EXAMINATION SYSTEM

Our TEAM

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OMAR MOHAMMED

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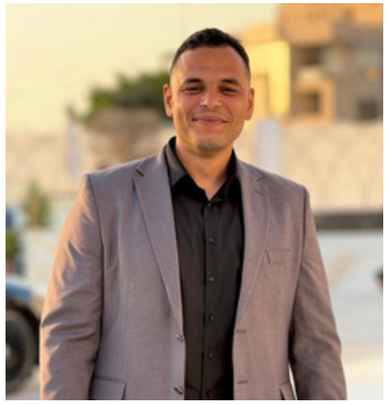


YOUSIF ASHRAF

AHMED MEDHAT

Table of Contents

What is
THE PROBLEM?

Student exam processes are traditionally:

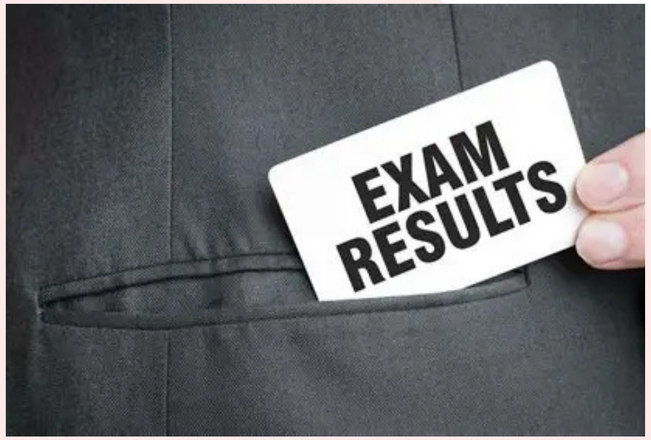
- **No centralized tracking**
- **Difficult performance measurement**
- **No real-time insights for instructors**
- **No automatic scoring**
- **Difficult to analyze topic weaknesses**

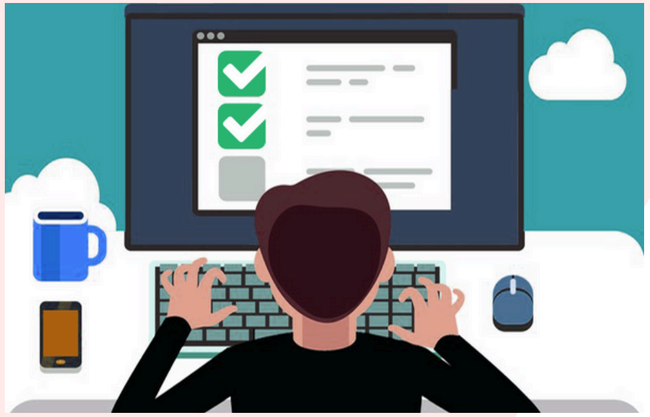
Academic institutions Suffer from:

- **Human error in grading**
- **Delayed results**
- **Limited analytics**

OBJECTIVE

- Digitize the entire student examination process
- Automate grading
- Store answers securely
- Track performance over time

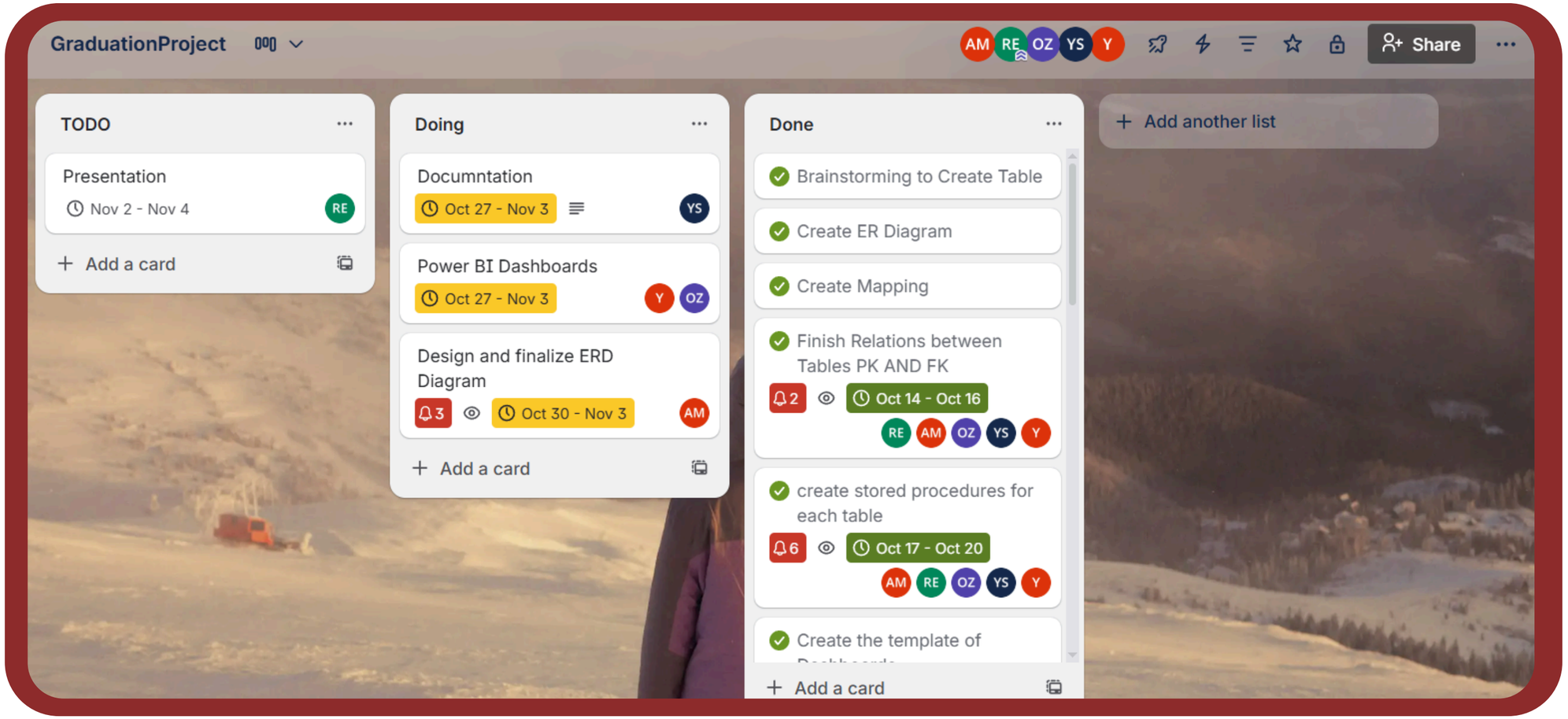




HOW DO WE MANAGE WORK AMONG US

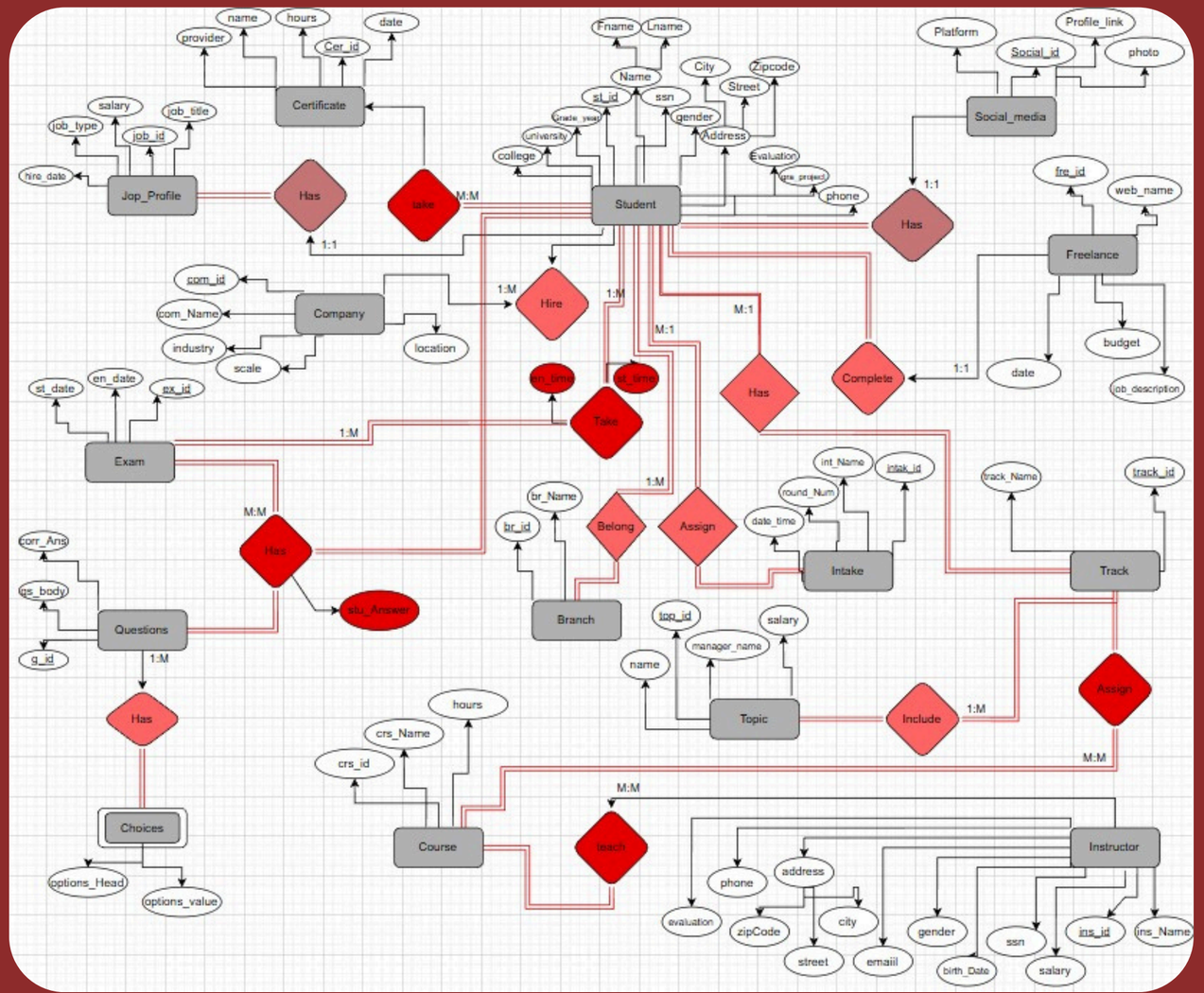
Methodology:

- Agile (2 Days - Sprint)
- Trello / Jira board



ER-DIAGRAM

- **We designed a relational database with carefully structured tables to ensure data integrity.**
- **Relationships follow a 1-to-Many model in most areas, such as students to exam answers, and courses to questions.**
- **Normalization minimized redundancy, while lookup tables improved consistency.**



