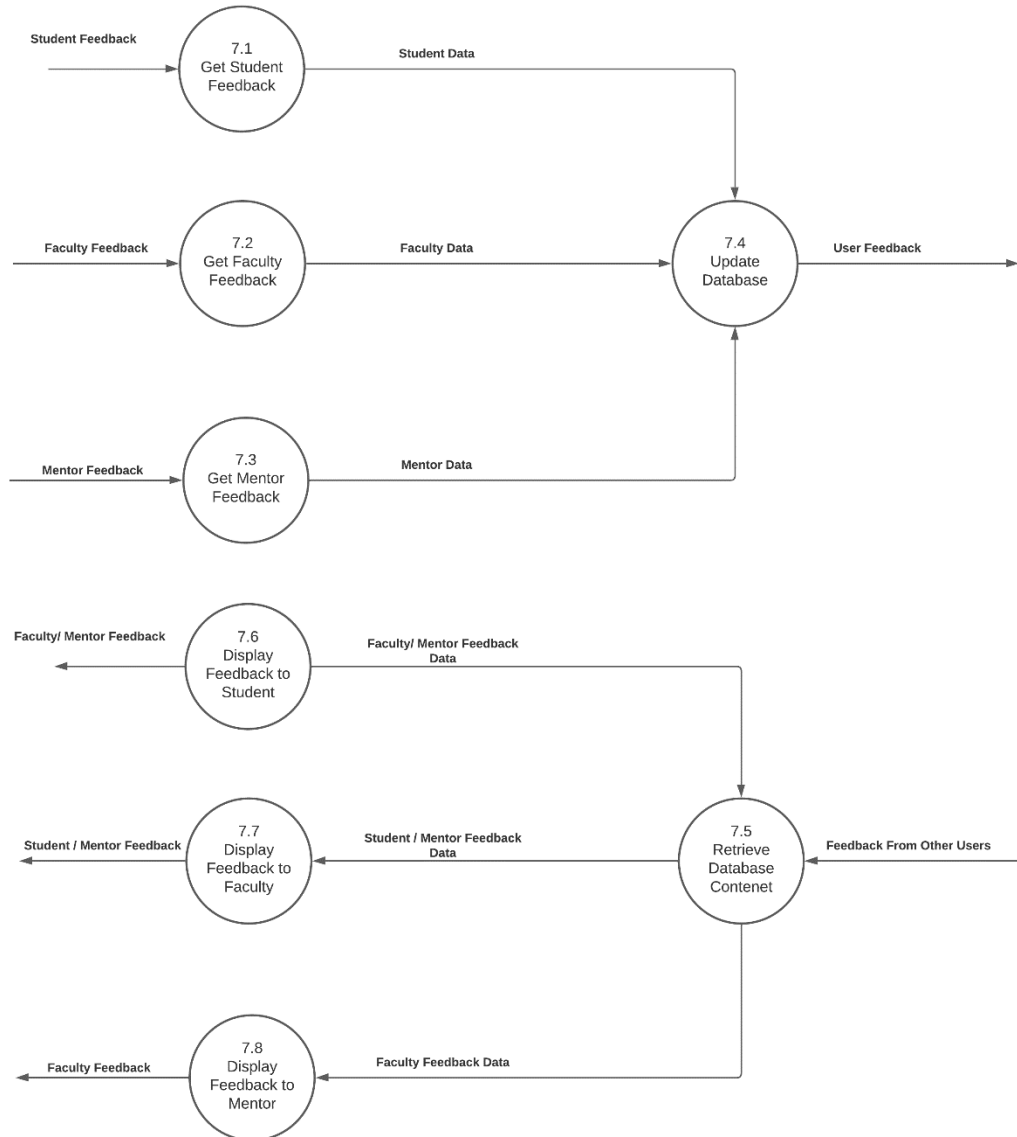

Fig 11. Data Flow Diagram (Level 2) for Feedback

4.2.1.3.8 Mentor/Faculty Registration (8.0)

Fig 12. Shows the level 2 DFD for the Mentor/Faculty Registration and how the data flows between the various sub-processes.
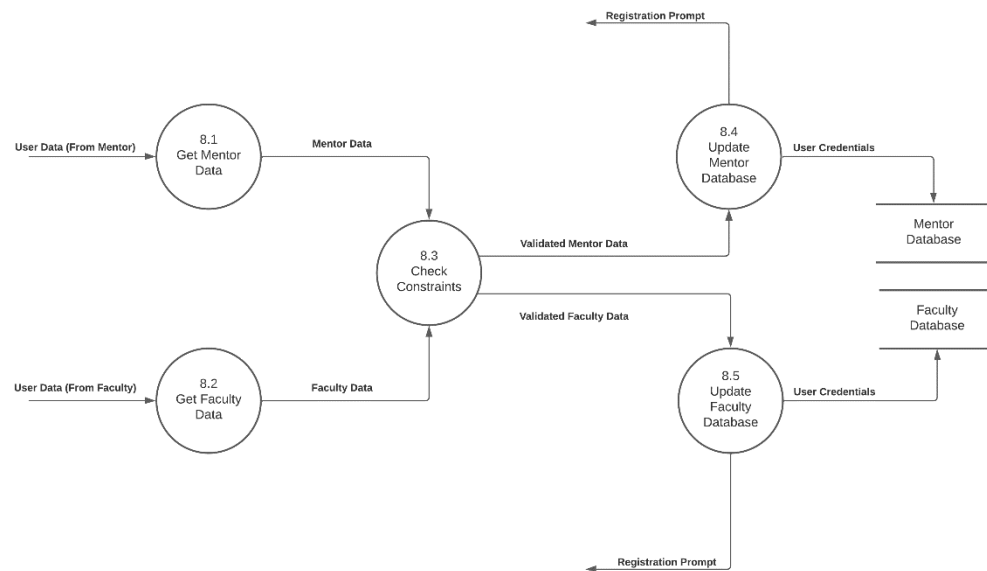

Fig 12. Data Flow Diagram (Level 2) for Mentor/Faculty Registration

4.2.2 Class Diagram

Fig 13. Shows the class diagram which describes the attributes and operations of various classes of objects and also their relationships and constraints imposed on the system.
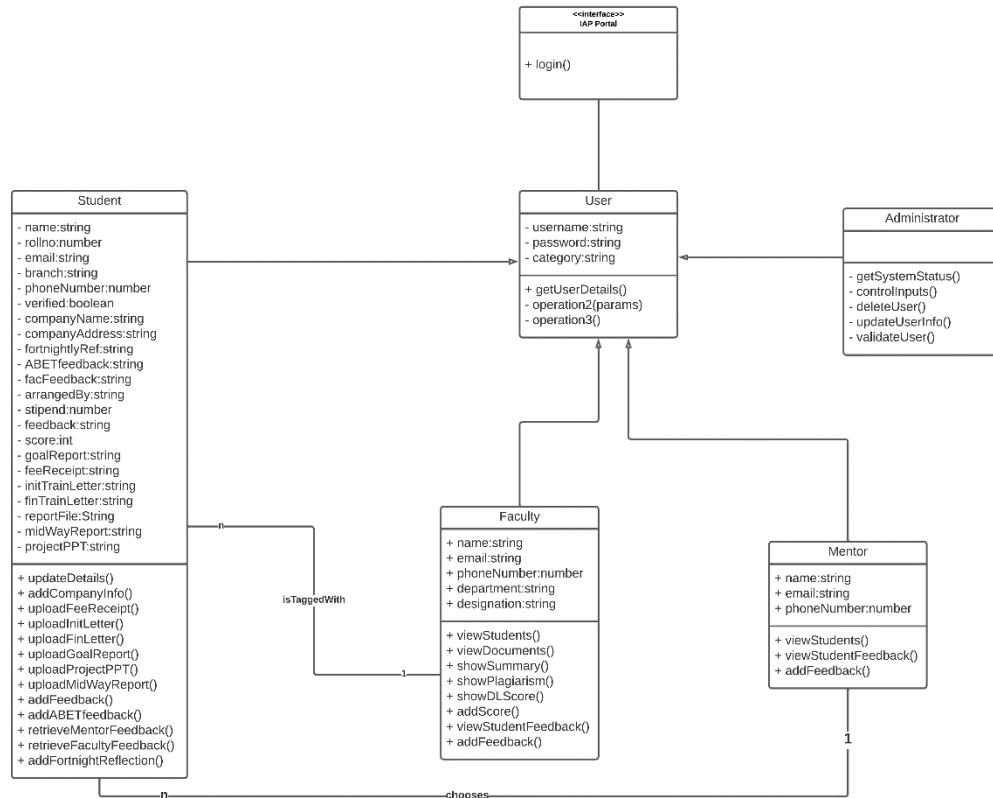

