

STUDENT PERFORMANCE ANALYSIS SYSTEM

¹Devita Durge, ²Nikhil Bagul, ³Rushikesh Gadge, ⁴Siddhesh Bhavsar

¹Assistant Professor, ²Student, ³Student, ⁴Student

¹Department of Computer Engineering,

¹Shivajirao S. Jondhale College of Engineering, Dombivli, India.

ABSTRACT: With reference to this document; it specifically mentions the details of the project how it was developed, the primary requirement, as well as various features and functionalities of the project and the procedure followed in achieving these functionalities. This structured system deals with the scores of students in various subjects he opted for during an academic year. For this research, students' scores across few important measures that tries to determine their academic excellence such as subjects conceptual knowledge based on marks scored in that exam, Time management skills based on number of questions attempted is obtained priorly, have been used to create homogeneous groups of students who opted for same subjects and share perceptions of their non-cognitive abilities. Result of statistical graphical data helps students and teachers to track the performance and direction in which the students perception and knowledge regarding the subject is inculcated. Results of this study indicate the degree to which specific profiles predict outcome of the conceptually relevant data and widen the scope of their information to discover knowledge from data. Also it facilitates smooth and efficient handling of data that includes storage and modification of data in files which can be easily converted to other formats as desired by the user.

Index Terms – Features, Structured System, score, statistical, graphical, efficient.

I. INTRODUCTION

Student Performance Analysis System is an application which refers to other analysis systems like the car quality analysis, Share Market analysis and in broad perspective Data Analysis. It is a completely offline application. It is developed to help teachers i.e. Faculty and Students enrolled in particular course in terms of their performance in that course and is useful for maintenance of records as well. DBA can implement, update, modify and can maintain the system and can develop the system for future use as per the needs of the users.

1.1 Purpose:-

- The software is for professor faculty and Students.
- It provides following facilities to:-
 1. USER (Student):-
 - Can retrieve details related to particular course in which he/she is enrolled.
 - Can compare his performance with other students in same course.
 - Can predict his marks in future test based on his previous scores..
 2. ADMIN (DBA):-
 - Can add, delete, view, and update Faculty and course details.
 - Can compare performance of students in all courses.
 - Can check the percentage of enrolment of student in different course in graphical format.
 3. USER (Faculty):-
 - Can add, delete, view and update student details of respective course of which they are assigned as the faculty or in charge.
 - Can compare performance of students in particular courses.
 - Can save statistics related to students performance.

1.2 Scope:-

The different areas where we can use this application are:

- Any Educational Institute can make use of it, for the departmental level and at basic subject level for providing a brief overview of the performance related to particular course.
- Any industrial firm or company can also make use of this application with minor changes to evaluate the performance of their employees for selecting best employee based on his productivity.

1.3 Functionality:-

- This system is specifically developed for the faculty and students.
- It provides information about Test Performances, detailed analysis of each subject, anytime.
- It provides with immediate updates in the Test performance based on previous test.
- It also acts as a platform where the complete academic information about the student.
- It provides Students Test Performance in consolidated and detailed performance sheets.
- It also predicts marks of upcoming examination.
- Student's record can also be maintained.
- Faculty and Course details can also be maintained without manual work.

1.4. Aims & Objectives:-

The aims and objective of the project that will be accomplished after completion of this project were carried out in this subchapter. To allow users (faculty) to analyze progress of his subject.

- To allow students to compare his performance in different tests.
- To provide convenience to faculty to guide and mentor students in their academic performance.
- To design a user-friendly graphical user interface.
- To conveniently maintain digital records of student, faculty and courses.

II. LITERATURE SURVEY

Performance Analysis Systems are backbone for every guide and mentor as well. A proper guidance and help using statistical data will surely help an individual to progress and in turn the success of firm associated with him. A background study is done to review similar existing systems used to perform student performance analysis. We start our literature survey by first understanding three existing systems which are similar to proposed system.

[1] Student Performance Analysis System (SPAS):-

This pre-existing system is similar to the proposed system in following aspects.

It helps faculty to analyze the performance of students in "TMC1013 System Analysis and Design" subject only. It helps the faculty to predict the performance of students using Data mining Technique of Classification. In this System only login facility to faculty has been provided and only the faculty can perform analysis of student in that particular subject and store the result. It generates reports of analysis in Portable Document Format (PDF) and illustration using charts.

[2] Faculty Support System (FSS):-

Faculty support system is a system which is low in cost as it uses cost effective open source analysis software. WEKA to analyze the student's performance in a course offered by Coimbatore Institute of Technology of Anna University. FSS is able to update and analyze student's data dynamically with the flow of the time to create or add a new rule. The update of new rule is possible with the help from domain expert and the rule is determined by data mining technique such as classification technique. FSS focuses on identification of factors that contribute to performance of student in particular course.