MAPPING

- 15 Main tables
- 7 M:M TABLES

- **Student** (ST_ID **P.K**, SSN, Fname, Lname, Gender, Birth_Date, Age, Address (City, Street, Zip_Code), Phone, University, College, Grade_Year, Grade_project, Evaluation, Email, Password, com_Id **F.K**, pro_Id **F.K**, track_Id **F.K**, intake_Id **F.K** , Branch_Id **F.K**) MAIN
- **Company** (Com_ID **P.K**, Com_name, Location, Industry, Scale)
- **Project** (Pro_ID **P.K**, Pro_Name track_Id **F.K**)
- **Freelance** (Fre_ID **P.K**, Website_name, Date, Budget, Job_description, ST_ID **F.K**,)
- **Course** (Crs_ID **P.K**, Crs_Name, Hours)
- **Student_Certificate** (st_Id **F.K**, cer_Id **F.K**) **P.K**
- **Student_Exam** ((ex_Id **F.K**, st_Id **F.K**) **P.K**, start_Time, end_Time, score, Grade, Percentage)
- **Stu_Exam_Ques** ((EX_Id **F.K**, Qs_ID **F.K**,St_ID **F.K**) **P.K**, Stu_Answer, Question_Order)
- Exam (EX_Id **P.K**, Start_Time, End_Time, Crs_ID **F.K**)
- **Questions** (Qs_ID **P.K**, Qs_Body, Correct_answer, Q_Type, Crs_ID **F.K**)
- **Choices** (Qs_Id **F.K**, Options_Header, Option_Value)
- **Ins_Course** (crs_Id **F.K**, Ins_Id **F.K**) **P.K**
- **Track_Course** (Track_Id **F.K**, Crs_Id **F.K**) **P.K**
- **Branch_Track**(Track_Id **F.K**, Branch_Id **F.K**) **P.K**
- **Track**(Track_Id **P.K**, Name, Ins_Id **F.K**,topic_Id **F.K**)
- **Intake**(Intake_Id **P.K**, Start_Date, End_Date,Int_name,Round_num)
- **Certificate**(Cer_Id **P.K**, Name, Hours, Provider, date)
- **Social_Media**(Social_Id **P.K**, Platform, Profile_link, Photo,st_Id **F.K**)
- **Branch**(Branch_Id **P.K**, Br_Name)
- **Instructor** (Ins_ID **P.K**, Ins_Name, Salary, SSN, Birth_Date, Gender, Email, City, Street, ZIP_Code,PHONE,Evaluation)
- **Topic**(Topic_ID **P.K**, Name,Manager_Name, Salary)

DATABASE IMPLEMENTATION

1

Technology
Microsoft SQL Server

2

Data Types
Describe the data types used for different fields (e.g., INT, VARCHAR, DATE).

3

Schema Diagram
Outline the schema design, including tables, relationships, and constraints.