Fig 13. Class Diagram

4.2.3 Entity Relation Diagram

Fig 14. Shows the Entity Relation diagram and depicts the data model of the proposed solution including various entities, their attributes and relationships among various entities.
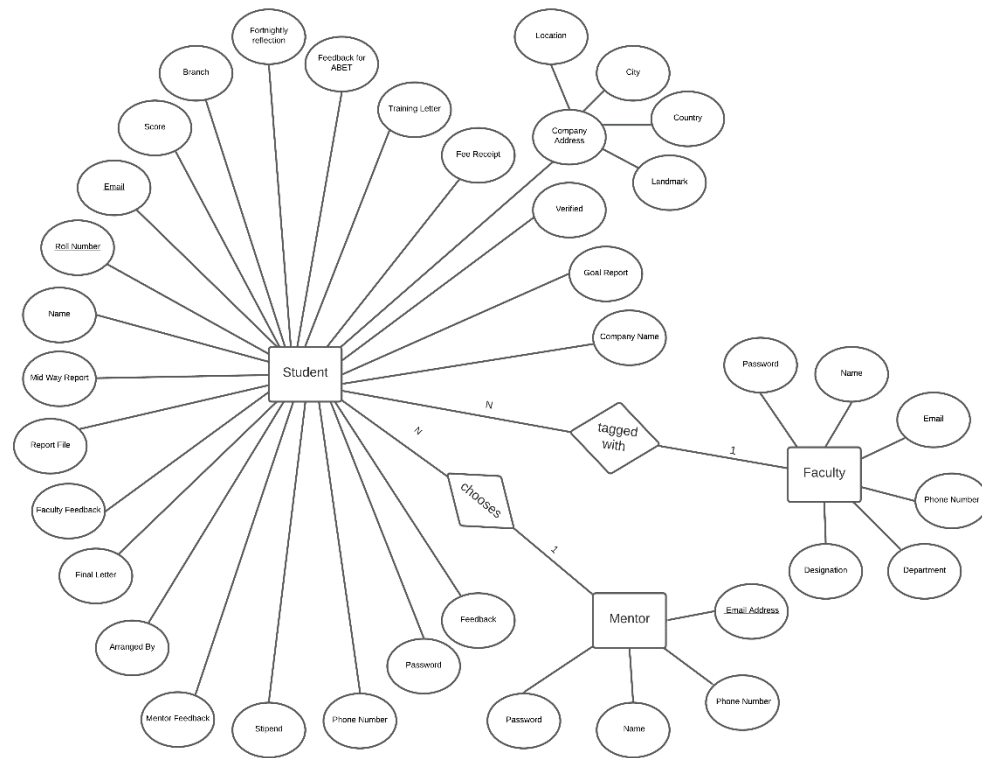

Fig 14. ER Diagram

4.2.4 Use Case Diagram:

Fig 15. Illustrates the various use cases for the proposed system along with the various external entities that interact with the system.

Fig 15. Use Case Diagram

4.2.4.1 Use Case Templates:

1	Use Case ID	1
2	Use Case Title	Register
3	Pre Conditions	Must have a 49hapar domain email id
4	Actors	Student, Faculty, Mentor
5	Purpose	To sign-up into the system
6	Description	
	The respective actor enters the credential and those are hence stored into the database.	
6.1	Task Sequence	
	1. (SR) The system asks the actor to sign-up.	
	2. (AA) The actor selects the particular option.	
	3. (SR) The system directs the actor to the respective sign-up interface	
	4. (AA) The actor enters the credentials accordingly and hit the signup button.	
	5. (SR) The system verifies the authenticity of the actor via sending a link to the particular email (Thapar ID)while signing up.	
	6. (AA) The actor clicks on the verification link.	
	7. (SR) The system verifies the user, saves the information in the database and hence directs the actor to the login page.	
6.2	Exceptional Flow	
	The system/database is down and thus actor cannot be registered into the system or the verification email is not sent. The email ID entered is not of Thapar domain which leads to generation of error.	
7	Type	Primary
8	Post Conditions	
	The user will be hence registered to the system and will be asked to login.	

Table 16. Use case template for Register

1	Use Case ID	2
2	Use Case Title	Login
3	Pre Conditions	The user must be registered on the portal.
4	Actors	Students, Faculty, Mentor, Admin
5	Purpose	To login into the system
6	Description	
	The respective actor enters the username and password and is hence logged in into the system	
6.1	Task Sequence	
	1. (SR) The system asks the actor to login.	
	2. (AA) The actor selects the particular option.	
	3. (SR) The system directs the actor to the respective login interface	
	4. (AA) The actor enters the credentials accordingly and hit the login button.	
	5. (SR) The system verifies the authenticity of the actor by verifying with the database and logs the particular actor in.	
6.2	Exceptional Flow	
	The system/database is down and thus actor cannot be logged in into the system. The actor enters invalid credentials which leads to generation of error.	
7	Type	Primary
8	Post Conditions	
	The user will be hence logged in into to the system.	

Table 17. Use case template for Login

1	Use Case ID	3
2	Use Case Title	Report Submission
3	Pre Conditions	The Student must be logged in and the faculty must have been assigned to that particular student. The Report must be submitted in a given time frame.
4	Actors	Students
5	Purpose	For submissions of reports/documents.
6	Description	
	The student will upload the documents as listed on the site of particular format mentioned for evaluation.	
6.1	Task Sequence	
	1. (SR) The system asks the actor to upload the series of documents as mentioned.	
	2. (AA) The actor selects the choose file option to upload the required file.	
	3. (SR) The system directs/allows the user to choose/browse a file from the device being used.	
	4. (AA) The actor selects the particular document which is to be evaluated and hit enter.	
	5. (SR) The system will again return to the site where the document is to be uploaded.	
	6. (AA) The actor clicks on upload button.	
	7. (SR) The system updates the status of that particular cell from not uploaded to uploaded.	
6.2	Alternative Flow	
	4. (AA) The actor selects the wrong document and hit enter.	
6.2	Exceptional Flow	
	The system/database is down and thus actor is unable to upload the documents. The file submitted is not in the mentioned format whether in respect of size or type. The time to submit the reports is up.	
7	Type	Primary
8	Post Conditions	
	The status of the documents will be set to uploaded and will be sent for evaluation.	

Table 18. Use case template for Report Submission

1	Use Case ID	4
2	Use Case Title	Evaluate Report
3	Pre Conditions	The faculty must be logged in and the reports must have been submitted by students.
4	Actors	Faculty
5	Purpose	To evaluate the reports of students.
6	Description	
	The respective actor evaluates the reports.	
6.1	Task Sequence	
	1. (SR) The system asks the actor to choose a particular student to be evaluated.	
	2. (AA) The actor selects the particular student.	
	3. (SR) The system directs the actor to the respective reports interface of the selected student where the three parameters are already evaluated by DL Evaluation namely Plagiarism Percentage. Score. Summary.	
	4. (AA) The actor cross verifies the score assigned and may or may not update accordingly and hit enter.	
	5. (SR) The system punches/locks the score of the student and returns to list of other students which are yet to be evaluated.	
6.2	Alternative Flow-1	
	4. (AA) The actor chose not to rely on the DL evaluator and evaluates all the reports by himself/herself and hits enter.	
6.2	Alternative Flow-2	
	4. (AA) The actor chose to rely on the DL evaluator and doesn't cross verify reports and hits enter.	
6.2	Exceptional Flow	
	The system/database is down and thus actor cannot be logged in into the system. The actor enters invalid credentials which leads to generation of error.	
8	Post Conditions	
	The scores of the students for the uploaded reports will be locked.	

Table 19. Use case template for Evaluate Report

1	Use Case ID	5
2	Use Case Title	Industry Feedback
3	Pre Conditions	The mentor must be logged in and the repost must be submitted after minimum work duration.
4	Actors	Mentor
5	Purpose	To give feedback of a particular student under training.
6	Description	
	The respective actor provides the feedback of the trainee as per the work done by the student.	
6.1	Task Sequence	
	1. (SR) The system asks the actor to submit a feedback of any student out of the provided list.	
	2. (AA) The actor selects the particular student.	
	3. (SR) The system directs the actor to the respective feedback form	
	4. (AA) The actor provides the feedback in particular format and hit enter.	
	5. (SR) The system then return to the main page where the list of other students is present who are still to be given feedback.	
6.2	Exceptional Flow	
	The system/database is down and thus actor cannot submit the feedback. The time to provide feedback is over.	
7	Type	Primary
8	Post Conditions	
	Feedback of the student will be locked and sent to the concerned authority.	