[3] Student Performance Analyzer (SPA):-

SPA is existing secure online web-based software that enables educators to view the student's performance and keep track of schools' data. The SPA is a tool designed for analyzing, storing displaying and getting feedback of student assessment data. It is a powerful analyzer tool used by schools worldwide to perform the analysis and display the analysis data once raw student data is uploaded to the system. The analysis is done by tracking the student or class to get the overall performance of student or class. This would allow the educators or staff to identify the current student Performance easily. Other than that, it enables various kinds of student performance reports such as progress report and achievement report to be generated.

During our study on the existing systems of similar type. We encountered certain challenges that we tried to overcome in our proposed systems. They are as follows:

- In the existing system of SPAS [1], login to only faculty members were given and as a result, students were not given space for self-analysis. So, providing student login with restricted functionality is proposed to overcome this challenge.

- In the existing system of SPAS [1], students' performance and data related to a single subject were done. This challenge was tackled by Adding multiple courses in which enrolment of student will be done by the respective faculty and Analysis also.
- The existing system of SPA [3], is a web-based online software to keep a track of student data. Whereas the proposed system is completely offline and is platform independent.
- In the existing system of FSS [2], Data mining technique of classification is used for prediction which is not efficient because of the number of computations involved in it. The proposed system uses Machine learning Algorithm using Linear Regression which is a type of Data mining technique involving comparatively a smaller number of calculations.

III. PROBLEM STATEMENT

The Student Performance Analysis System is designed in response to various problems in the current Grading system enumerated below:

- Academic information delivery system is efficient but is not that analytic as from the point of view of student.
- A new system/software is needed that can analysis student's performance in different subject the topics & sub-topics involved in that subject.
- The software must compare a student performance with the highest one and lowest one. So that the student can focus on the area of subject in which he/she is not that comfortable.
- The system must be updated and the analysis must be graphical so as to create an interest.
- User friendly environment with real time dynamically generated result optimization.
- Creation of Digital Records along with analysis was not accomplished.
- Loss of Data: As compared to traditional pen n paper system there is a threat of loss of data along with loss of documents.
- Time Consuming: Modification of records and analysis from them was a time consuming task.

Hence the Student Performance Analysis System is developed to:

- The system's primary task is analytical.
- It analyses students' performance in different subject so that the student knows where he stands in this competition.
- It provides a detailed comparison of students performance with other students enrolled in the same course.
- It provides analysis in graphical format like pie charts creating interest among students.
- System is user friendly.
- Digital records creation and Modification is facilitated.
- Storage of Data and its copies to avoid loss of data is possible..
- System is fast as compared to traditional system of data storage in files (paper) format and updates can be easily done.
- System is highly efficient and useful for Students and faculty i.e. teachers.

IV. REQUIREMENT ANALYSIS

4.1. User Interface:-

- It Contains Buttons, Text fields, Graphical Analyzer.

4.2. Hardware Requirements:-

- Windows: Windows 7 Or Above
- Processor: i3 Or Above
- HDD: 256GB
- RAM: 2 GB

4.3. Software Requirements:-

- Python IDLE 3.6.

Python Libraries:-

- ✓ tkinter
- ✓ cx_Oracle
- ✓ pandas
- ✓ matplotlib
- ✓ numpy
- ✓ sklearn
- ✓ tabulate
- ✓ openpyxl
- Microsoft Excel 2016.
- ORACLE 11G Express Edition.
- Programming Language : Python
- Machine Learning.

V. METHODOLOGY

5.1 Process Model:-

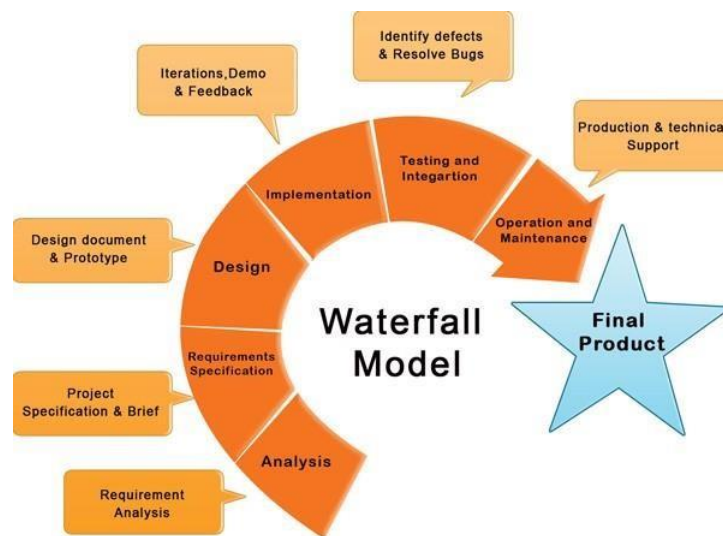


Fig. 5.1 Waterfall Model

- The system is developed using the waterfall model, because all the requirements, resources process flow was already discussed.
- The waterfall model is termed as classical life cycle, as it suggests systematic, robust, ideal, sequential approach to software development. Here, any phase in the development process begins only if the previous phase is complete.
- Typically, the outcome of one phase is an input for the next phase.
- It is fast and easy to understand and implement.