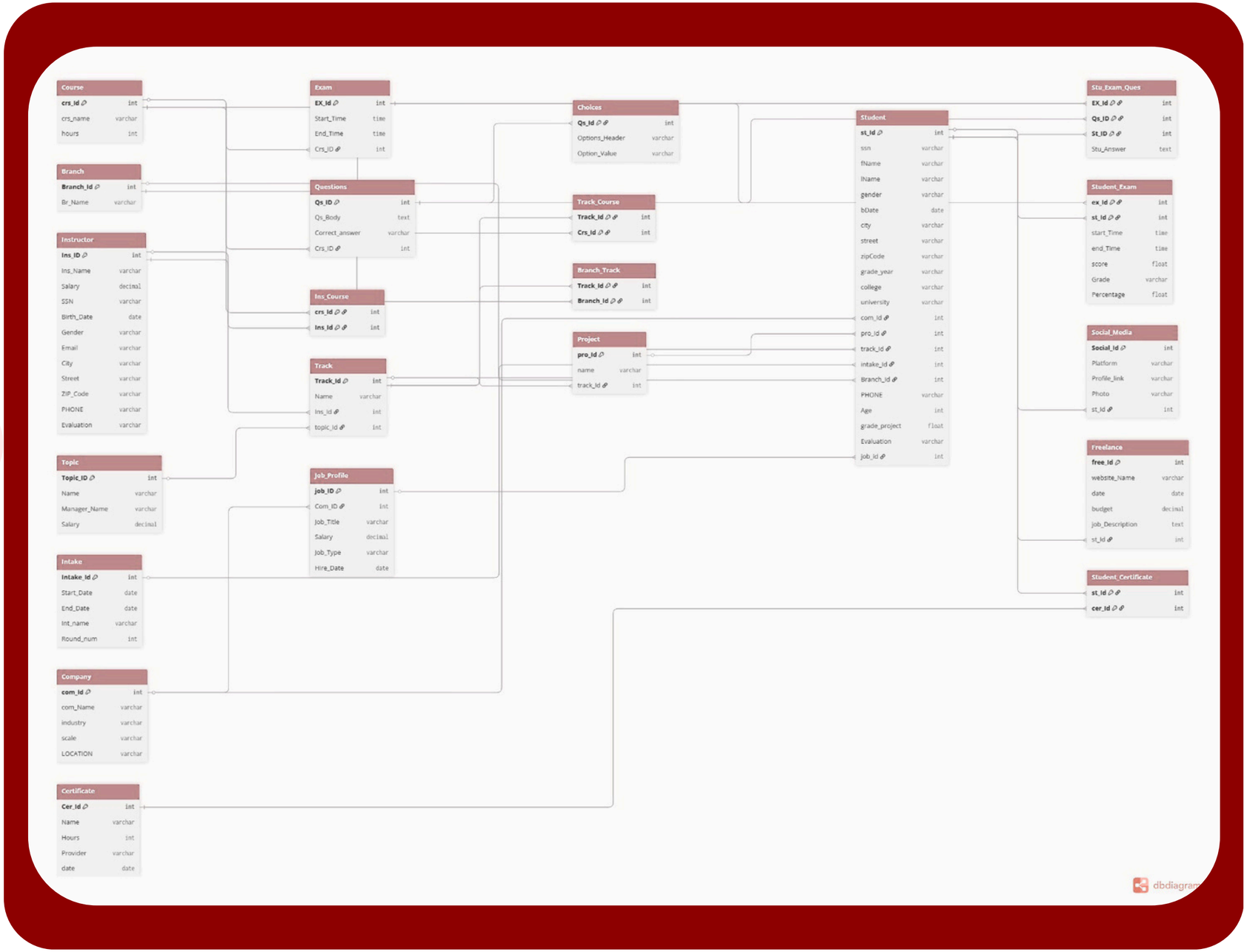
4

Security
Encrypted Database Objects
E.g: SP, Views

5

Backup & Recovery
Daily Backup

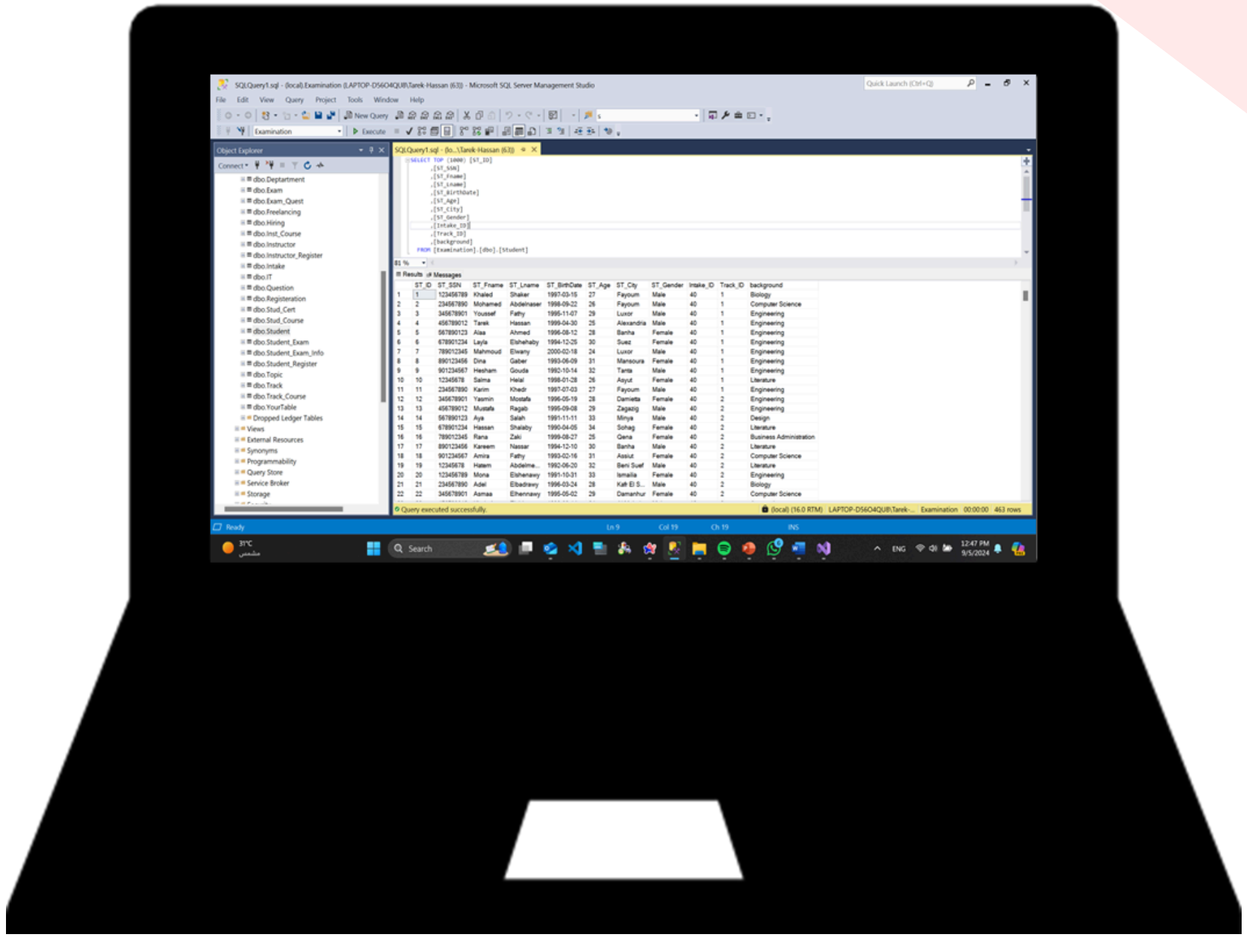
DATABASE DIAGRAM



DATA FILL

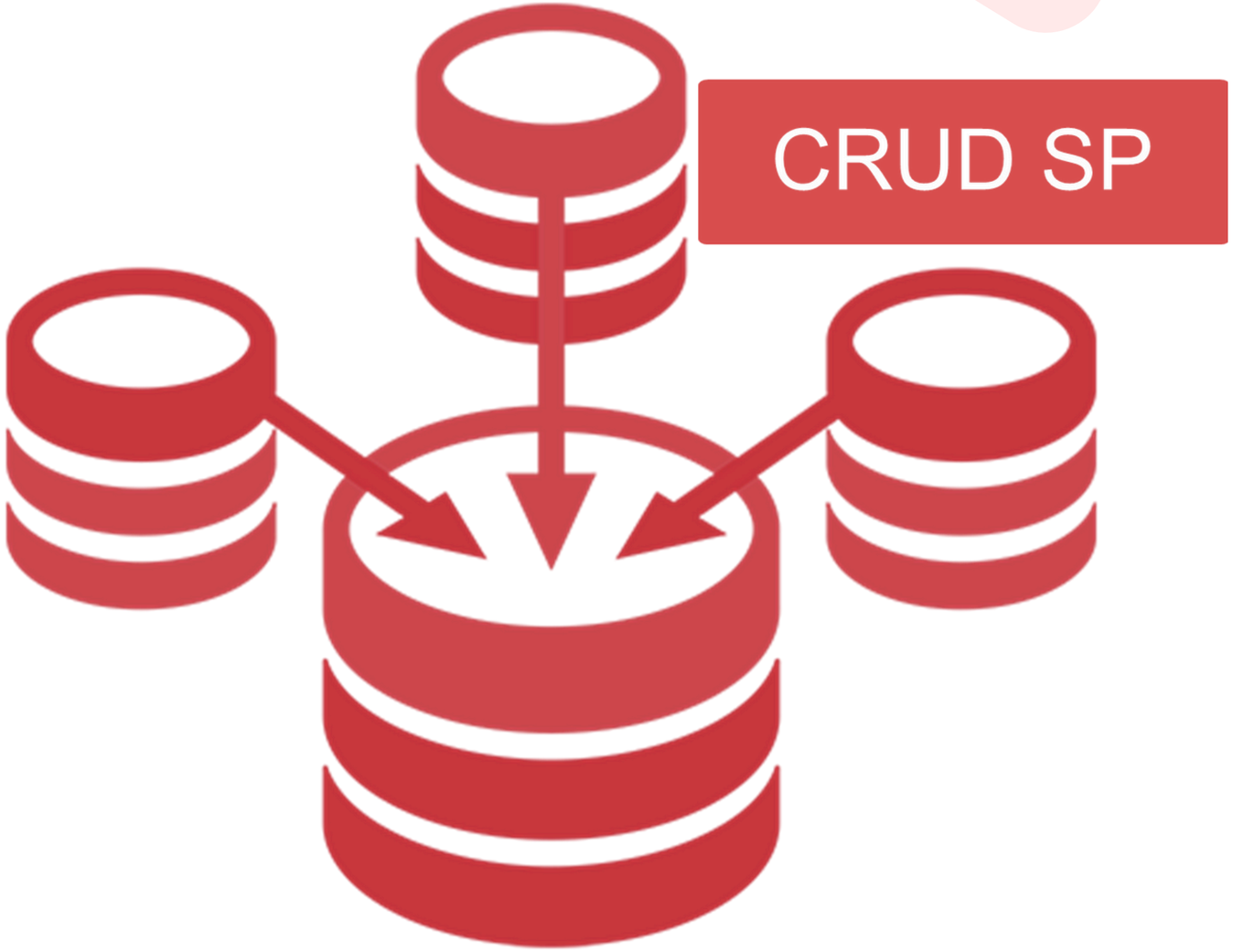
- **AI-Generated**

(Claudera- Gemini - Mockaro - GPT)



CRUD STORED PROCEDURES

They simplify and secure database operations by encapsulating the logic for Create, Read, Update, and Delete (CRUD) actions for Each Table.



CRUD STORED PROCEDURES

Examples

SP For Selection

```
ALTER procedure [dbo].[SELECT_br_tr]
@BRANCH_ID INT= NULL,
@TRACK_ID INT = NULL
AS
BEGIN
SET NOCOUNT ON
SELECT
BRANCH_ID,
TRACK_ID
FROM Branch_Track
 WHERE
        (@Branch_ID IS NULL OR Branch_ID = @Branch_ID)
        AND (@Track_ID IS NULL OR Track_ID = @Track_ID)
END
```

SP For Insertion

```
    @Fname NVARCHAR(100),
    @Lname NVARCHAR(100),
    @Gender NVARCHAR(10),
    @Birth_Date DATE,
    @City NVARCHAR(50),
    @Street NVARCHAR(100),
    @ZipCode NVARCHAR(10),
    @Phone VARCHAR(11),
    @Grade_Year VARCHAR(10),
    @Com_Id INT,
    @Pro_ID INT,
    @Track_ID INT,
    @Intake_ID INT,
    @Social_ID INT,
    @Branch_ID INT,
    @College VARCHAR(100),
    @University VARCHAR(100),
    @Grade_Project VARCHAR(30),
    @Evaluation NVARCHAR(20)
AS
BEGIN
    if Exists(select 1 from Student
    where SSN=@SSN)
    begin
    print('This Student already exists');
    return;
    end;
    begin try
    IF NOT EXISTS (SELECT 1 FROM Student WHERE SSN = @SSN)
    BEGIN
        INSERT INTO Student
        ([SSN],[Fname],[Lname],[Gender],[Birth_Date],[City],[Street],
         [ZipCode],[Phone],[Grade_Year],[Com_ID],[Pro_ID],[Track_ID],
         [Intake_ID],[Social_ID],[Branch_ID],
         [College],[University],[Grade_Project],[Evaluation])
        VALUES
        (@SSN,@Fname,@Lname,@Gender,@Birth_Date,@City,@Street,
         @ZipCode,@Phone,@Grade_Year,@Com_Id,@Pro_ID,@Track_ID,
```

CRUD STORED PROCEDURES

SP For Deletion

```
ALTER   PROCEDURE [dbo].[Delete_Student]
    @St_Id INT
AS
BEGIN
    BEGIN TRY
        DELETE FROM Student
        WHERE St_Id = @St_Id;

        PRINT ('Student deleted successfully')
    END TRY
    BEGIN CATCH
        PRINT ('Cannot delete Student')
    END CATCH
END;
```

SP For Update

```
    @Pro_ID INT,
    @Track_ID INT,
    @Intake_ID INT,
    @Social_ID INT,
    @Branch_ID INT,
    @College NVARCHAR(100),
    @University NVARCHAR(100),
    @Grade_Project VARCHAR(30),
    @Evaluation NVARCHAR(20)
AS
BEGIN
    UPDATE Student
    SET
        [Fname] = @Fname,
        [Lname] = @Lname,
        [Gender] = @Gender,
        [Birth_Date] = @Birth_Date,
        [City] = @City,
```

EXAM STORED PROCEDURES

1 Add New Exam

```
ALTER PROCEDURE [dbo].[Add_Exam]
    @Start_Time TIME,
    @End_Time TIME,
    @Crs_ID INT
AS
BEGIN
    SET NOCOUNT ON;

    DECLARE @Today DATETIME = CAST(GETDATE() AS DATE);

    INSERT INTO Exam ( Start_Time, End_Time, Crs_ID,Exam_Date)
    VALUES ( @Start_Time, @End_Time, @Crs_ID,@Today);

    DECLARE @New_Ex_ID INT = SCOPE_IDENTITY();
    PRINT 'Exam Added Successfully. Exam ID: ' + CAST(@New_Ex_ID AS NVARCHAR(10));
END;
```

2 Register New Student

```
ALTER   proc [dbo].[Register_Student] @St_ID INT , @Ex_ID INT
 AS
BEGIN
     Set Nocount on;
    If Not Exists (Select 1 from Student_Exam where St_ID = @St_ID and Ex_ID = @Ex_ID)
    begin
    insert into Student_Exam (St_ID , Ex_ID , Start_Time , End_Time)
    select @St_ID , @Ex_ID , Start_time , End_time
    From Exam
    where Ex_ID = @Ex_ID
        Print 'Student Registered For Exam'
    end
    else
    begin
        Print 'Student Already Registered'
end
end;
```

EXAM STORED PROCEDURES

3 Generate Random Questions

```
    @Ex_ID INT,
    @Crs_ID INT
AS
BEGIN
    SET NOCOUNT ON;

    IF NOT EXISTS (SELECT 1 FROM Student_Exam WHERE St_ID = @St_ID AND Ex_ID = @Ex_ID)
    BEGIN
        PRINT 'Student not registered for this exam.';
        RETURN;
    END
    CREATE TABLE #temp_questions
    (
        Temp_ID INT IDENTITY(1,1) PRIMARY KEY,
        Qs_ID INT,
        Qs_Body VARCHAR(1000)
    );
    INSERT INTO #temp_questions (Qs_ID, Qs_Body)
    SELECT TOP 10 Qs_ID, Qs_Body
    FROM Questions
    WHERE Crs_ID = @Crs_ID
    ORDER BY NEWID();

    INSERT INTO Stu_Exam_Qs (Stu_ID, Ex_ID, Qs_ID, Question_Order)
    SELECT @St_ID, @Ex_ID, Qs_ID, Temp_ID
    FROM #temp_questions;
    SELECT Temp_ID AS QuestionNumber, Qs_Body AS Question
    FROM #temp_questions
    ORDER BY Temp_ID;
```

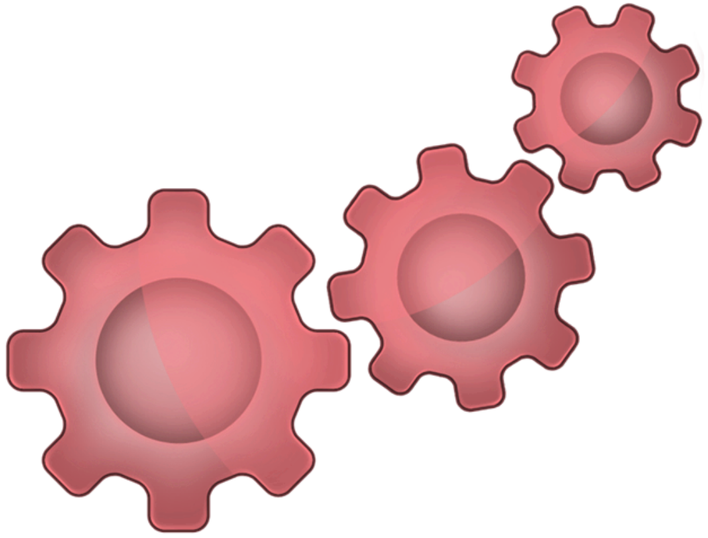
4 Submit Answers and Calculate Scores

```
ALTER PROCEDURE [dbo].[SubmitExamAnswers]
    @St_ID INT,
    @Ex_ID INT,
    @Answers NVARCHAR(MAX)
AS
BEGIN
    SET NOCOUNT ON;
    ;WITH StudentAnswers AS (
        SELECT
            value AS Stu_Answer,
            ROW_NUMBER() OVER (ORDER BY (SELECT NULL)) AS rn
        FROM STRING_SPLIT(@Answers, ',')
    )
    UPDATE S
    SET S.Stu_Answers = SA.Stu_Answer
    FROM Stu_Exam_Qs S
    INNER JOIN StudentAnswers SA
        ON SA.rn = S.Question_Order
    WHERE S.Stu_ID = @St_ID AND S.Ex_ID = @Ex_ID;
    DECLARE @Correct INT;
    SELECT @Correct = COUNT(*)
    FROM Stu_Exam_Qs S
    JOIN Questions Q ON S.Qs_ID = Q.Qs_ID
    WHERE S.Stu_ID = @St_ID AND S.Ex_ID = @Ex_ID
      AND S.Stu_Answers = Q.Correct_Answer;
    UPDATE Student_Exam
    SET
    Score = @Correct,
    Percentage = (CAST(@Correct AS FLOAT) / 10) * 100
    WHERE ST_ID = @St_ID AND Ex_ID = @Ex_ID;
    PRINT 'Exam submitted. Correct Answers: ' + CAST(@Correct AS VARCHAR(10));
END;
```