Table 20. Use case template for Industry Feedback

1	Use Case ID	6
2	Use Case Title	Approves Students, Faculty, Mentor Details
3	Pre Conditions	The admin must be logged in.
4	Actors	Admin
5	Purpose	To approve the Students, Faculty and Mentor Details.
6	Description	
	The respective actor enters the credential and those are hence stored into the database.	
6.1	Task Sequence	
	1. (SR) The system asks the actor to sign-up.	
	2. (AA) The actor selects the particular option.	
	3. (SR) The system directs the actor to the respective sign-up interface	
	4. (AA) The actor enters the credentials accordingly and hit the signup button.	
	5. (SR) The system verifies the authenticity of the actor via sending a link to the particular email submitted while signing up.	
	6. (AA) The actor clicks on the verification link.	
	7. (SR) The system verifies the user, saves the information in the database and hence directs the actor to the login page.	
6.2	Exceptional Flow	
	The system/database is down and thus actor cannot be registered into the system or the verification email is not sent. The email ID entered is not of Thapar domain which leads to generation of error.	
7	Type	
8	Post Conditions	The respective user is now approved to use the portal

Table 21. Use case template for Approves Students, Faculty, Mentor Details

1	Use Case ID	7
2	Use Case Title	Faculty Allocation
3	Pre Conditions	Admin must be logged into the system.
4	Actors	Admin
5	Purpose	To assign a faculty to every project semester student.
6	Description	
	The Admin uploads a csv file having the name of students corresponding to the mentor assigned.	
6.1	Task Sequence	
	1. (SR) The system asks the actor to upload a csv file.	
	2. (AA) The actor selects a csv file from their device and submits it.	
	3. (SR) The system stores the csv file to the database and shows the uploaded file on portal.	
	4. (AA) The actor views the file.	
6.2	Exceptional Flow	
	The system/database is down or network connection maybe down and thus file couldn't be saved to the database.	
7	Type	Primary
8	Post Conditions	
	The user has now tagged the faculty and students	

Table 22. Use case template for Faculty Allocation

4.2.5 Activity Diagram

Fig 16. Is the activity diagram of the solution proposed and shows the flow from one activity to another in the IAP portal for the student and the faculty.
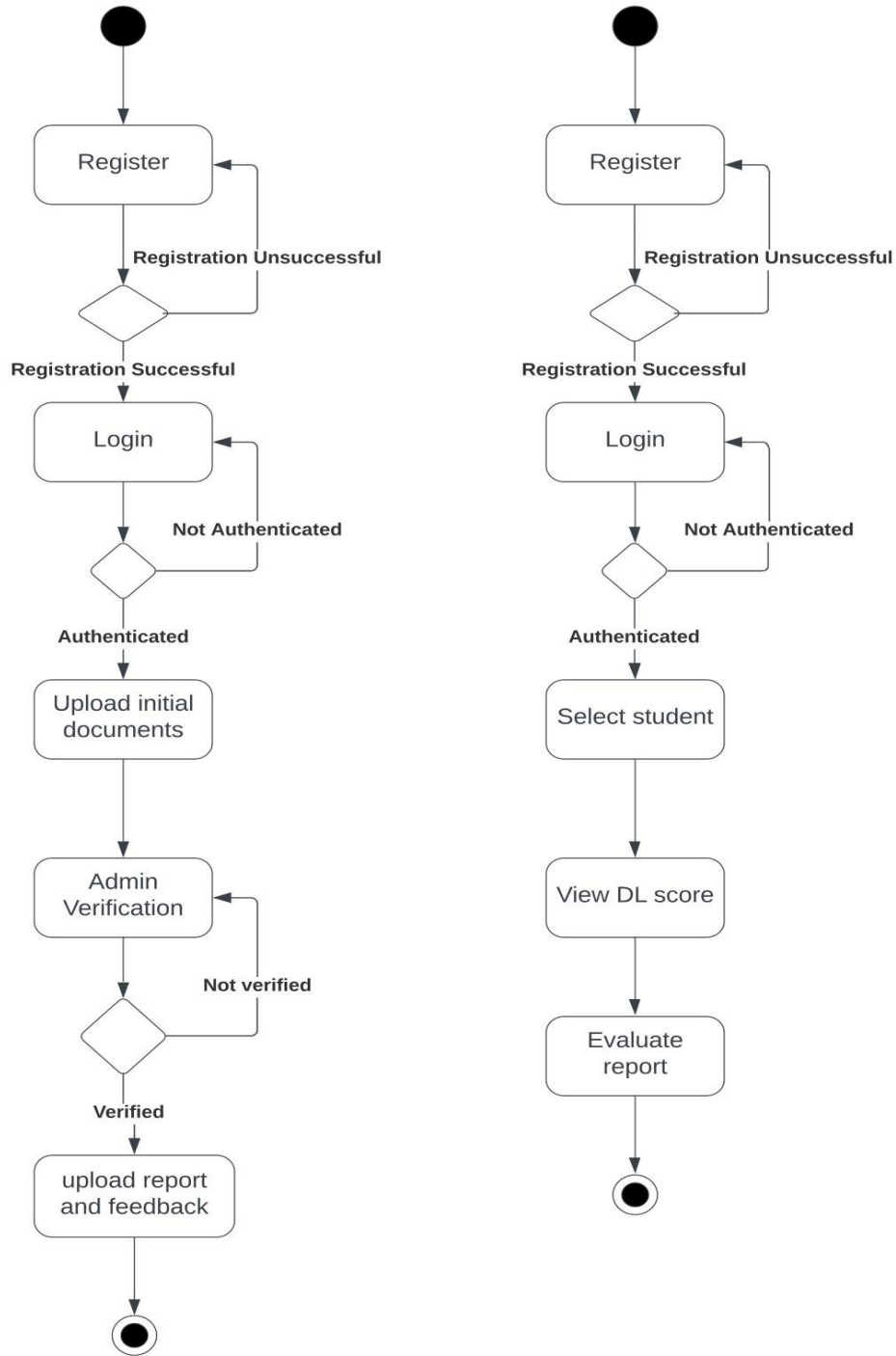
Fig 16. Activity Diagrams

4.2.6 Swimlane Diagram

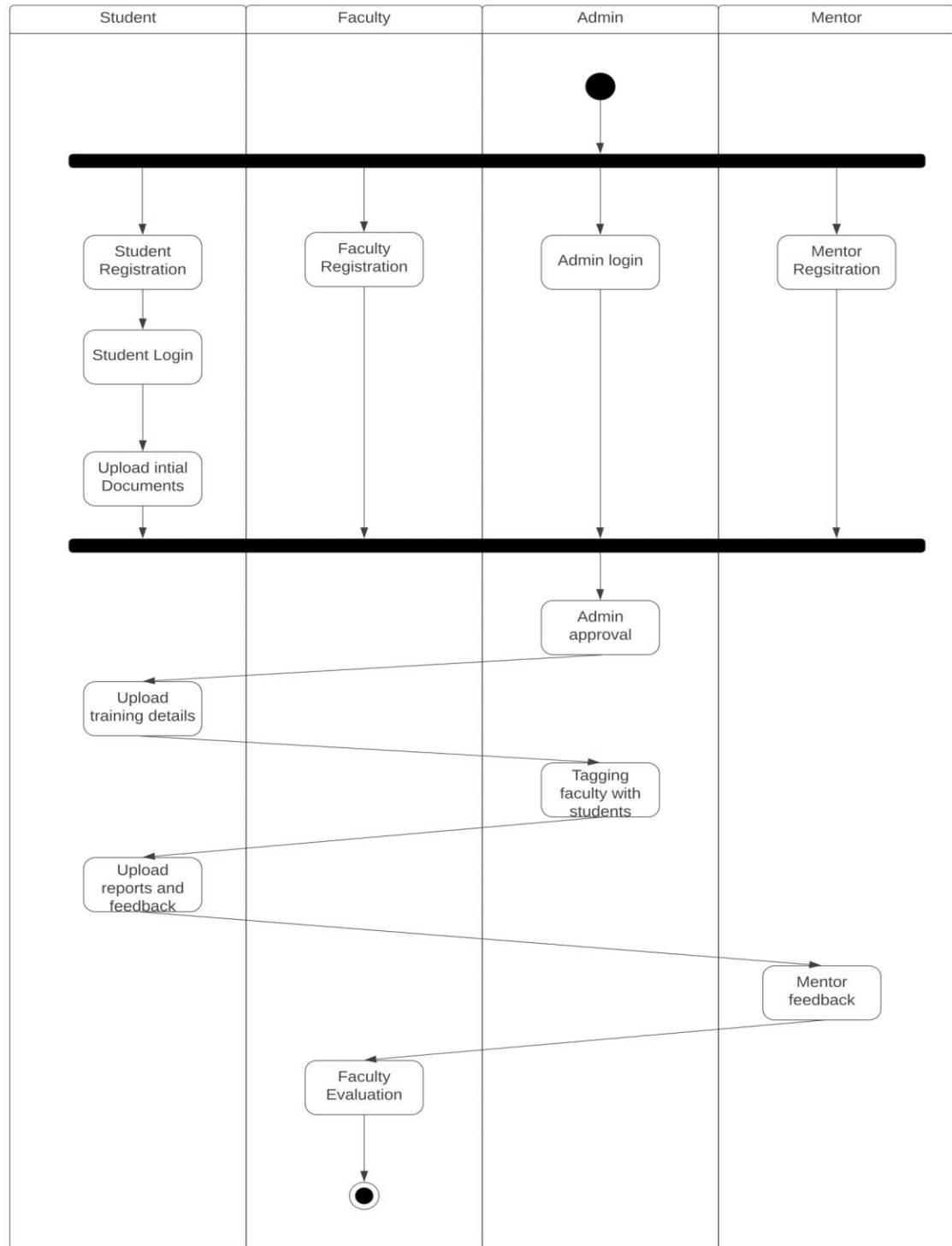Fig 17. Is the swimlane diagram that visually distinguishes job-sharing and responsibilities for sub process of IAP.