Framework Activities:-

- **Requirements:** During this initial phase, the potential requirements of the application are methodically analyzed and written down in a specification document that serves as the basis for all future development. The result is typically a requirements document that defines what the application should do, but not how it should do it.
- **Analysis:** During this second stage, the system is analyzed in order to properly generate the models and business logic that will be used in the application.
- **Design:** This stage largely covers technical design requirements, such as programming language, data layers, services, etc. A design specification will typically be created that outlines how exactly the business logic covered in analysis will be technically implemented.
- **Coding:** The actual source code is finally written in this fourth stage, implementing all models, business logic, and service integrations that were specified in the prior stages.
- **Testing:** During this stage, QA, beta testers, and all other testers systematically discover and report issues within the application that need to be resolved. It is not uncommon for this phase to cause a “necessary repeat” of the previous coding phase, in order for revealed bugs to be properly squashed.
- **Deployment:** Finally, the application is ready for deployment to a live environment. This stage entails not just the deployment of the application, but also subsequent support and maintenance that may be required to keep it functional and up-to-date.

5.2 Use Case Diagram:-

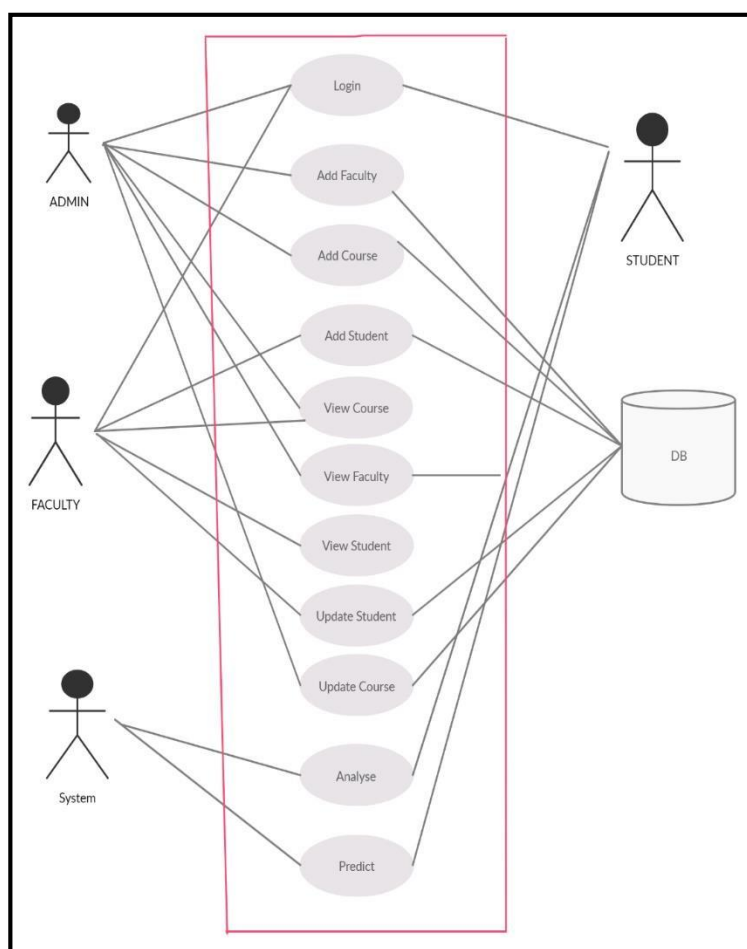


Fig. 5.2 Use Case Diagram for SPAS

5.3 Data Flow Diagram:-

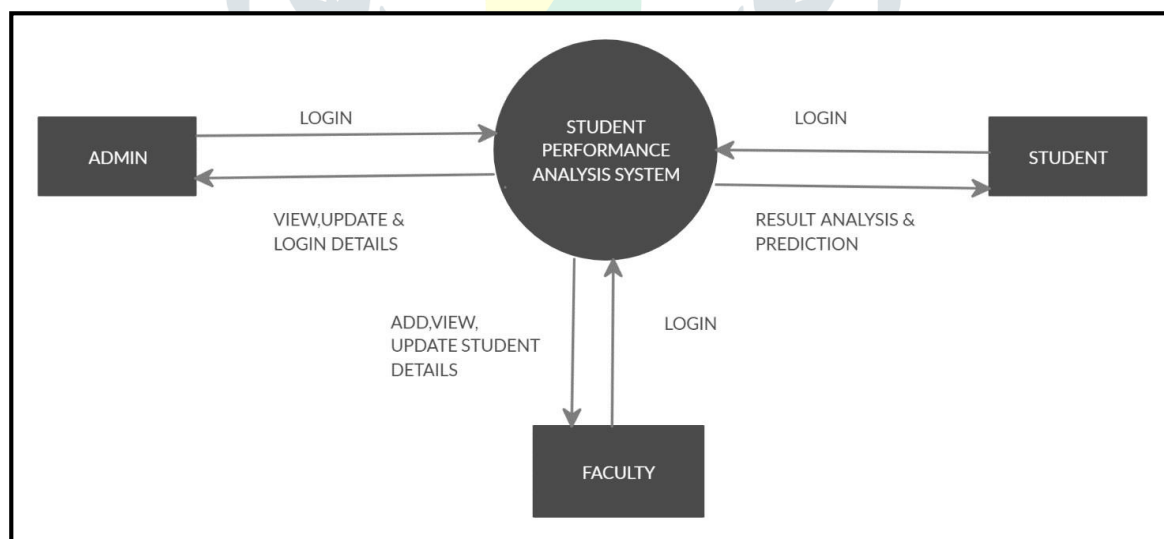


Fig. 5.3 DFD Level 0 for SPAS

5.4 Activity Diagram:

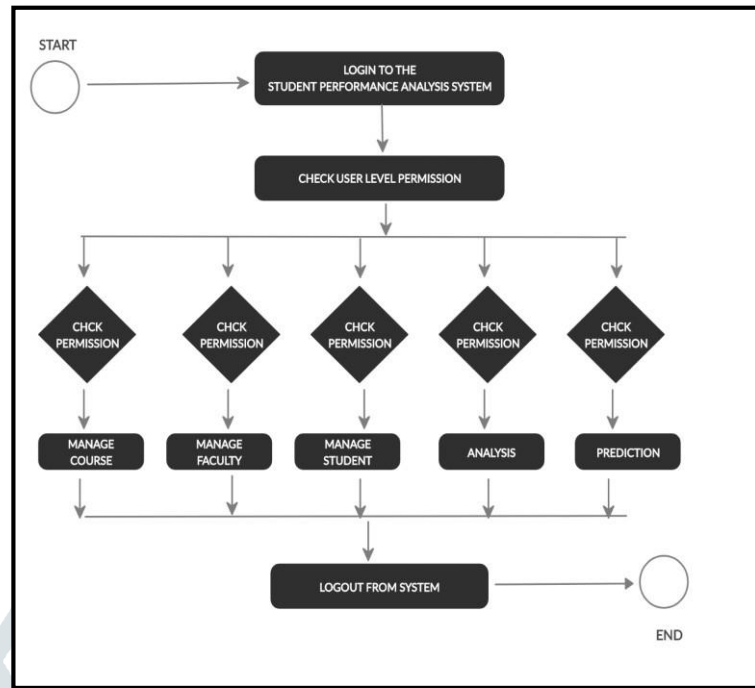


Fig 5.6 SPAS Flow Activity Diagram

5.5 Algorithm for SPAS:-

5.5.1 FOR Login:

1. Start
2. Enter User Name
3. Enter Password
4. If User Name== Null
Then Display "User Name cannot be Empty"
Else If Username! = Null
Then Check if User Name is in Database and Valid.
5. If Password==NULL