EXAM SP CHALLENGES

Handling Random Question Generation

Mapping Answers to the Correct Question Order

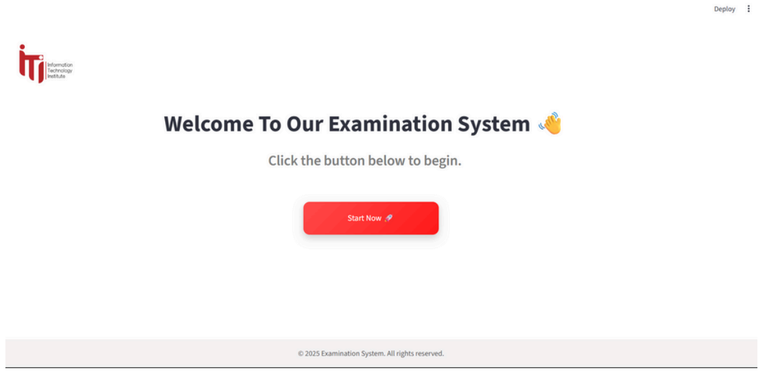


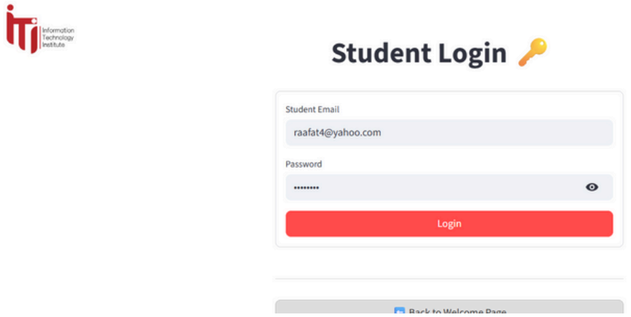
Preventing Multiple Exam Submissions

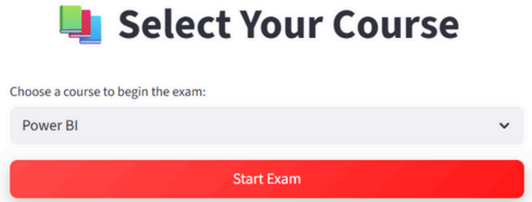
WEB APPLICATION

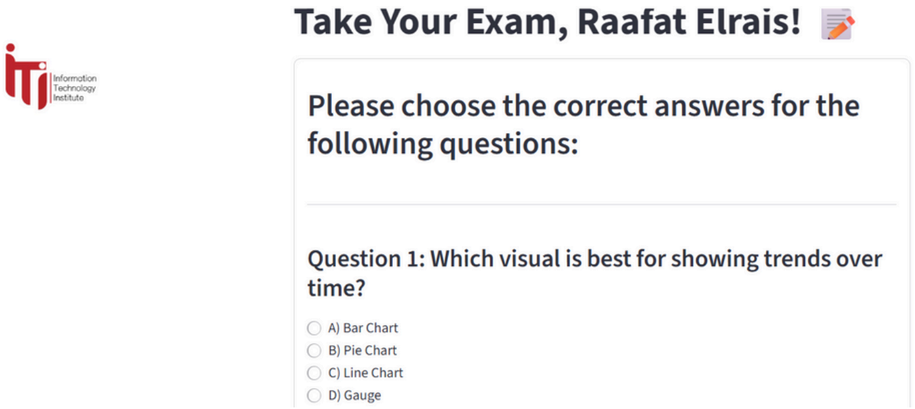
We developed a multi-page Streamlit web application to serve as a user-friendly interface for our SQL-based examination system. The application features a custom, professional UI and seamlessly navigates students through the entire exam process. It robustly connects to our database to execute stored procedures, automating everything from dynamic question generation to the instant correction .

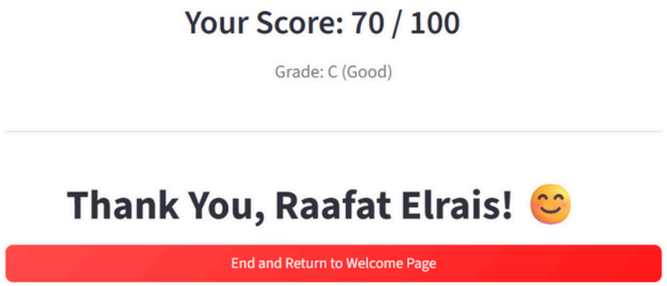
WEB APPLICATION











The Process

1. **Exam Initialization:** Upon course selection, the system calls the **Add_Exam** and **Register_Student** procedures to create a unique, secure exam session linking the specific student to a new exam record.

2. **Dynamic Question Generation:** The **Generate_And_Show_Exam** procedure is then executed, which dynamically selects 10 random questions from the database relevant to the chosen course, ensuring a unique and fair test for every student.

The Process

3

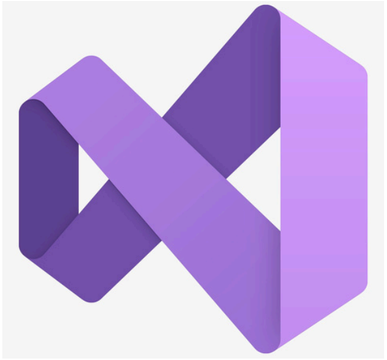
Interactive Answering : The 10 questions and their choices are displayed in a clean web interface. After the student makes their selections, all answers are securely packaged and sent to the database upon submission.

4

Automated Scoring & Results: Finally, the **SubmitExamAnswers** procedure is called. It instantly corrects the submitted answers, calculates the final score, saves it to the Student_Exam table, and the result is immediately retrieved and displayed to the student**.**

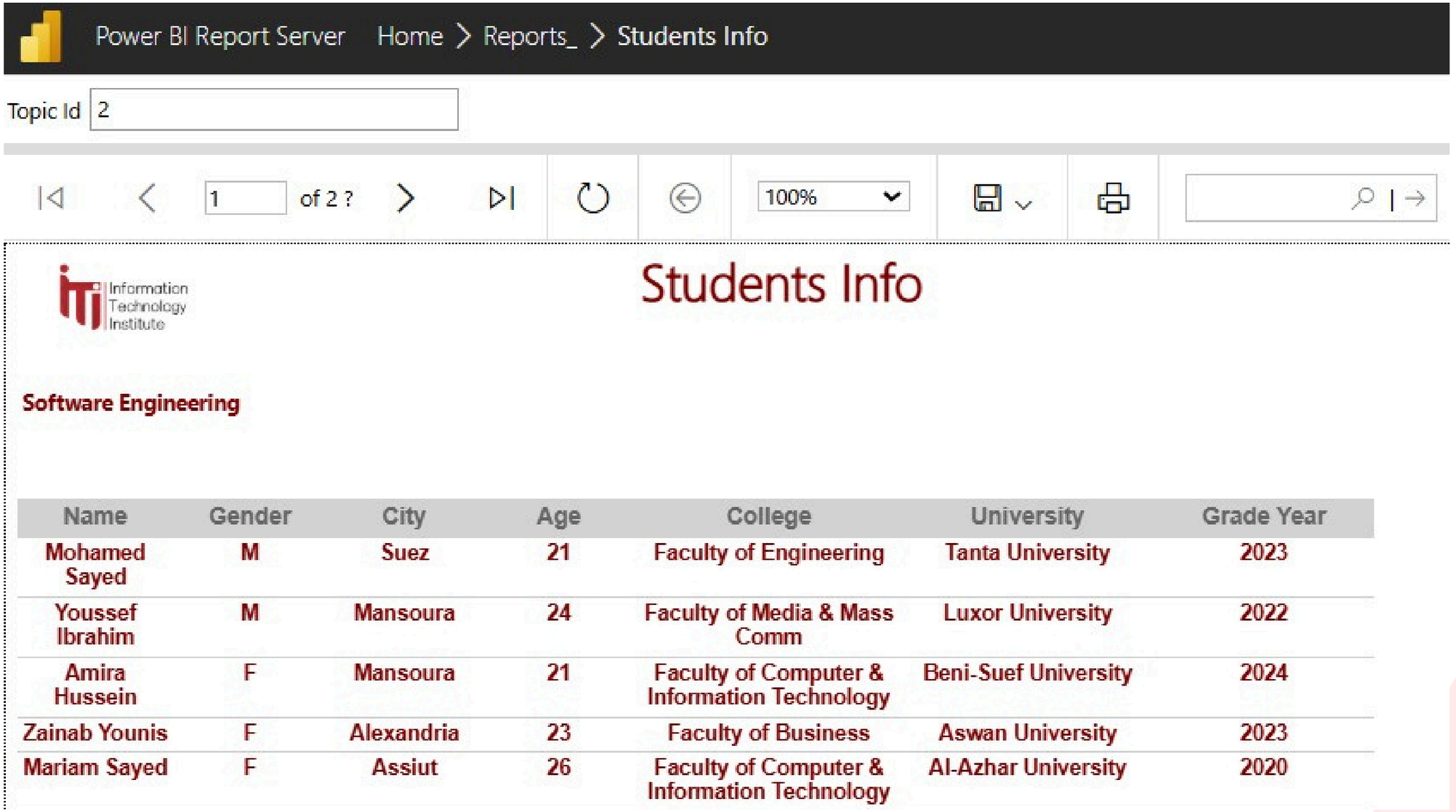
SQL SERVER REPORT SERVICES (SSRS)

Using SSRS in Visual Studio, we created interactive reports that transform raw database data into clear, actionable insights for students, instructors, and administrators.



