Part-1: Migration from Relational Database (PostgreSQL) to MongoDB

- The goal of this project was to migrate a university database from a relational database (PostgreSQL) to a NoSQL database (MongoDB).
- The relational database consisted of five tables **(Departments, Instructors, Students, Courses, Enrollments)**. In MongoDB, we consolidated the data into four collections **(departments, instructors, students, courses),** eliminating the need for a separate enrollments table by denormalizing the data.
- In PostgreSQL, the data was distributed across multiple tables (e.g., Students, Courses, Enrollments), which required multiple joins during query execution. In MongoDB, we embedded lists of enrolled courses directly within each student document and lists of enrolled students in each course document.
- In MongoDB, embedding data avoids expensive joins that are common in relational databases. Fetching all the courses a student is enrolled in is now a single query operation instead of multiple joins across students, courses, and enrollments tables.

SQL

- **Departments:** Stores department information such as department ID, name, building, and budget.
- **Instructors:** Contains instructor details along with a foreign key reference to the department they belong to.
- **Students:** Includes student details along with their department affiliation.
- **Courses**: Details about the courses offered, including which department and instructor are associated with each course.
- **Enrollments**: A junction table that links students to courses, storing enrollment information and grades.

MongoDB

- **Departments:**Stores department information as it is, keeping the structure simple and similar to the relational schema.
- **Instructors:**Holds instructor details, including references to the departments they belong to.
- **Students:**The students collection not only stores student information but also embeds a list of courses that the student is enrolled in. Each course record contains the course ID and the enrollment date. This eliminates the need for a separate enrollment collection, making it easier to fetch a student's courses directly from the students collection.
- **Courses:**The courses collection stores course information, and similar to students, it embeds a list of students enrolled in each course. Each student record includes the

student ID and the enrollment date. This also eliminates the need for the enrollments table, making it more efficient to retrieve course enrollment data.