Then Display "Password cannot be Null"
Else if Password! =NULL
Then Check if User Name and Respect password in Database are Equal
If entered Password == Respective Password in Database
Then Open Home Page on Clicking Login and Display "Login Successful".
6. If Username not present in database
Then Display "Not a Registered User".
7. Stop.

5.5.2 For Different Modules:

1. Start
2. Successful Login by registered user
3. If ((ADD|| Update|| Delete) Course)
Check for User Privilege
If Privileged User then ALLOW CHANGES
Else Display "CHANGES BY DBA ONLY".
4. If ((ADD|| Update|| Delete) Faculty)
Check for User Privilege
If Privileged User then ALLOW CHANGES
Else Display "CHANGES BY DBA ONLY".
5. If ((ADD|| Update|| Delete) Student)

Check for User Privilege
 If Privileged User then ALLOW CHANGES
 Else Display "CHANGES BY DBA ONLY".

6. Logout.
7. Stop

5.5.3 Linear Regression:

Linear regression is perhaps one of the most well-known and well understood algorithms in statistics and machine learning.

Linear Regression Learning the Model:-

Learning a linear regression model means estimating the values of the coefficients used in the representation with the data that we have available. There are many more techniques because the model is so well studied.

1. Simple Linear Regression:-

With simple linear regression when we have a single input, we can use statistics to estimate the coefficients. This requires that you calculate statistical properties from the data such as means, standard deviations, correlations and covariance. All of the data must be available to traverse and calculate statistics.

2. Ordinary Least Squares:-

When we have more than one input we can use Ordinary Least Squares to estimate the values of the coefficients. The [Ordinary Least Squares](#) procedure seeks to minimize the sum of the squared residuals. This means that given a regression line through the data we calculate the distance from each data point to the regression line, square it, and sum all of the squared errors together. This is the quantity that ordinary least squares seeks to minimize.