SSRS

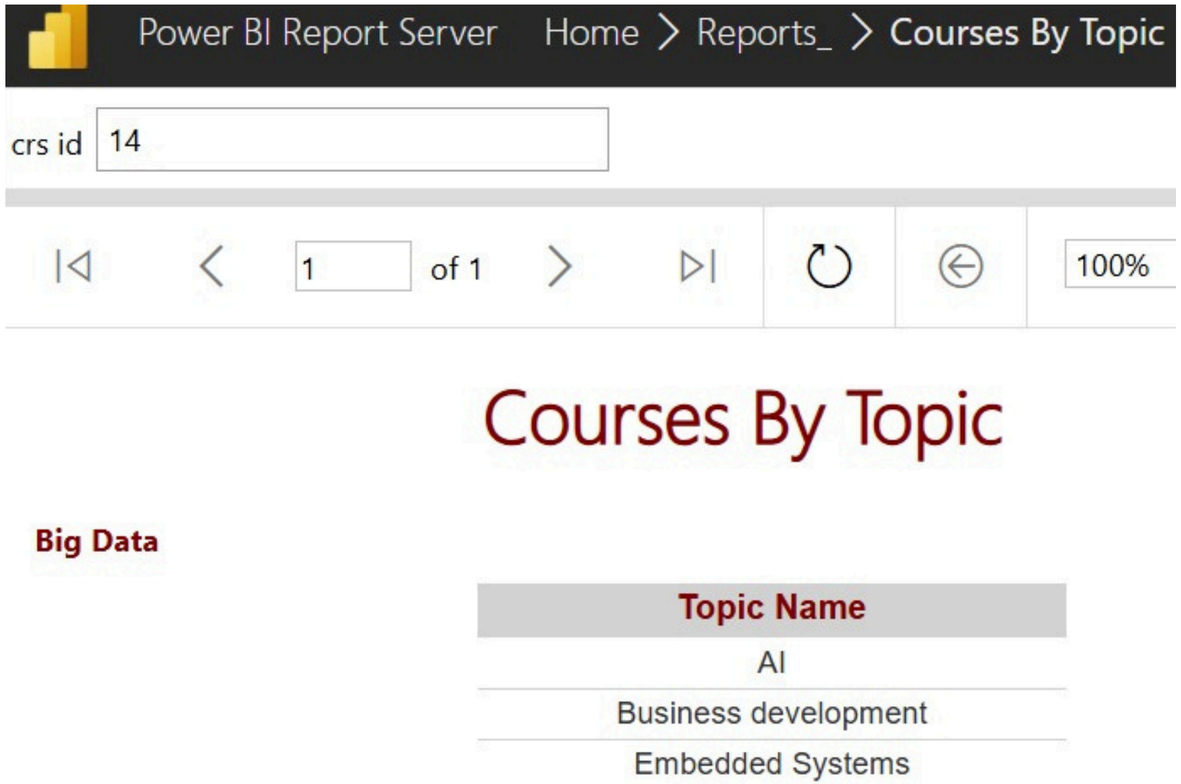
- **Report that returns the students information according to Department No parameter. (GetStudentTopic)**



Name	Gender	City	Age	College	University	Grade Year
Mohamed Sayed	M	Suez	21	Faculty of Engineering	Tanta University	2023
Youssef Ibrahim	M	Mansoura	24	Faculty of Media & Mass Comm	Luxor University	2022
Amira Hussein	F	Mansoura	21	Faculty of Computer & Information Technology	Beni-Suef University	2024
Zainab Younis	F	Alexandria	23	Faculty of Business	Aswan University	2023
Mariam Sayed	F	Assiut	26	Faculty of Computer & Information Technology	Al-Azhar University	2020

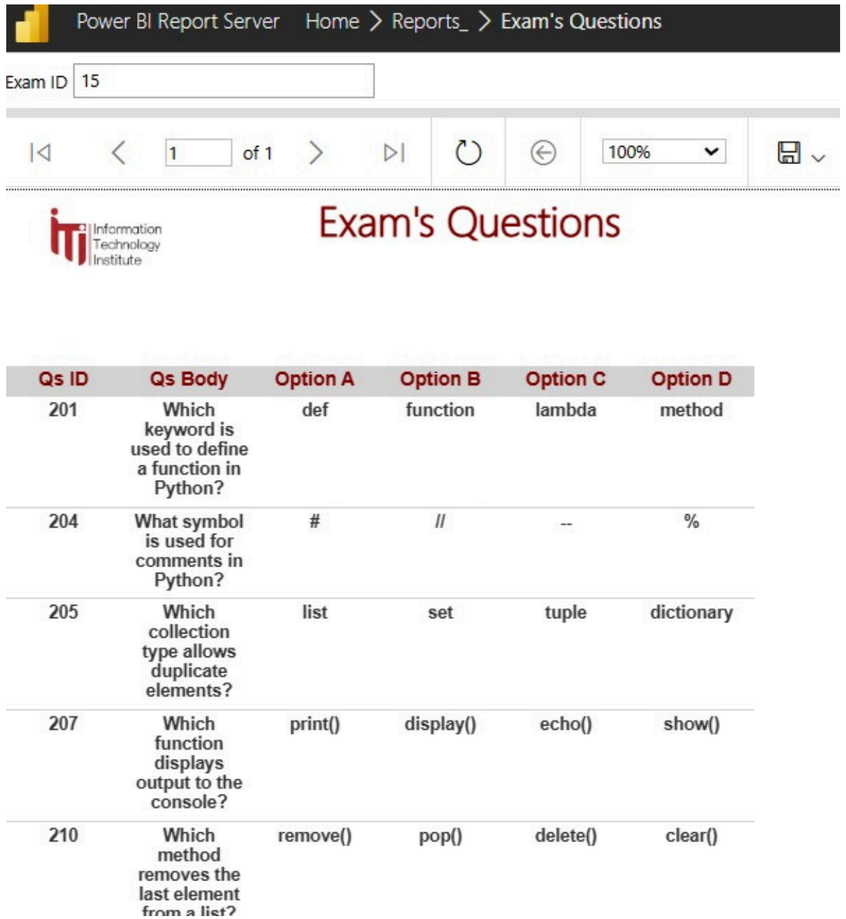
SSRS

·Report that takes course ID and returns its topics.



(GetTopicbyCourses) Procedure

·Report that takes exam number and returns the Questions in it and choices [freeform report]



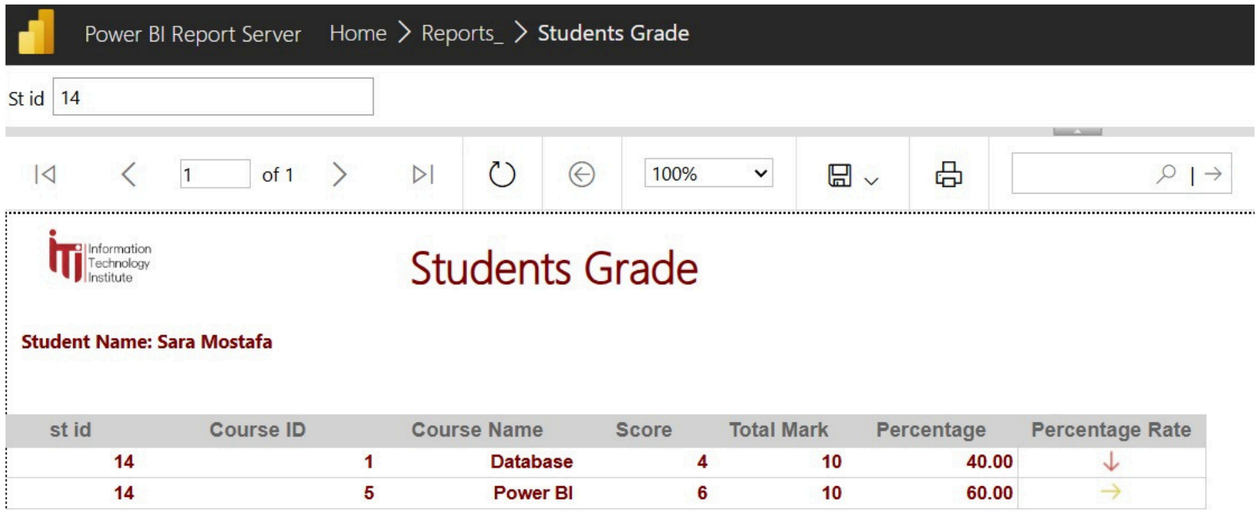
Qs ID	Qs Body	Option A	Option B	Option C	Option D
201	Which keyword is used to define a function in Python?	def	function	lambda	method
204	What symbol is used for comments in Python?	#	//	--	%
205	Which collection type allows duplicate elements?	list	set	tuple	dictionary
207	Which function displays output to the console?	print()	display()	echo()	show()
210	Which method removes the last element from a list?	remove()	pop()	delete()	clear()

(GetQuestions) Procedure

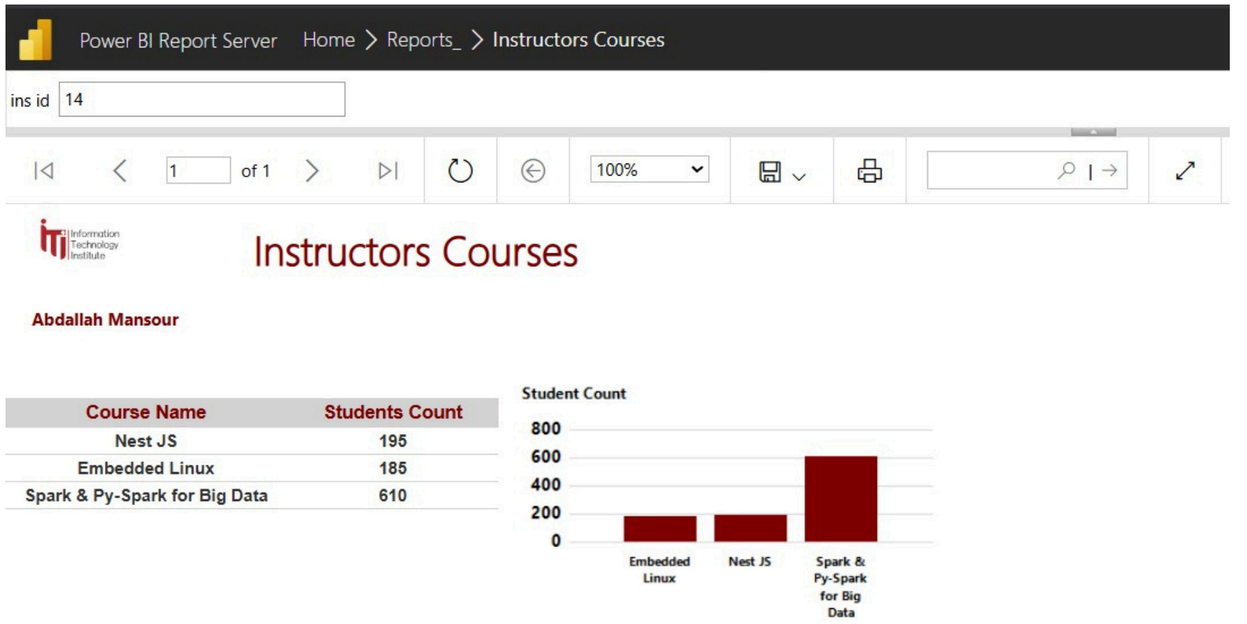
SSRS

·Report that takes the student ID and returns the grades of the student in all courses. %

· Report that takes the instructor ID and returns the name of the courses that he teaches and the number of students per course.