Fig 17. Swimlane Diagram

4.2.7 Sequence Diagram

Following sequence diagrams depict the sequence of occurrence of events in the proposed IAP system.

4.2.7.1 Sequence Diagram for Student
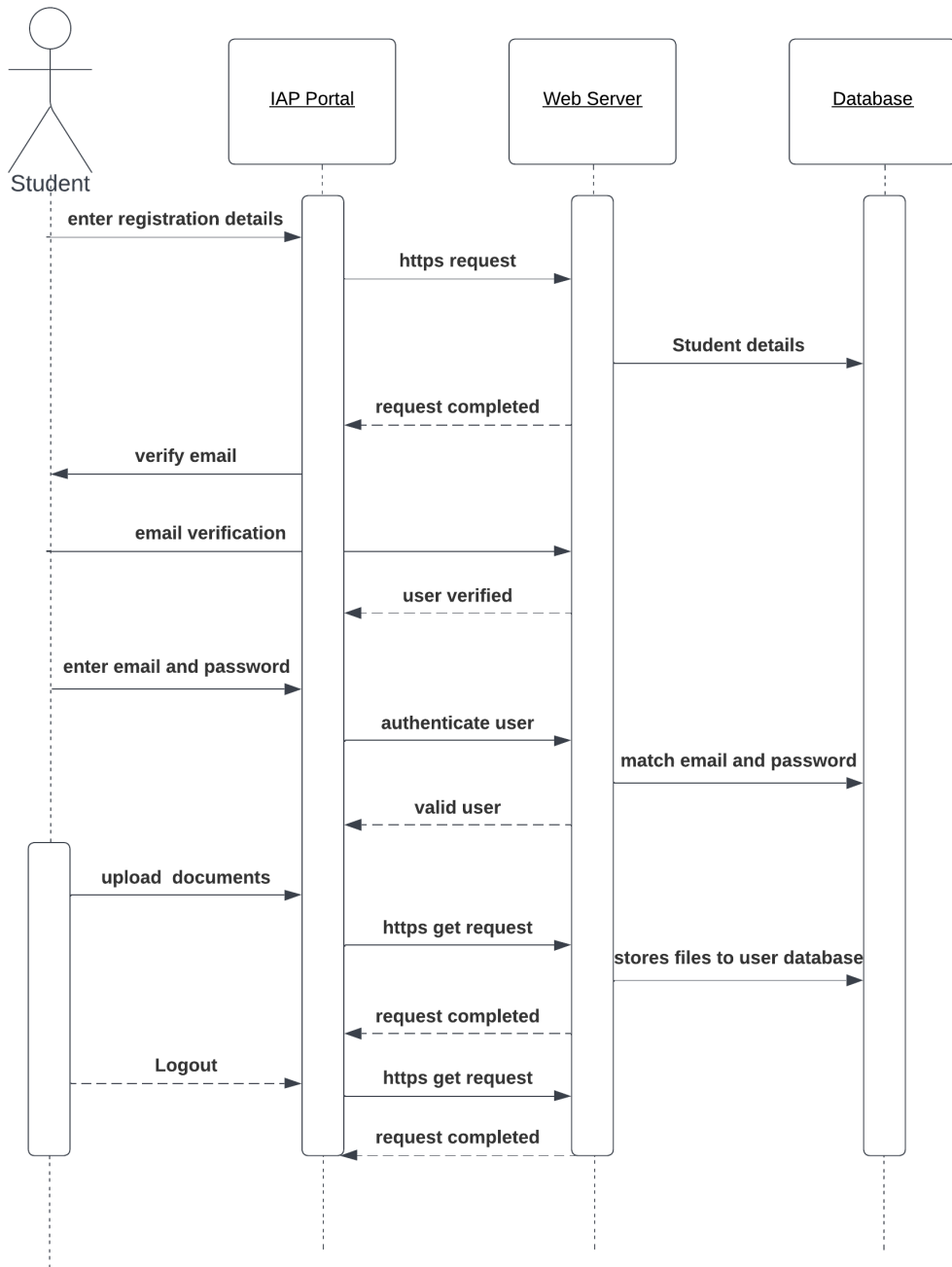
Fig 18. Sequence Diagram for student

4.2.7.2 Sequence Diagram for Mentor
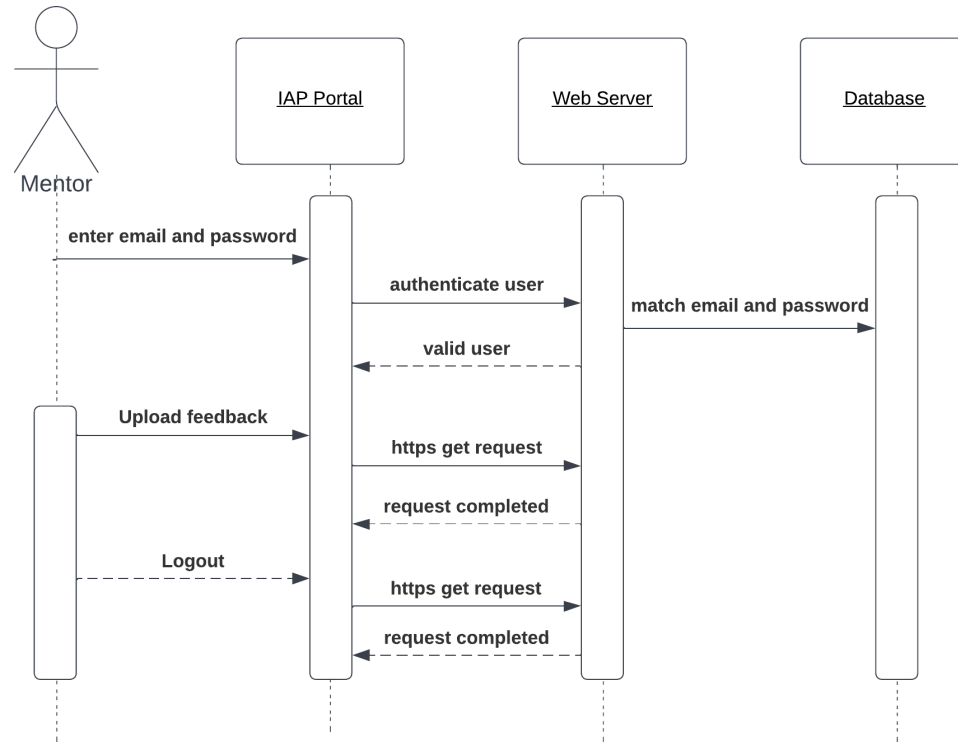
Fig 19. Sequence Diagram for student

4.2.7.3 Sequence Diagram for Faculty
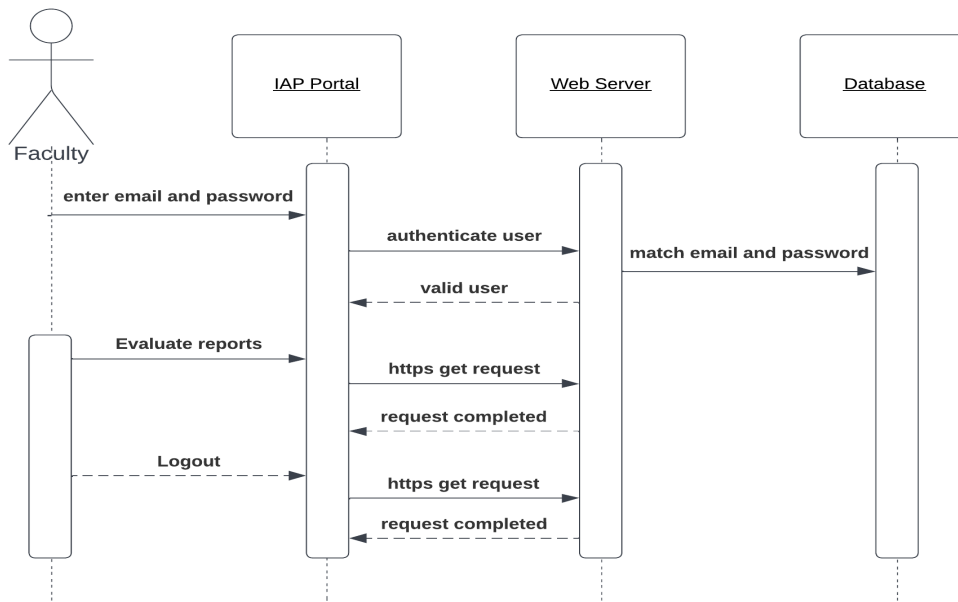