3. Gradient Descent:-

When there are one or more inputs you can use a process of optimizing the values of the coefficients by iteratively minimizing the error of the model on your training data. This operation is called [Gradient Descent](#) and works by starting with random values for each coefficient. The sum of the squared errors are calculated for each pair of input and output values. A learning rate is used as a scale factor and the coefficients are updated in the direction towards minimizing the error. The process is repeated until a minimum sum squared error is achieved or no further improvement is possible.

4. Regularization:-

There are extensions of the training of the linear model called regularization methods. These seek to both minimize the sum of the squared error of the model on the training data (using ordinary least squares) but also to reduce the complexity of the model (like the number or absolute size of the sum of all coefficients in the model).

VI. ADVANTAGES & DISADVANTAGES

6.1 Advantages:-

- Graphical user interface is user friendly.
- Easy for faculty to manage student data.
- Easy for student to view his academic records.
- Academic records and performance analysis can be stored in image format.
- Pie chart for enrolments in each course is displayed.
- Machine learning regression algorithm is used to predict marks for upcoming test.
- Easy to update and maintain data in digital format.
- No threat of Data loss as multiple copies of data can be created.

6.2 Disadvantages:-

- Single student cannot enrol for multiple courses using same student id.
- Graphical user interface is user friendly but not fascinating.
- Student cannot analyse his grip over subtopics of same subject.