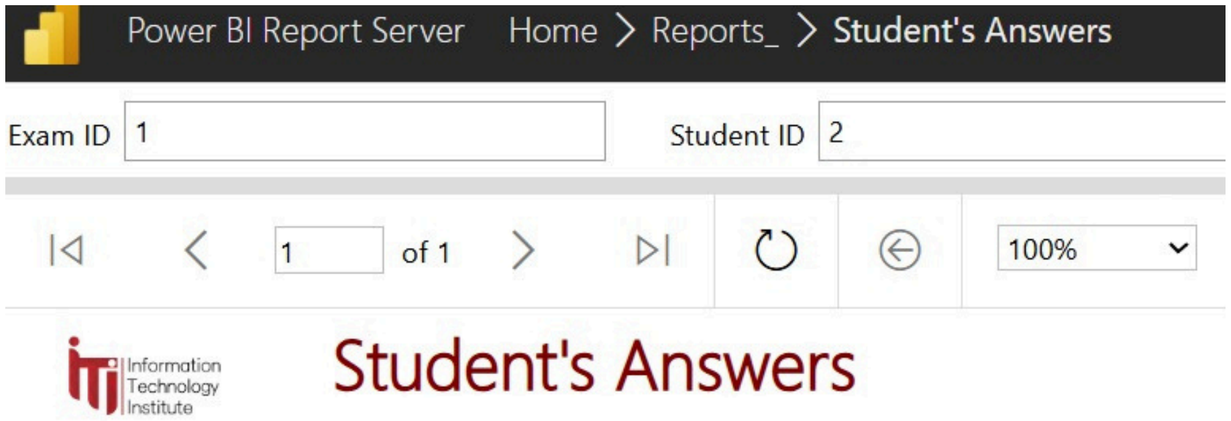
(GetStudentGrade) Procedure



(GetInstructorInfo) Procedure

SSRS

·Report that takes exam number and the student ID then returns the Questions in this exam with the student answers.



(GetStudentAnswers) Procedure

Exam ID: 1 | Student ID: 2

Qs Body	Student Answer
Which clause is used to filter records in SQL?	A
Which constraint ensures a column cannot have NULL values?	A
Which clause groups rows that have the same values?	A
What is the main key in a table called?	A
Which SQL function gives the current date?	A
Which command changes data in an existing	B

Data Model

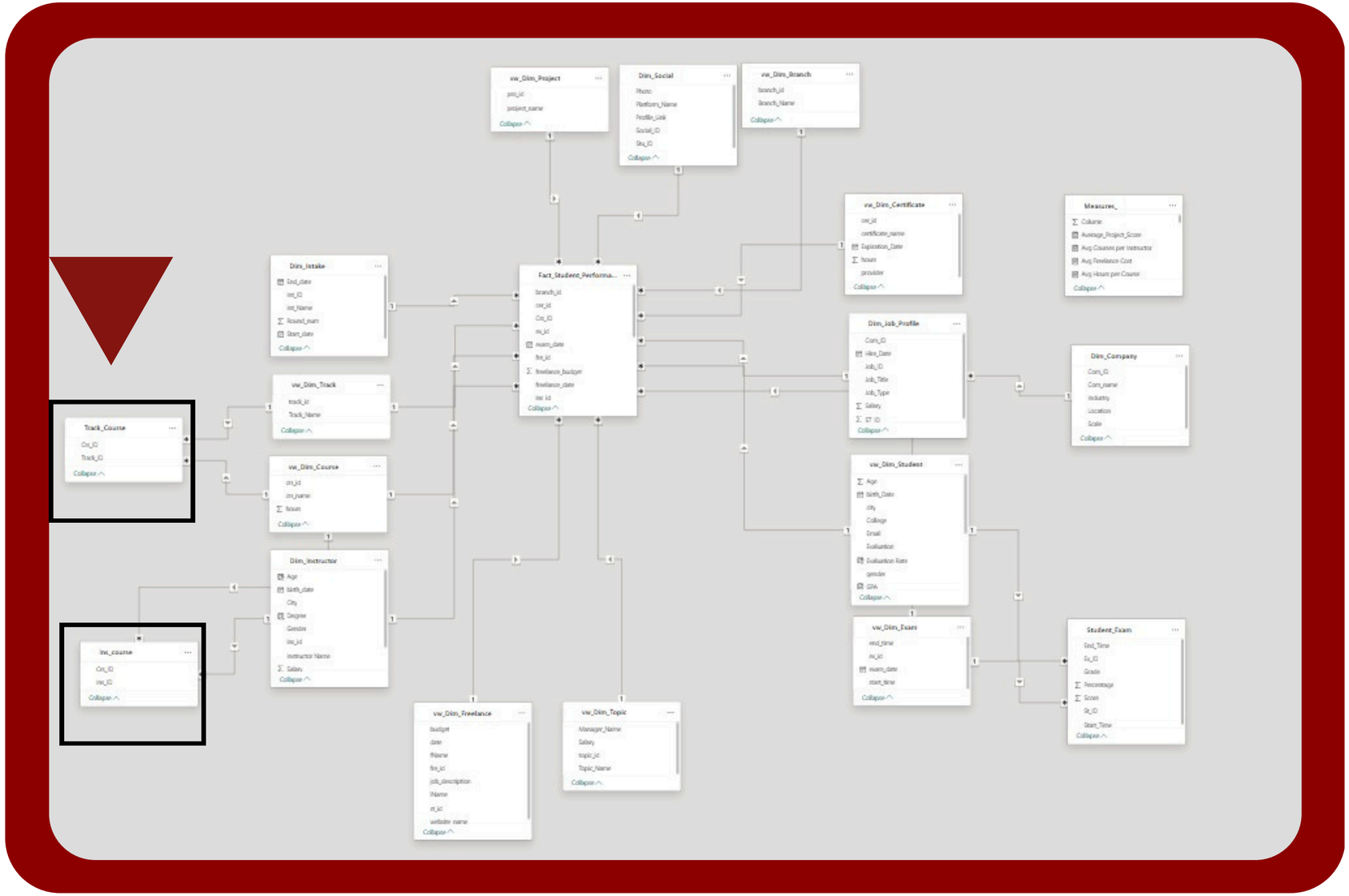
- THE SYSTEM USES A **STAR SCHEMA** WITH A CENTRAL **FACT_STUDENT**

  A TABLE STORING KEY STUDENT METRICS. IT CONNECTS TO MULTIPLE DIMENSION TABLES, SUCH AS STUDENT, INSTRUCTOR, COURSE, EXAM, AND TRACK, AND PROVIDES CONTEXT FOR FILTERING AND ANALYSIS.

- A **BRIDGE TABLE** IS INCLUDED TO PROPERLY HANDLE **MANY-TO-MANY** RELATIONSHIPS AND ENSURE ACCURATE REPORTING. A DEDICATED MEASURES TABLE ORGANIZES DAX CALCULATIONS FOR BETTER PERFORMANCE AND MAINTENANCE.

- THIS DESIGN DELIVERS **FAST QUERIES**, **FLEXIBLE FILTERING**, AND A **SCALABLE FOUNDATION** FOR BUSINESS INTELLIGENCE.

Star Schema


vw_Dim_Project
Dim_Social
vw_Dim_Branch
vw_Dim_Certificate
Measures_
Dim_Intake
Fact_Student_Performa...
Dim_Job_Profile
Dim_Company
vw_Dim_Track
Track_Course
vw_Dim_Cource
vw_Dim_Student
Dim_Instructor
Ins_course
vw_Dim_Exam
Student_Exam
vw_Dim_Freelance
vw_Dim_Topic

