

# Domain Modelling and ER Diagrams





# Objectives

- Understand what domain models and ER diagrams are.
- Learn how to create a domain model & ER diagram for a given project.



# Step 1: Select a project i.e AI Teaching Assistant

Let's break down the features of the AI Teaching Assistant into components:

- **Lecture Summarization:** The system can extract key points and summarise the lecture from video or audio files.
- **Quiz Generation:** Based on the summarised content, the system generates quizzes, including questions and answers.
- **User Interaction:** Users (students and instructors) will interact with the system to upload files, view summaries, take quizzes, and track progress.



# Step 2: Define the Domain Model

A domain model represents the core components and their relationships in a software system. In this case, the key components of our domain are :

- **Lecture**
- **Quiz**
- **Question**
- **Answer**
- **User (Student and Instructor)**
- **AI Assistant**



# Key Entities

## User

- Attributes: `user_id`, `name`, `email`, `role` (Student or Instructor)
- Actions: Upload lecture files, view summaries, take quizzes, and track progress

## Lecture

- Attributes: `lecture_id`, `title`, `file` (video/audio), summary
- Actions: Summarize content, create quizzes from content.

## Quiz

- Attributes: `quiz_id`, `lecture_id`, `quiz_title`, `total_questions`, `date_created`
- Actions: Automatically generated based on the lecture summary.

## Question

- Attributes: `question_id`, `quiz_id`, `content`, `type` (Multiple Choice, True/False, etc.)
- Actions: Linked to a specific quiz.

## Answer

- Attributes: `answer_id`, `question_id`, `answer_text`, `is_correct`
- Actions: Part of the quiz evaluation process.

## AI Assistant

- Actions: Processes uploaded files to generate lecture summaries and quizzes.

# Relationships in the Domain Model

- A **User** can upload multiple **Lectures**.
- A **Lecture** is summarised by the **AI Assistant**.
- A **Quiz** is generated based on the summarised **Lecture**.
- A **Quiz** consists of multiple **Questions**.
- Each **Question** has one or more **Answers**.



# Step 3: Design the Entity-Relationship (ER) Diagram

An ER diagram visually represents the relationships between the entities. We'll use the relationships defined in our domain model to construct the diagram.

## Entities in the ER Diagram:

User (Student/Instructor)	Lecture	Quiz	Question	Answer
<ul style="list-style-type: none"><li>• user_id (Primary Key)</li><li>• name</li><li>• email</li><li>• role</li></ul>	<ul style="list-style-type: none"><li>• lecture_id (Primary Key)</li><li>• title</li><li>• file</li><li>• summary</li></ul>	<ul style="list-style-type: none"><li>• quiz_id (Primary Key)</li><li>• lecture_id (Foreign Key)</li><li>• quiz_title</li><li>• total_questions</li><li>• date_created</li></ul>	<ul style="list-style-type: none"><li>• question_id (Primary Key)</li><li>• quiz_id (Foreign Key)</li><li>• content</li><li>• type</li></ul>	<ul style="list-style-type: none"><li>• answer_id (Primary Key)</li><li>• question_id (Foreign Key)</li><li>• answer_text</li><li>• is_correct</li></ul>

# Relationships in the ER Diagram

## 1. User - Lecture:

- A **User** uploads multiple **Lectures**.
- One-to-many relationship between **User** and **Lecture**.

## 2. Lecture - Quiz:

- A **Lecture** generates one **Quiz**.
- One-to-one relationship between **Lecture** and **Quiz**.

## 3. Quiz - Question:

- A **Quiz** contains multiple **Questions**.
- One-to-many relationship between **Quiz** and **Question**.

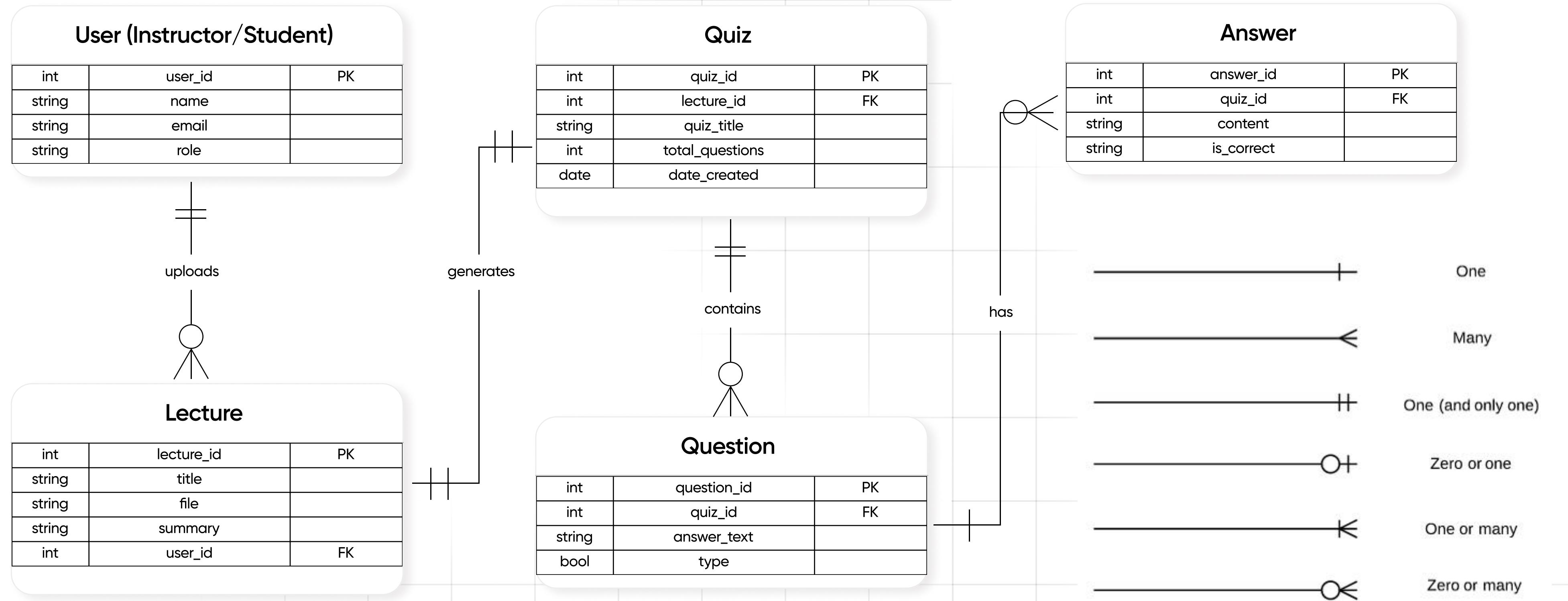
## 4. Question - Answer:

- A **Question** can have multiple **Answers**.
- One-to-many relationship between **Question** and **Answer**.



# ER Diagram Example

Here's the structure:



# Example Scenario

Let's take an example where **Instructor John** uploads a lecture titled "Introduction to Machine Learning."

1. John, the **User**, uploads a **Lecture** file.
  - a. The AI system processes the lecture and generates a **summary**: "Machine learning is the science of teaching computers to learn from data."
2. The AI Assistant generates a **Quiz** based on the summarised content.
  - a. **Quiz**: Title: "Quiz on Machine Learning Basics"
  - b. The quiz contains two **Questions**:
    - i. "What is machine learning?"
    - ii. "Which of the following is an example of supervised learning?"
3. Each question has multiple **Answers**:
  - a. Question 1:
    - i. Answer: "Teaching computers to learn from data" (Correct)
    - ii. Answer: "A type of software programming" (Incorrect)