Fig 20. Sequence Diagram for faculty

4.2.7.4 Sequence Diagram for Admin
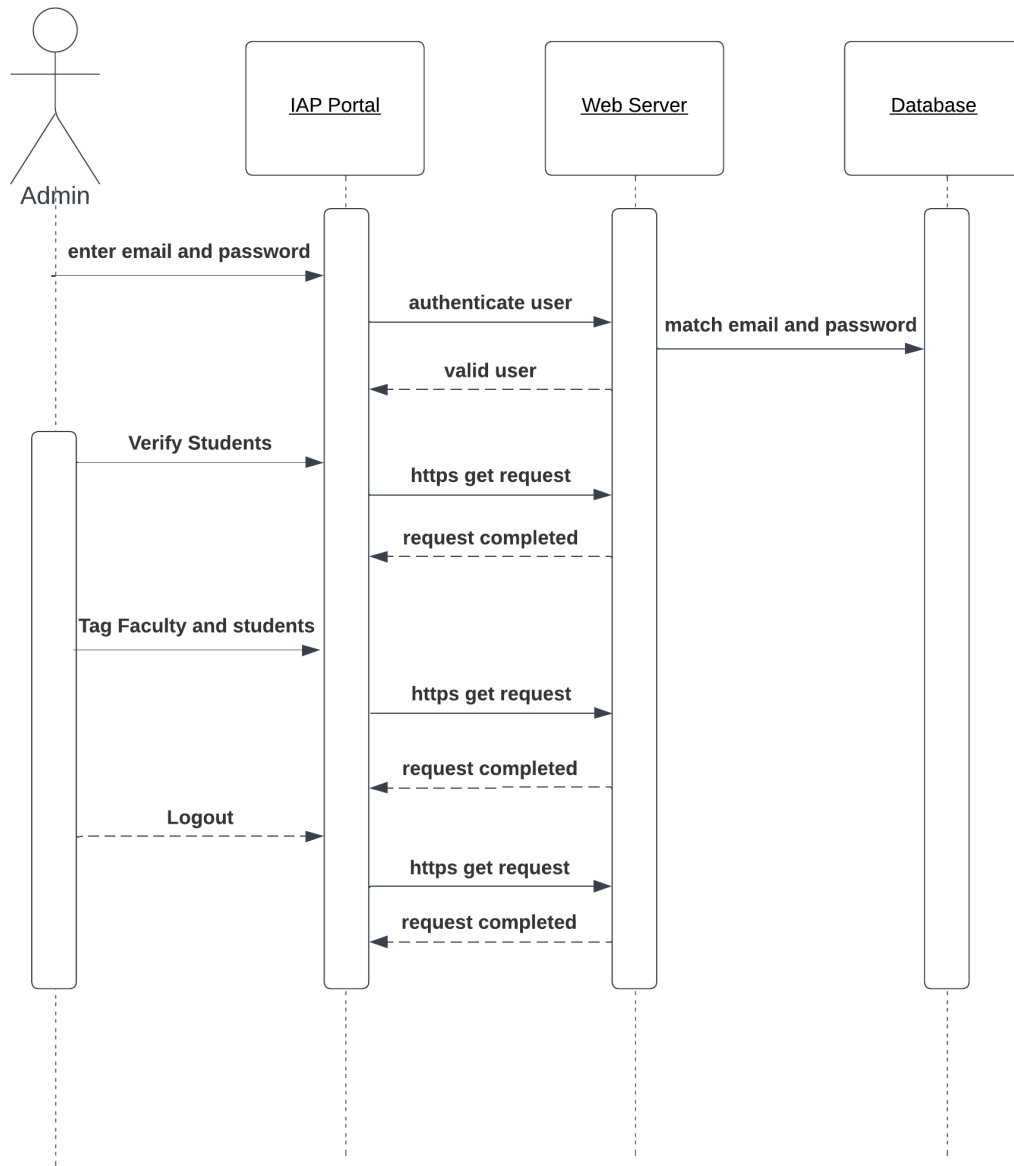
Fig 21. Sequence Diagram for admin

4.2.8 State Chart Diagram

Following state chart diagrams describes the flow of control from one state to another state.
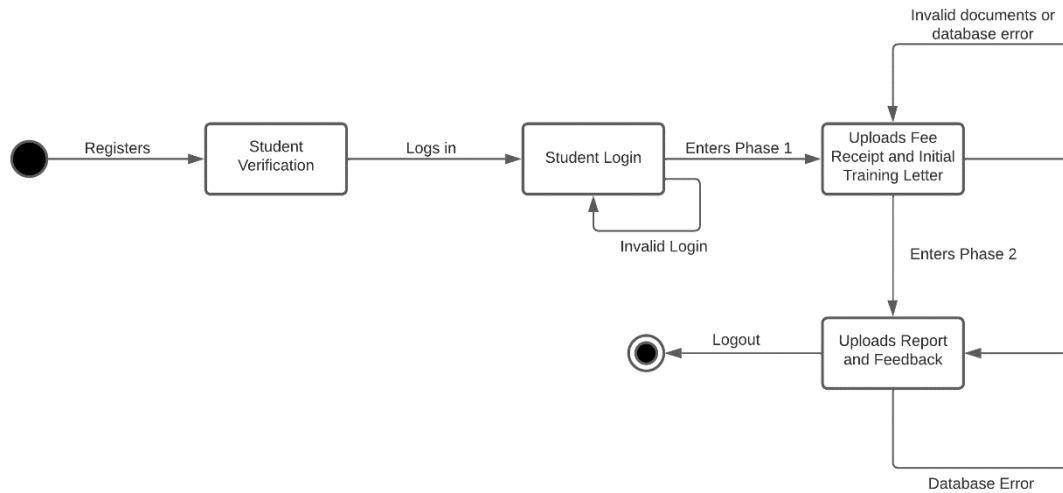
4.2.8.1 State Chart Diagram for Student

Fig 22. State Chart Diagram for Student
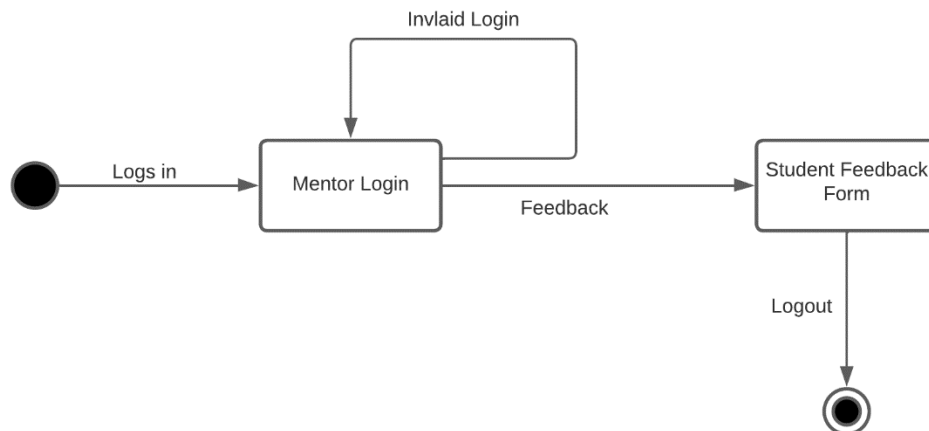
4.2.8.2 State Chart Diagram for Mentor