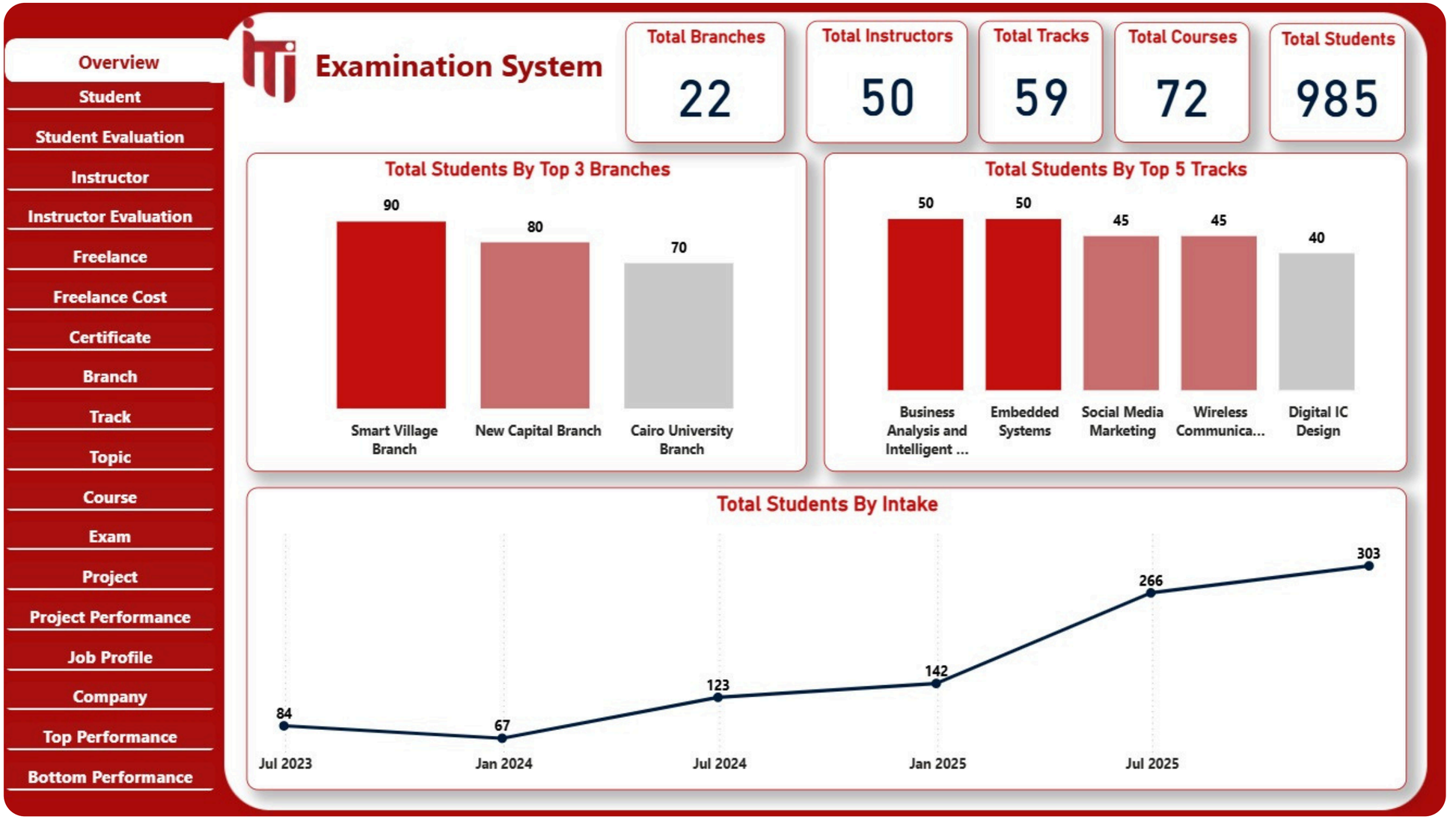
POWER BI DASHBOARD

Power BI

POWER BI DASHBOARD

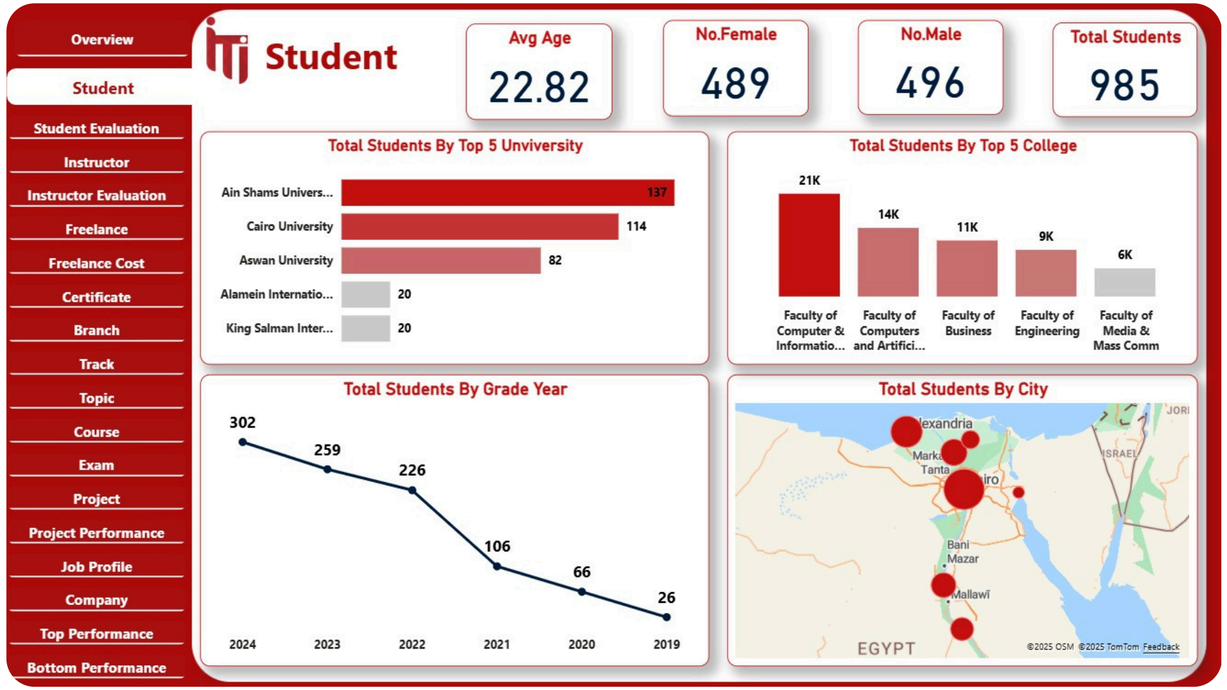
1

OVERVIEW

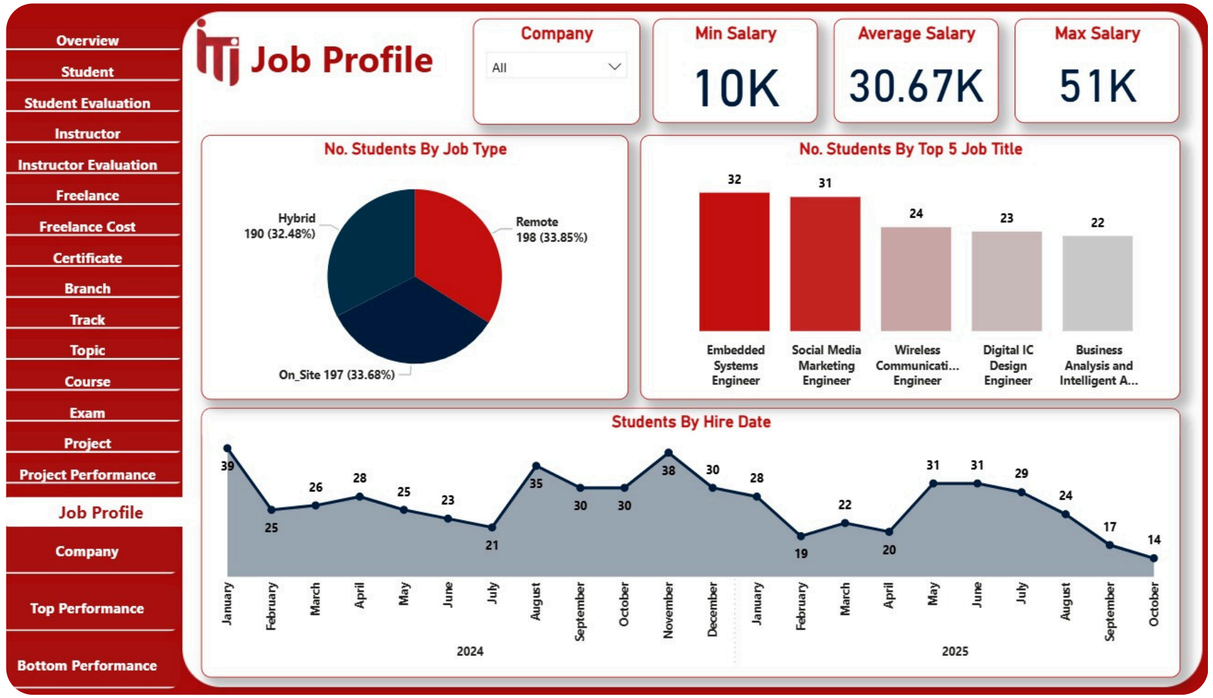


POWER BI DASHBOARD

2 STUDENT

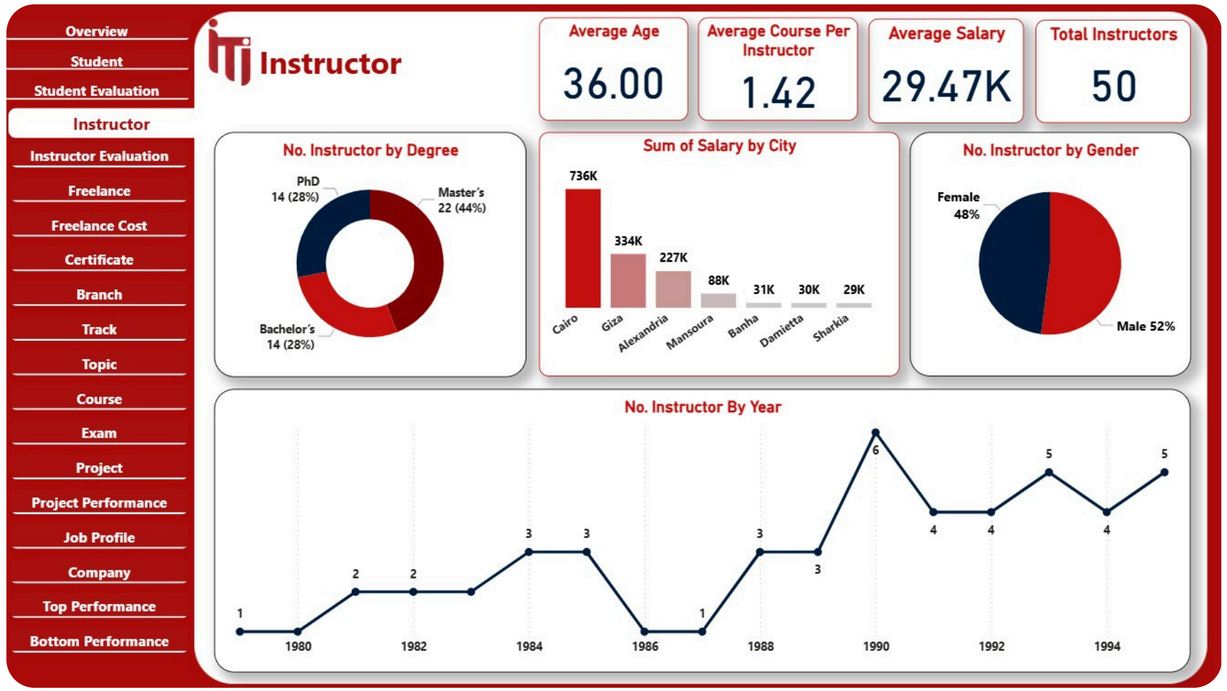


3 JOB PROFILE

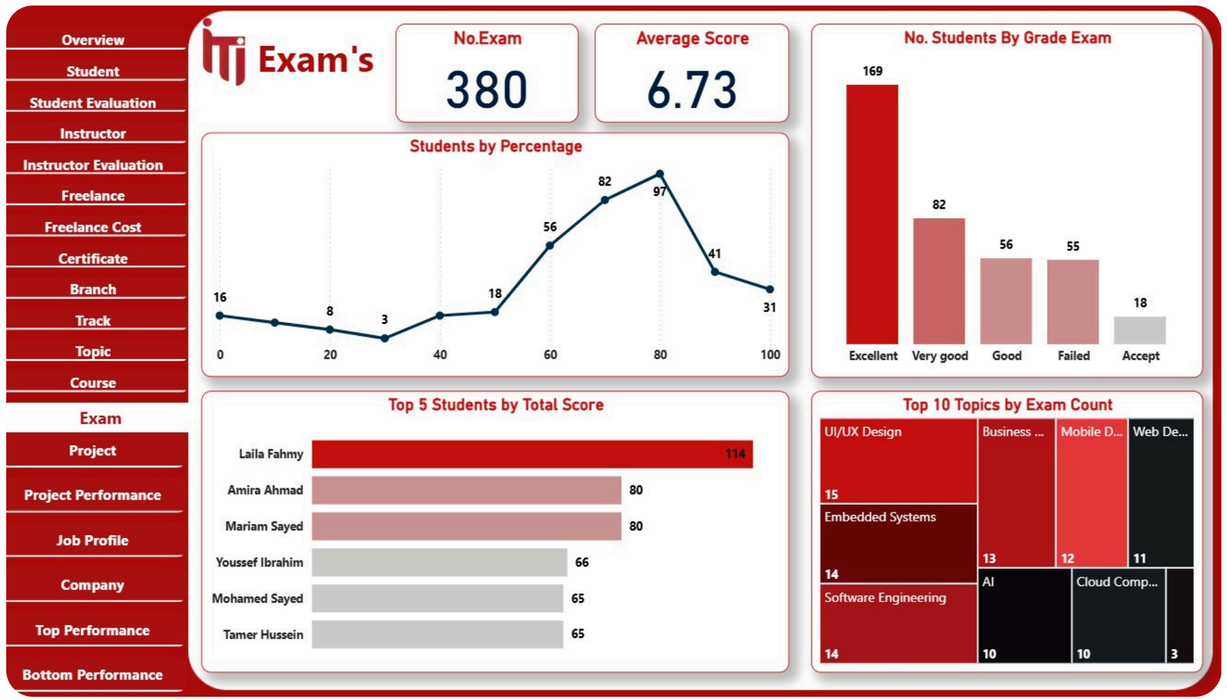


POWER BI DASHBOARD

4 INSTRUCTOR



5 EXAM

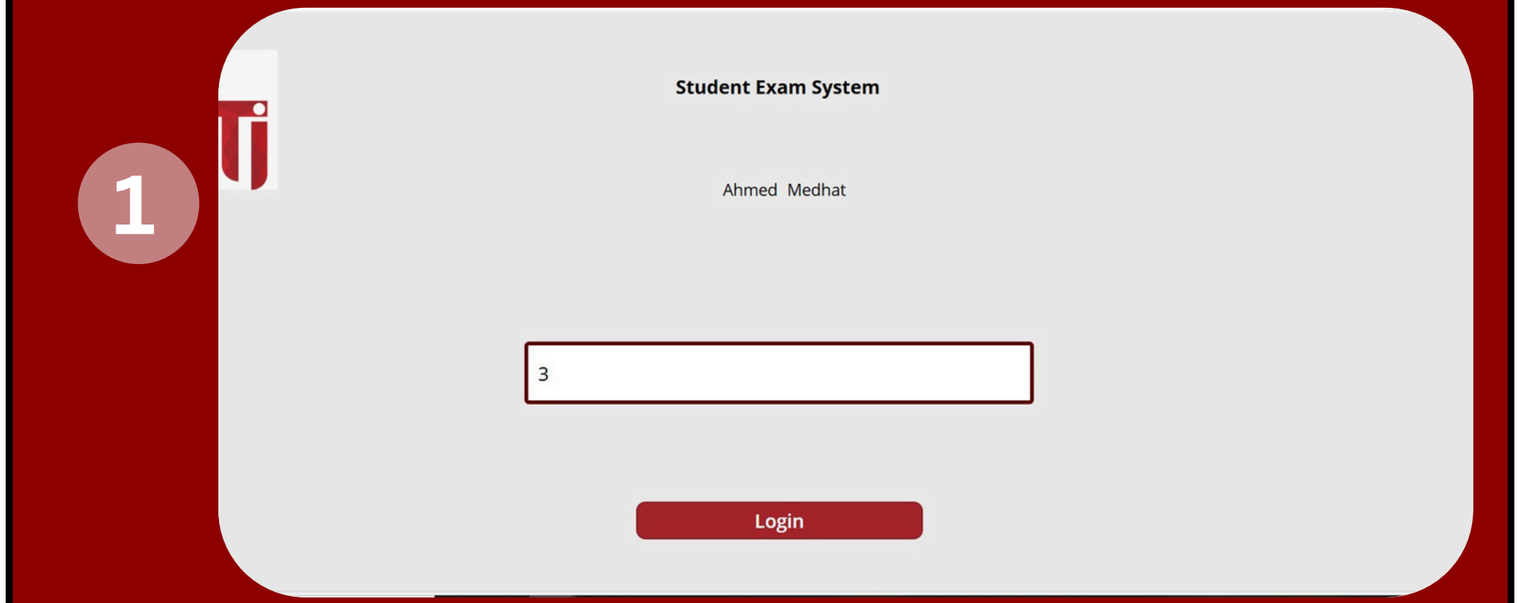


POWER APP

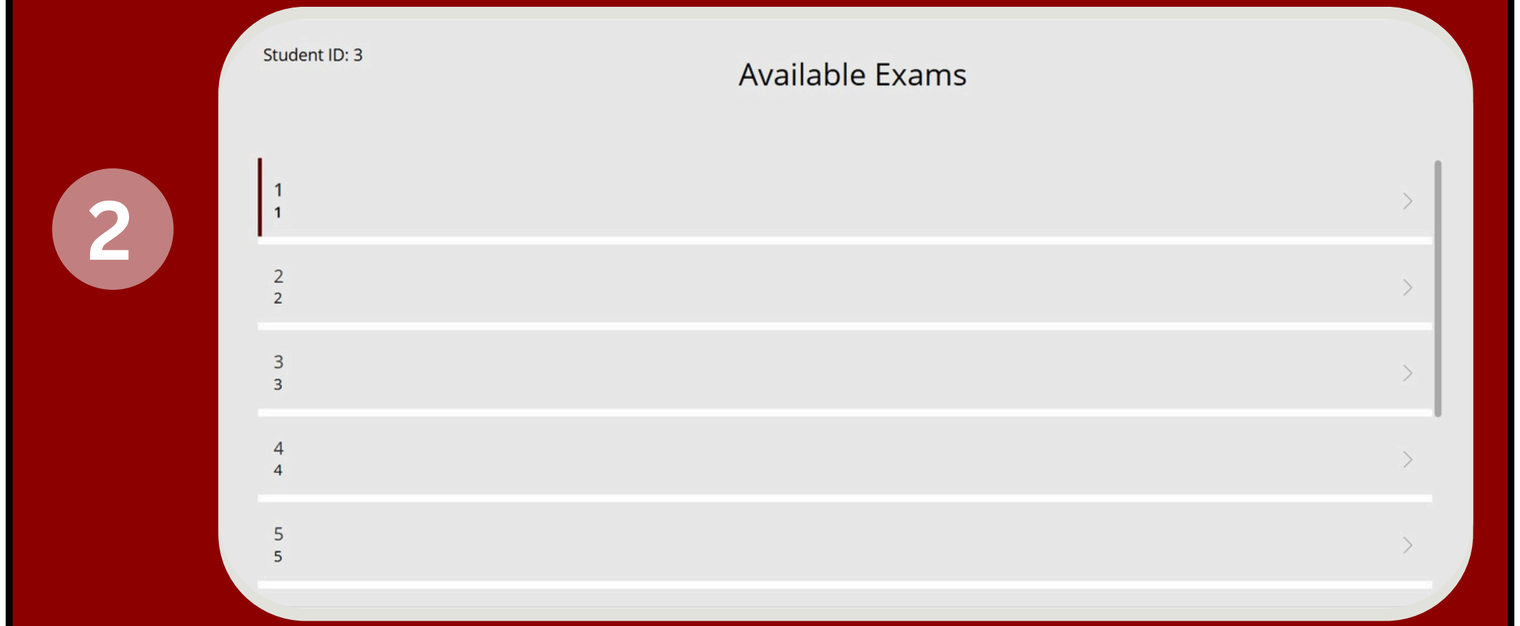
The Power Apps Examination System enables students to take exams digitally and submit answers through a simple interface. It connects to SQL Server for secure, real-time data handling. Power Apps was chosen for its fast development, mobile support, and Power BI integration.