VII. RESULTS

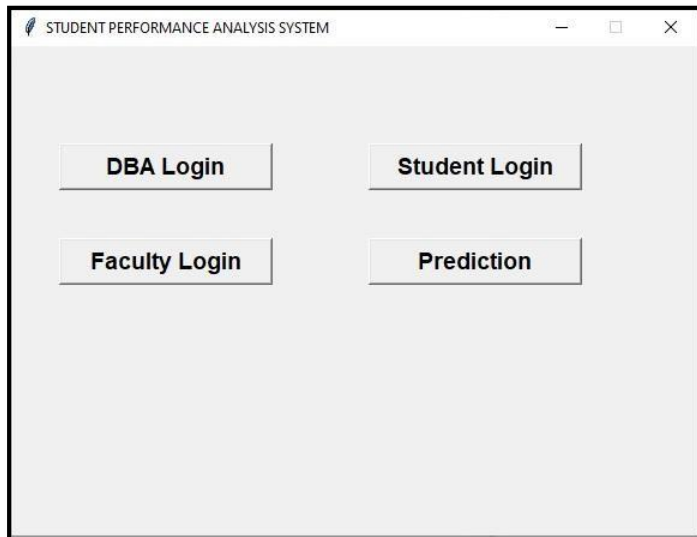


Fig. 7.1 Home Page

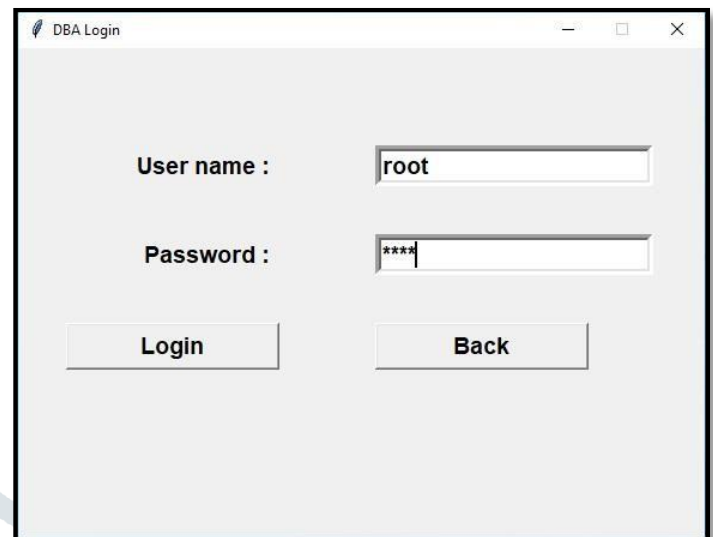


Fig. 7.2 DBA login

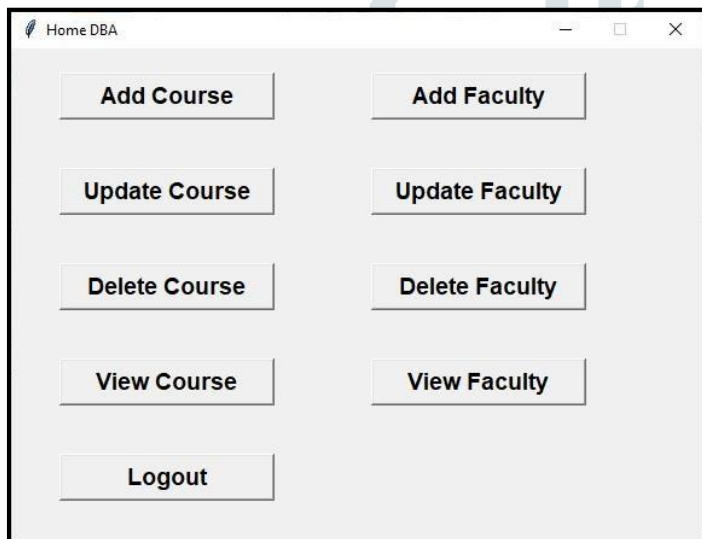


Fig. 7.3 DBA Home Page

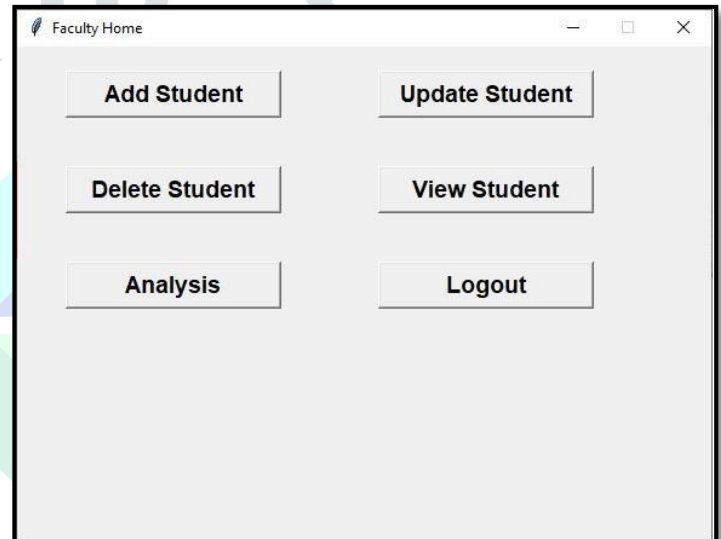


Fig. 7.4 Faculty Home

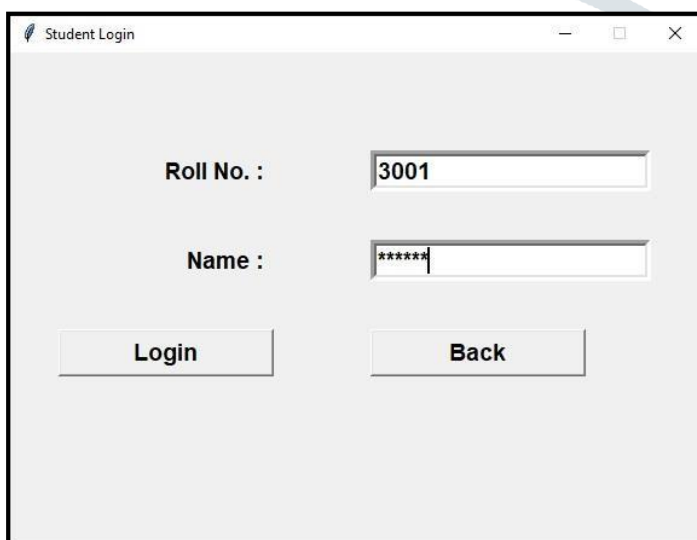


Fig. 7.5 Student Login

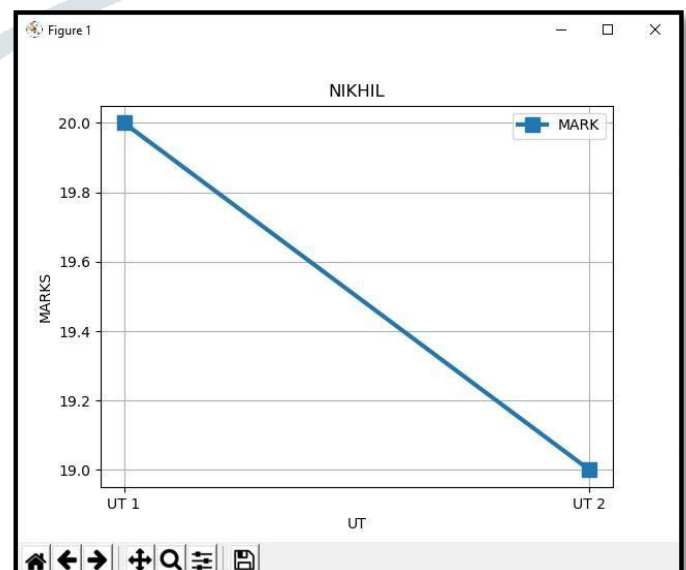


Fig. 7.6 Student Analysis

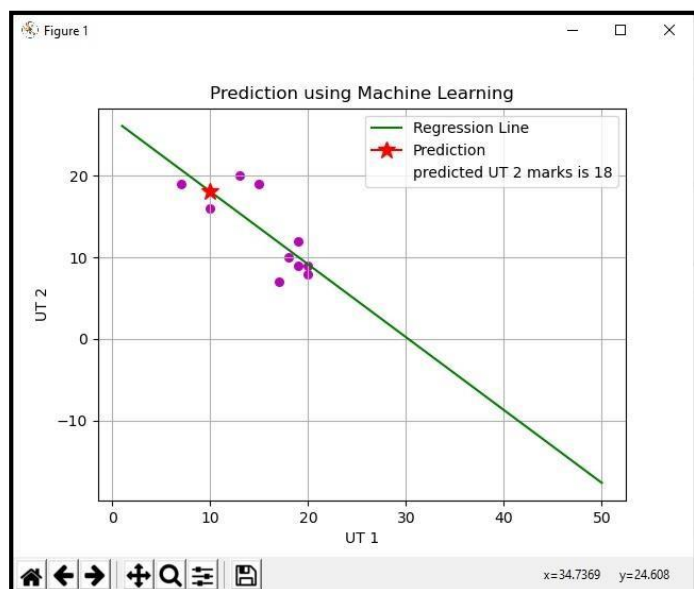


Fig. 7.7 Regression Line

Fig. 7.8 Prediction

No	Course Name	Student Name	UT 1	UT 2
3006	BIOLOGY	DAKSHATA	7	19
3007	BIOLOGY	SAYLI	13	20
3008	BIOLOGY	POOJA	10	16
3009	BIOLOGY	OMKAR	15	19
3010	BIOLOGY	HARSHADA	17	7
3011	BIOLOGY	TANISHA	18	10
3012	BIOLOGY	AADITI	19	12
3013	BIOLOGY	SANCHITA	20	9
3014	BIOLOGY	SHIVANGI	20	8
3015	BIOLOGY	SIDDHESH	19	9

No	Course Name	Student Name	UT 1	UT 2
3004	CHEMISTRY	POONAM	19	7
3005	CHEMISTRY	PRANALI	15	20

No	Course Name	Student Name	UT 1	UT 2
3001	PHYSICS	NIKHIL	20	19
3002	PHYSICS	SHREYA	19	15
3003	PHYSICS	RUHIE	15	20
3016	PHYSICS	ROSH	17	9
3017	PHYSICS	SAGAR	19	19