Fig 23. State Chart Diagram for Mentor
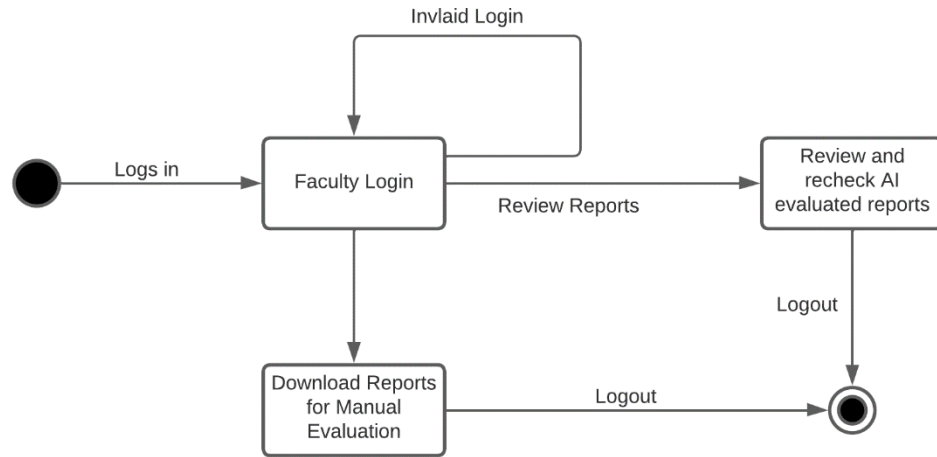
4.2.8.3 State Chart Diagram for Faculty

Fig 24. State Chart Diagram for Faculty
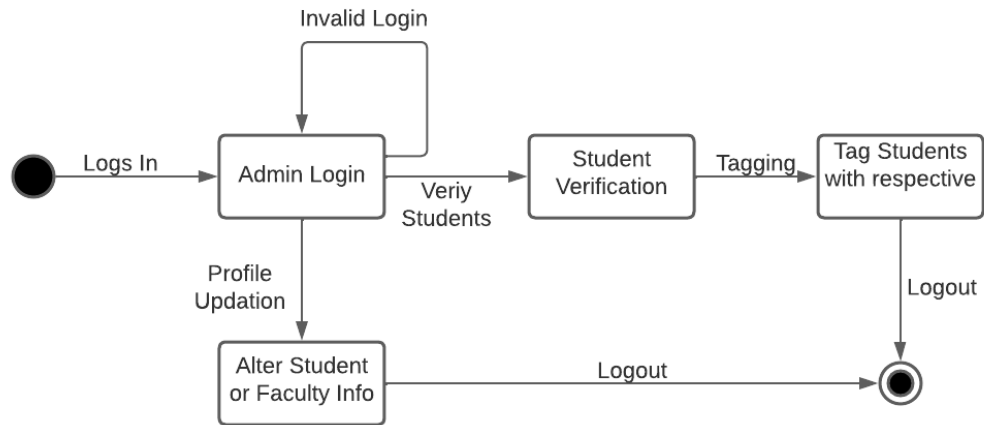
4.2.8.4 State Chart Diagram for Admin

Fig 25. State Chart Diagram for Admin

4.2.9 Component Diagram

Fig 26. is the component diagram and is used to describe the physical artifacts of the system.
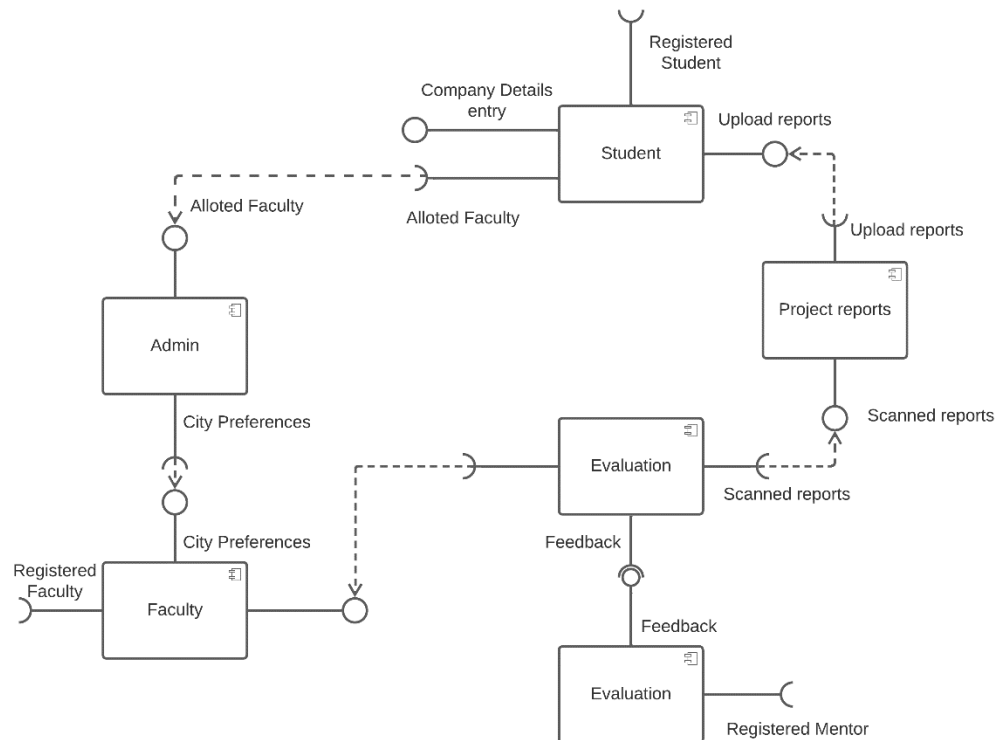

Fig 26. Component Diagram

4.2.10 Deployment Diagram

Fig 27. is the deployment diagram that shows the architecture of the system as distribution of software artifacts to deployment targets.
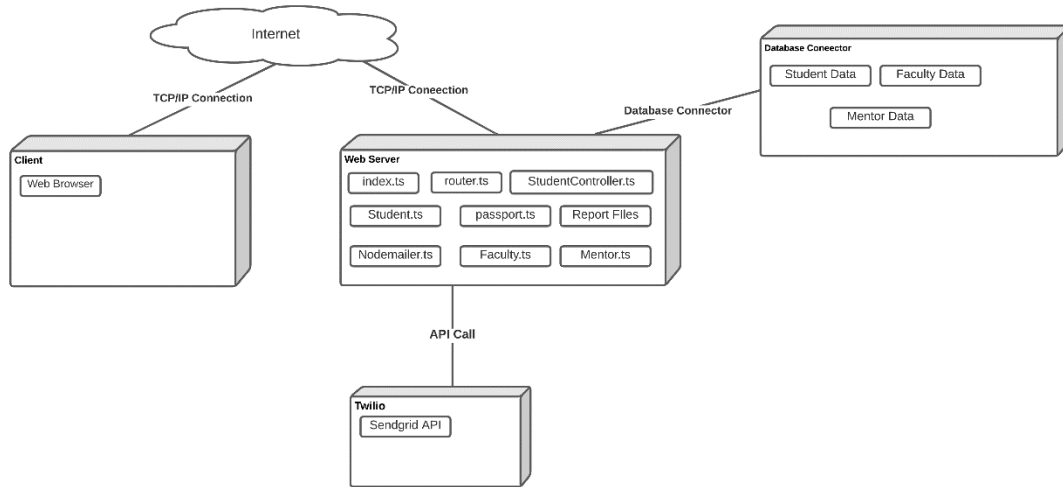