The System Flow

1

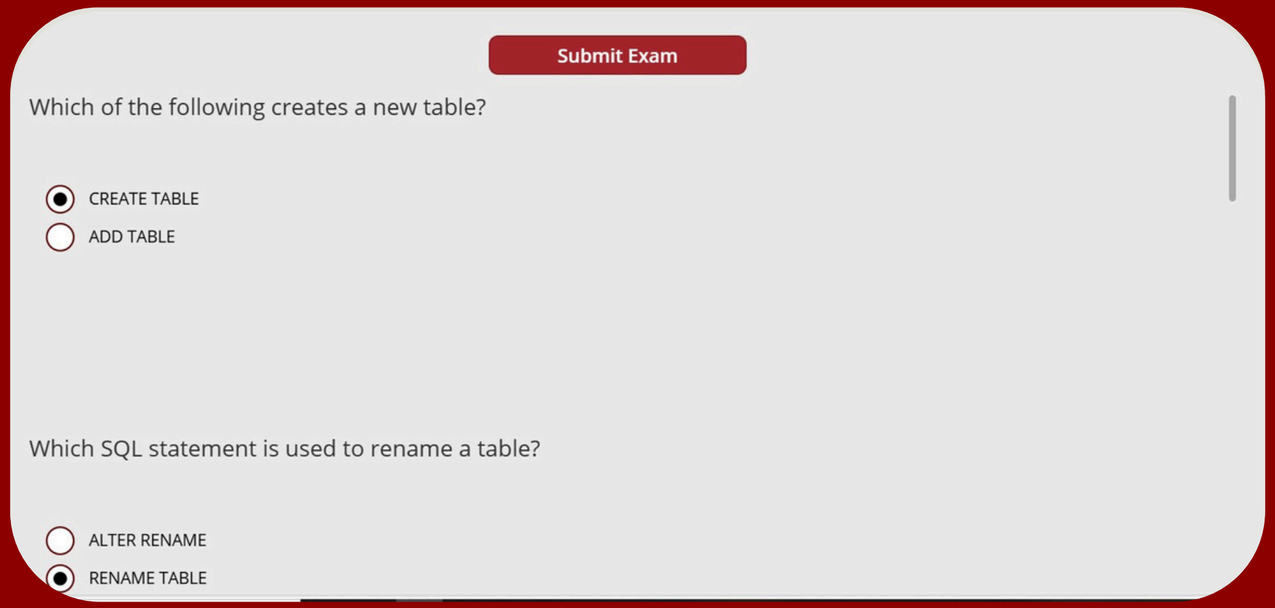


2



The System Flow

3



4

Problems and Solutions

Problems

- Unbalanced data impacting result accuracy.
- Foreign key deletion constraint issue.
- Difficulty choosing optimal data model

Solutions

- Applied asymmetric distribution for accuracy.
- Applied cascade and null strategies.
- Implemented efficient star schema design

Used Tools


Microsoft
SQL Server


Power BI

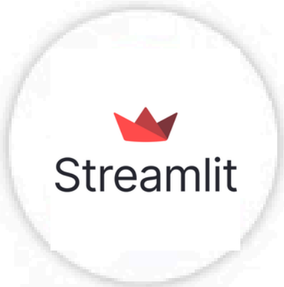

Python


Gemini AI


Trello


ERD


mockaroo


Streamlit


Power Apps


Visual Studio
IDE

Future Plan

- Instructor Question Configuration
- Smart Question Bank Expansion
- Adaptive Exam Generation
- Mobile Examination App

QUESTIONS ??

THANK YOU