Fig. 7.9 Excel File for Details Individual Courses

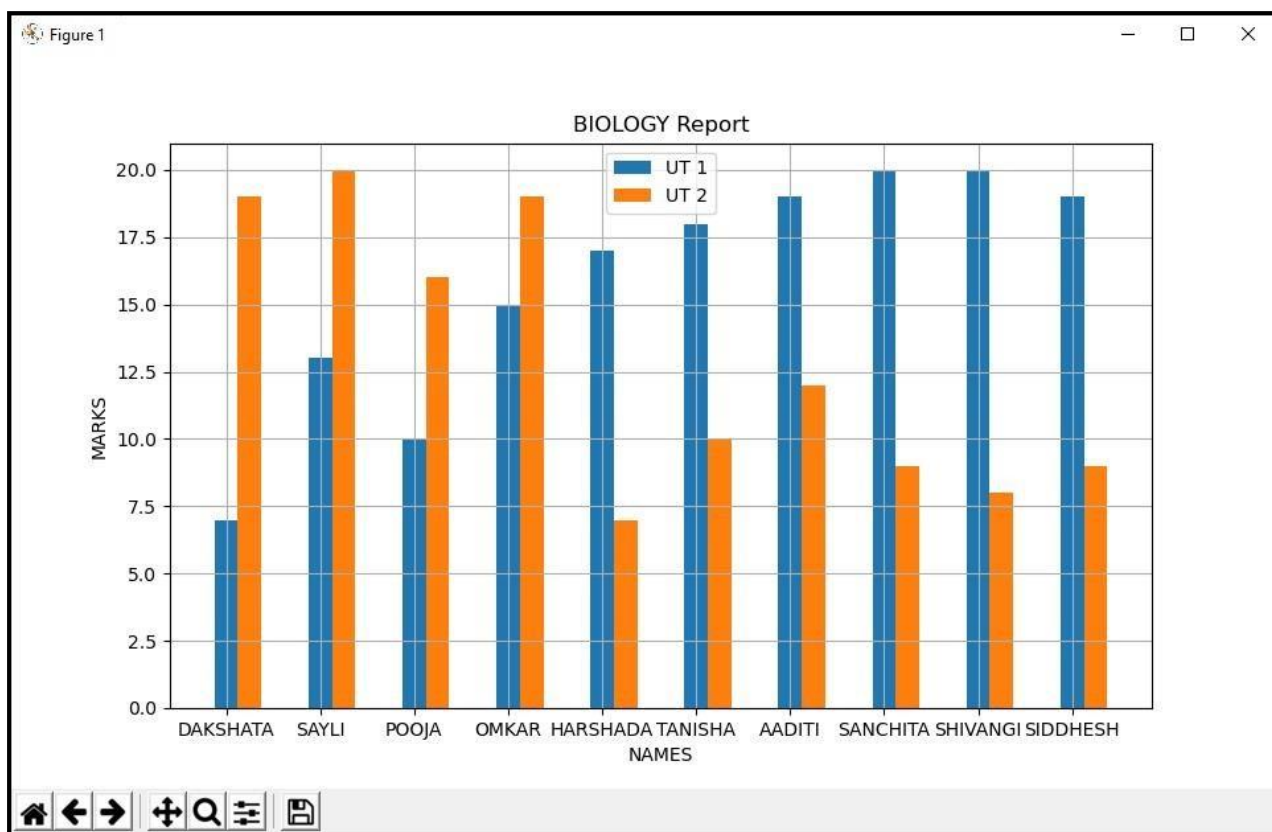


Fig. 7.10 Course Analysis

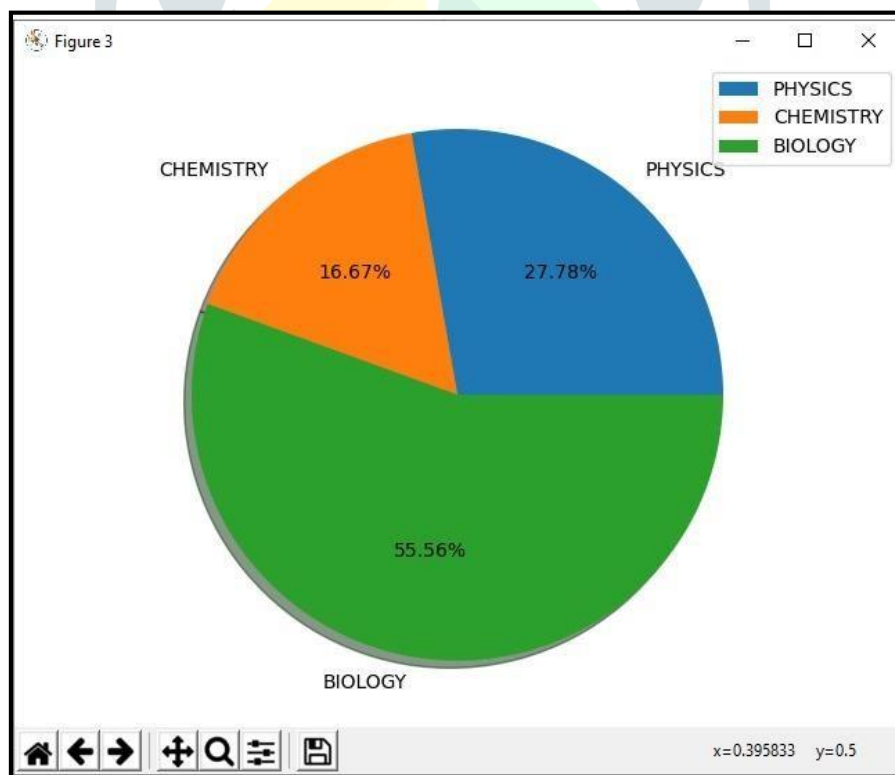


Fig. 7.11 Student Distribution

VIII. CONCLUSION

This 'Student Performance Analysis System' has been developed successfully and was also tested successfully by taking few test cases. It is user friendly and has required options, which can be used by user to perform desired operation. According to the result analysis the current model works properly and has achieved the goal of getting 100% accuracy within the desired format. We have implemented various best practices to create and train our model. Throughout the development of the model we have learned various best practices and architecture patterns being used in industry today.

The goals that are achieved by the system are:

- ✓ Optimum utilization of resources.
- ✓ Efficient management of records.
- ✓ Simplification of Operations.
- ✓ Less processing time and easy of getting required information.
- ✓ Usefulness and correctness.

IX. ACKNOWLEDGEMENT

We sincerely wish to thank the project guide **Prof.Devita Durge** for her encouraging and inspiring guidance helped us to make our project a success. Our project guide makes us endure with her expert guidance, kind advice and timely motivation which helped to us determine our project.

We would like to thank our project coordinator **Dr.Uttara Gogate** for all the support needed from her our project.

We also express our deepest thanks to our HOD **Prof.Pramod Rodge** whose benevolent help us making available the computer facilities to us for our project in our laboratory and making it true success. Without his kind and keen co-operation our project would have been stifled to standstill.

Lastly, we would like to thank our college principal **Dr.J.W. Bakal** for providing lab facilities and permitting to go on with our project. We would also like to thank our colleagues who helped us directly or indirectly during our project.

REFERENCES

- [1] Chew Li Sa, Dayang Hanani bt. Abang Ibrahim, Emmy Dahliana Hossain, Mohammad Bin Hossain "Student Performance Analysis System (SPAS)" 2014.
- [2] J. Shana, and T. Venkatacalam, "A framework for dynamic Faculty Support System to analyze student course data", International Journal of Emerging Technology and Advanced Engineering, Vol. 2, No. 7, 2012, pp.478-482.
- [3] SPA (2013). What is SPA Standard? *SPA Student Performance Analyser*
Online Available: <https://www.studentperformanceanalyser.com.au/spa/about>
- [4] Machine learning using Linear Regression
Online Available: <https://machinelearningmastery.com/linear-regression-for-machine-learning/>