Fig 27. Deployment Diagram
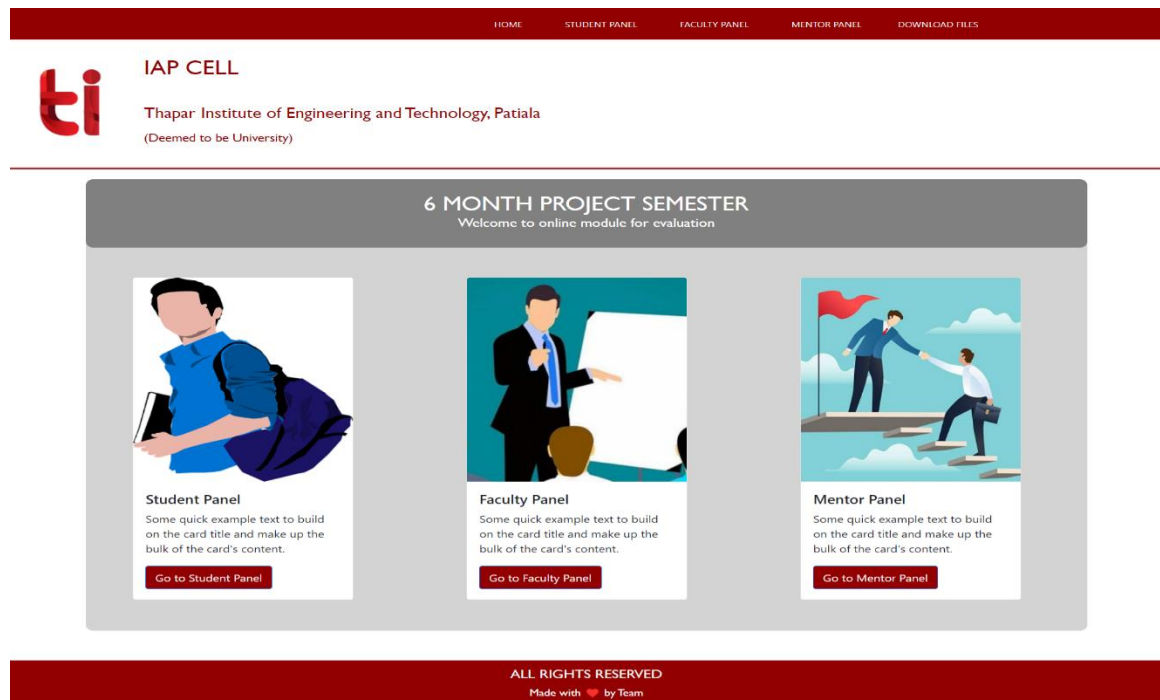
4.3 Snapshots of Working Prototype

Fig 28. Main Page

Fig 28. Shows the start of the proposed IAP Portal which is the landing page. It contains options to go to various panels namely Student, Faculty and Mentor Panel. Also, it has option to download various important files.

Fig 29. Student Login Page

Fig 29. Shows the student login page wherein the student can enter his/her credentials to log in to the system. It also has options for registering an new user and to retrieve the password in case forgotten.

Fig 30. Student Registration Page

Fig 30. Shows the student registration page wherein a new student can register himself/herself by entering the required details.
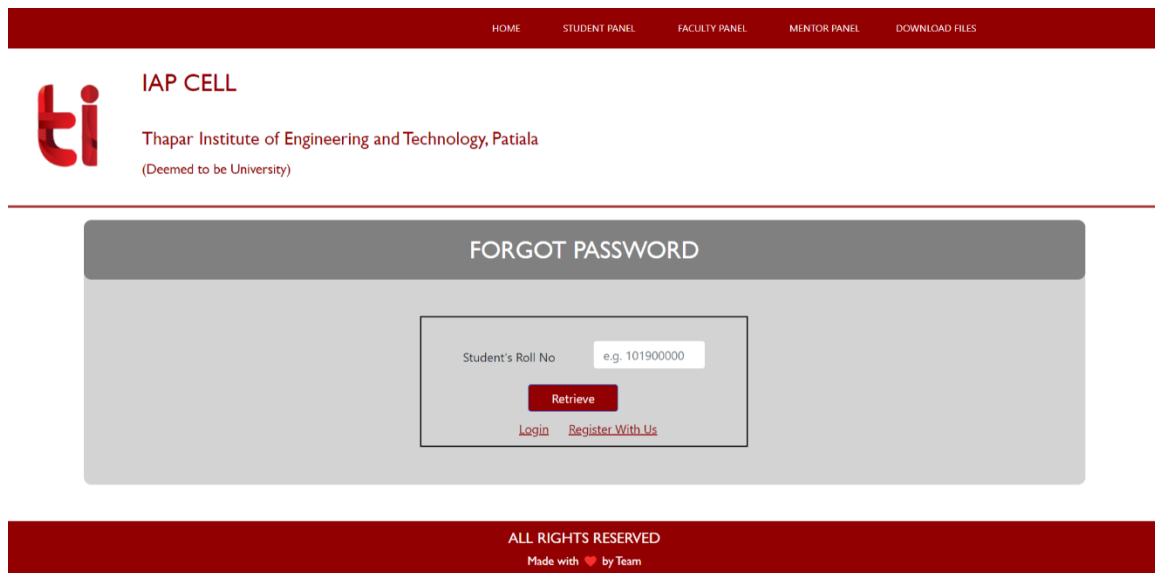
Fig 31. Password Retrieval Page

Fig 31. Shows the page for retrieval of password if in case a student fails to remember the password.
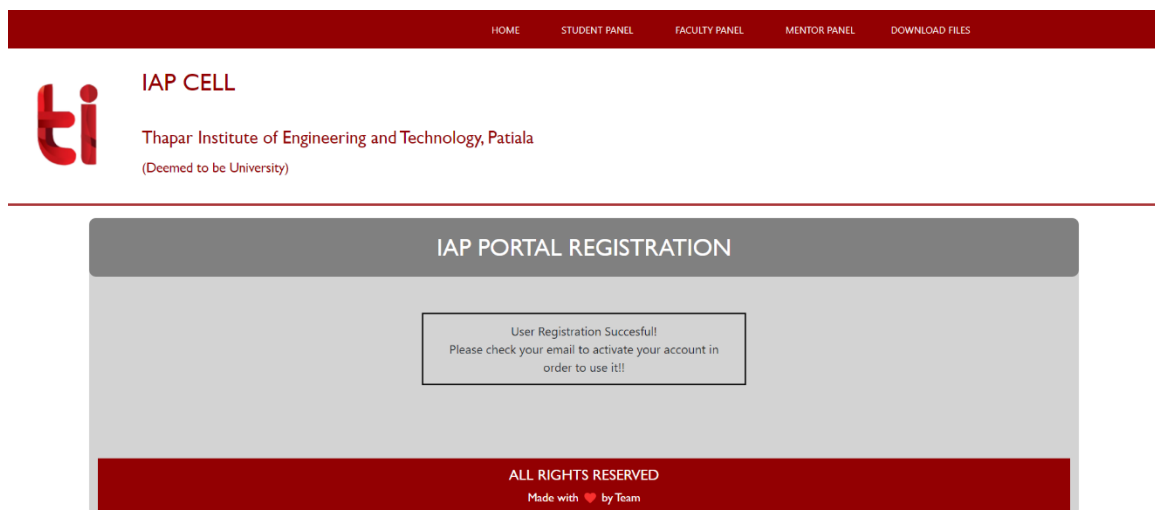
Fig 32. Acknowledgement Page

Fig 32. Shows the page when a student has been successfully registered on the portal and hence requires to verify his/her email ID entered by clicking on link received in the mail.

Fig 33. Documents Upload (Initial) Page

Fig 33. Shows the page for initial processing of the documents namely, the training letter and the fee receipt. One cannot move further before completing these steps. After Uploading, the user has to wait for getting verified by the admin.

IAP CELL

Thapar Institute of Engineering and Technology, Patiala

(Deemed to be University)

Stipend Information, Mentor Detail, Company Address (All fields are mandatory)

Arranged By	---Choose one---	Stipend(/Month)	Rs. 0
Mentor's Name		Mentor's Contact Number	Ex. +919999999999
Mentor's Email		Student's Updated Number +91	Fill same if not Changed

Company/Organization Address

Country	---Choose one---
Country Name(if outside india)	
City	NA
Company Name	
Complete Address	
LandMark	To locate your Institute/Organization easily.

Submit

Fig 34. Page for General Information about Stipend, Mentor and Company

Fig 32. Ask the students to enter Stipend Information, Mentor Details and the information about the company for the record keeping.

IAP CELL

Thapar Institute of Engineering and Technology, Patiala

(Deemed to be University)

Information of Faculty Member

Faculty Assigned: Dr XYZ

Fig 35. Tagged Faulty Page

Fig 35. Shows the tagged faculty name to a particular student.

IAP CELL

Thapar Institute of Engineering and Technology, Patiala

(Deemed to be University)

UPLOAD DOCUMENTS

- **Upload Initial Training Letter**

  At the Starting of Training (Please Upload Only .pdf File[Max 10MB])

  Choose File   No ...osen   Uploaded

  (PDF once saved cannot be changed or amended, please make sure while

  (PDF once saved cannot be changed or amended, please make sure while submission)

- **Upload Goal Report**

  At the End of 4 Weeks (Please Upload Only .pdf File[Max 20MB])

  Choose File   No ...osen   Start Upload

  (PDF once saved cannot be changed or amended, please make sure while

  (PDF once saved cannot be changed or amended, please make sure while submission)

- **Upload Mid Way Report**

  At the End of 10 Weeks (Please Upload Only .pdf File[Max 20MB])

  Choose File   No ...osen   Start Upload

  (PDF once saved cannot be changed or amended, please make sure while

  (PDF once saved cannot be changed or amended, please make sure while submission)

- **Upload Report File**

  1 Week before the Final Evaluation (Please Upload Only .pdf File[Max 50MB])

  Choose File   No ...osen   Start Upload

  (PDF once saved cannot be changed or amended, please make sure while submission)

- **Upload Proect Presentation**

  1 Week before the Final Evaluation (Please Upload Only .ppt or .pptx File[Max 30MB])

  Choose File   No ...osen   Start Upload

  (PPT once saved cannot be changed or amended, please make sure while submission)

- **Upload Final Training Letter**

  At the End of Training (Please Upload Only .pdf File[Max 10MB])

  Choose File   No ...osen   Start Upload

  (PDF once saved cannot be changed or amended, please make sure while submission)

Verification of your document's will take 5 days. After verification (from IAP Coordinator) Student can proceed to fill his/her allied details. Student can access the portal to it's full extent only after verification from IAP Cell.

