**Functional Dependencies and Normalisation**

# Introduction

The goal of this activity is for you to practice the technique of using functional dependencies to normalize a relational database schema and for you to take an information source and normalise from UNF to 3NF.

We will start with the universal schema, i.e., a single relation database schema, where all the attributes of interest belong to the single relation in the database schema. However, we could start from a partially normalized schema as well. In the next task given the information source you are to undergo the normalisation process to create new relations that progressively become strong to help avoid insert, update and delete anomalies.

This technique is often applied in real-world software development by a database designer when a relational database schema already exists but needs expansion, or else needs to be revised if it has been otherwise modified.

The outcome of this step is a normalized relational database schema.

## Task 1

Consider the universal relation:

$$R = \{A, B, C, D, E, F, G, H, I, J\}$$

and the set of functional dependencies:

$$F = \{ \quad AB \rightarrow C, \\ A \rightarrow DE, \\ B \rightarrow F, \\ F \rightarrow GH, \\ D \rightarrow IJ \\ \}$$

1. What is the key for $R$? Explain your answer.

2. Decompose $R$ into 2NF, then 3NF relations. Explain your decisions.

# Task 2

Consider the following information source:

**Student Details**

| | | Courses | | |
|---|---|---|---|---|
| Registration No | 545878 | Module Code | Module Title | Grade |
| Name | Peter Smith | COMP101 | Team Project | 86 |
| Address | 45 Some made up place | COMP163 | Python Programming | 62 |
| | | COMP132 | Data Science | 66 |
| Personal Tutor ID | 556 | COMP152 | Operating Systems | 72 |
| Personal Tutor Name | Dr Nice Person | | | |

GPA   71.5

Program ID          COMPSCI_AI
Program Name        Computer Science with AI

1. Show the information source as a table with the associated columns and data in UNF. Include a short description of the process.

2. Convert from UNF to 1NF and show the resulting relations. Include a short description of the process.

3. Convert from 1NF to 2NF and show the resulting relations. Include a short description of the process.

4. Convert from 2NF to 3NF and show the resulting relations. Include a short description of the process.