Student can contact their respective IAP coordinator for any queries.

Fig 36. Document Upload (For Evaluation Purpose) Page

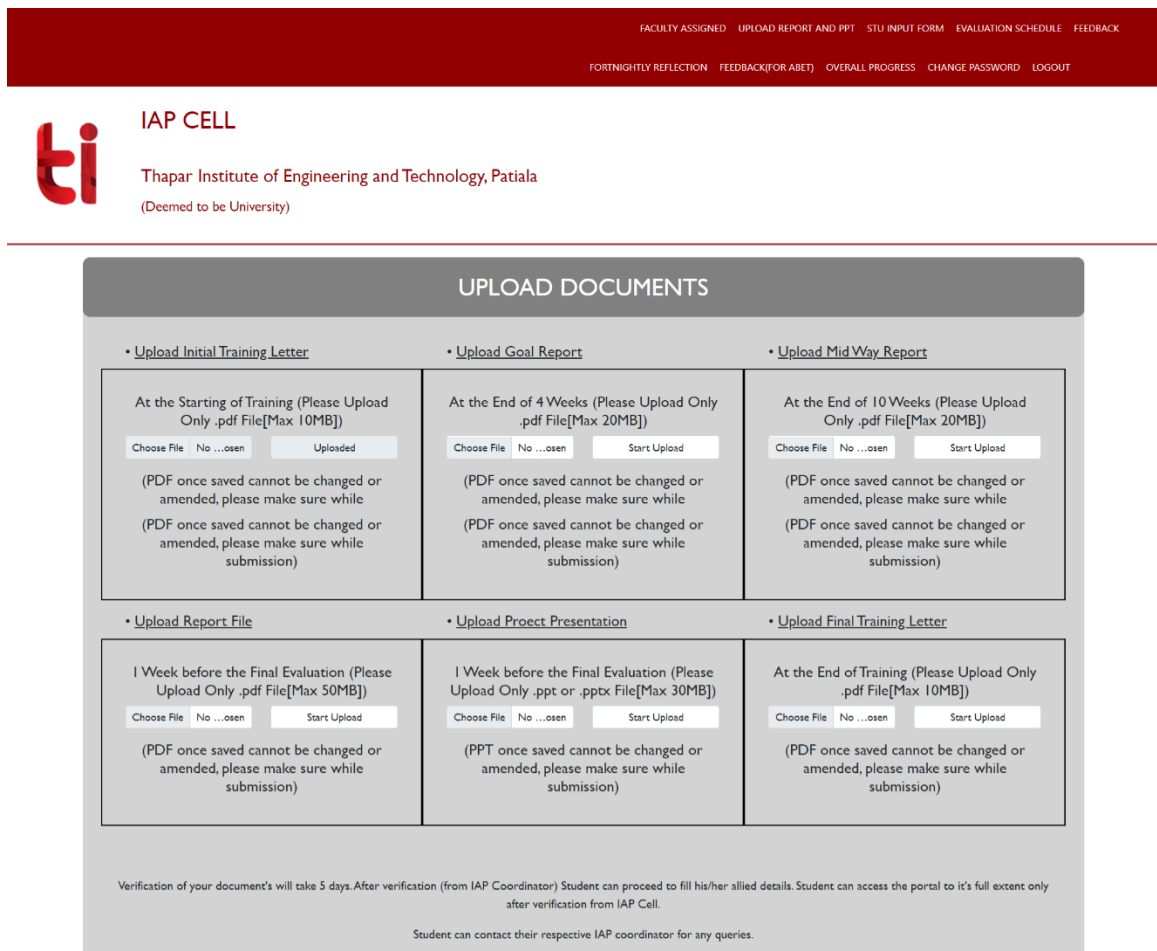Fig 36. Shows the upload document page wherein the student needs to upload the Goal Reports timely, as one can upload a document within a specific duration only.

5. Conclusions and Future Scope

5.1 Work Accomplished

- The existing system was studied thoroughly with a detailed analysis of various components of the system and areas with potential for improvement were identified.

- Existing techniques for developing various ML/DL features like Plagiarism Detection, Text Summarization, Automatic Scoring were studied in order to identify the best state-of-the-art technologies to be used in the system.

- Work was started on the development of actual working prototype, with the student panel being complete and work in progress on the other panels.

5.2 Conclusions

The project is currently in its development phase. There has been a significant progress in the project, with the designing part complete and work going on in the actual prototype creation. Major parts of the web app for the project are already ready with the development of Machine Learning/Deep Learning models also being started. Our proposed solution is surely one to make a difference owing to its improved design and new game-changing features.

5.3 Social Benefits

Our project is primarily aimed at automating and simplifying the evaluation process of various Industrial Attachment Program (IAP) activities by providing features using various Machine Learning / Deep Learning technologies. These include features like Plagiarism detection, Document Summarization as well as Automatic Scoring based on certain pre-defined Rubrics.

The Automatic Scoring feature will be of great assistance for the faculty members who currently have to evaluate each document manually. This also will provide a system of standardized evaluation as the predicted scores will be calculated based on pre-defined

rubrics using a common evaluation system. This will reduce the personal bias which may occur during manual evaluation.

Also, the plagiarism checker will ensure the integrity of documents submitted by the students and prevent use of any unfair means. This will add a degree of security to the overall document submission process and help for a fair evaluation.

The Text summarizer will also be a tool of great assistance for the faculty as they will be able to have a quick glimpse of the whole document, which in turn, will help them to evaluate the documents quicky yet accurately. All in all, this will be a great assistance tool for the faculty members and will reduce their burden by a great extent.

Another useful aspect of our solution is the cross platform reactive UI. This will offer the users a seamless experience across various devices and improve their overall User Experience. Moreover, the portal is proposed to be hosted on the institute servers only which will allow for a better control over the portal while simultaneously being cost effective.

5.4 Future Scope

- The machine learning models can be improved further with the development of new state-of-the-art technologies.
- The system can be scaled up for management of other use cases which require submission and evaluation of reports.
- The user experience can be improved further by further modifying the GUI.
- If the system is to be scaled up to a very high level, Cloud technologies can be used to run the various Machine Learning/Deep Learning algorithms as well as store the documents in a distributed framework.

APPENDIX

REFERENCES

[1] Liu, Y., & Lapata, M. (2019). Text summarization with pretrained encoders. arXiv preprint arXiv:1908.08345.

[2] Day, M. Y., & Chen, C. Y. (2018, July). Artificial intelligence for automatic text summarization. In 2018 IEEE International Conference on Information Reuse and Integration (IRI) (pp. 478-484). IEEE.

[3] Gharavi, E., Bijari, K., Zahirnia, K., & Veisi, H. (2016). A Deep Learning Approach to Persian Plagiarism Detection. FIRE (Working Notes), 34, 154-159.

[4] Dong, F., Zhang, Y., & Yang, J. (2017, August). Attention-based Recurrent Convolutional Neural Network for Automatic Essay Scoring. In CoNLL (pp. 153-162).

[5] He, H., Gimpel, K., & Lin, J. (2015, September). Multi-perspective sentence similarity modeling with convolutional neural networks. In Proceedings of the 2015 conference on empirical methods in natural language processing (pp. 1576-1586).

[6] Dong, F., & Zhang, Y. (2016, November). Automatic Features for Essay Scoring-An Empirical Study. In EMNLP (Vol. 435, pp. 1072-1077).

PLAGIARISM REPORT

REPORT OF THE PLAGIARISM CHECK

THIS REPORT CERTIFIES THAT THE ATTACHED WORK

IAP Portal for TIET

WAS CHECKED WITH THE PLAGIARISM PREVENTION SERVICE
MY.PLAGRAMME.COM AND HAS:

SIMILARITY

6%

RISK OF THE PLAGIARISM

18%

PARAPHRASE

0%

IMPROPER CITATIONS

0%

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