Faculty of Science, Engineering and Technology

# Fundamentals of Data Management

## Credit Tasks 4.2.1: Functional Dependencies and Normalisation

## Overview

In this tutorial, you'll practise identifying functional dependencies and ensuring a relational database is in third normal form.

**Purpose**

Learn to identify problems with database schemas and how to solve them using normalisation.

**Task**

Solve the functional dependency and relational design problems outlined below.

**Time**

This task should be completed in your fourth lab class and submitted for feedback in the fourth lab.

**Resources**

- Elmasri & Navathe, Fundamentals of Database Systems, Chapter 15
- Connolly & Begg, Database Systems, Chapter 14
- Online resources, e.g.
  - https://www.youtube.com/watch?v=oGObN5TKY9E
  - http://www.cs.nott.ac.uk/~nza/G51DBS/dbs11.pdf
- You can use a specialised tool or simply use tables in your lab report.

**Feedback**

Discuss your solutions with the tutorial instructor.

**Next**

Get started on week5.

## Credit Tasks 4.2.1 — Submission Details and Assessment Criteria

Document your solutions to the tasks in document using a word processor or other suitable software. Upload a pdf to Doubtfire. The tutors will discuss them with you in the lab.

## Subtask 4.2.1

Suppose all information you have to determine functional dependencies is a table of data. Depending on unique mappings available a column or a set of columns may qualify as foreign key. Note that given we don't know the actual purpose of the table, any new row may contradict our findings.

Identify the possible functional dependencies in a table that has the following entries:

| A | B | C | D |
|---|---|---|---|
| a1 | b1 | c1 | d3 |
| a1 | b2 | c3 | d2 |
| a2 | b2 | c3 | d4 |
| a3 | b3 | c5 | d4 |

A, B, C and D are the attribute names. Decide which attributes could possibly be dependent on another attribute or pair of attributes. The way to decide is by exclusion; if a value of A is in the same row with a two different values of C, C cannot be functionally dependent on A (but the reverse may be the case).

For example, both a1 and a2 are in the same row with a value of b2. So based on A, we can't be sure what the value of B should be.

This is the same question as asking what is a potential primary key for this table.

Present your findings in the following table (you can copy it into your report):

| Dependency | Possible (Yes/No) | Why/why not? |
|---|---|---|
| A -> B | | |
| A -> C | | |
| A -> D | | |
| B -> A | | |
| B -> C | | |
| B -> D | | |
| C -> A | | |
| C -> B | | |
| C -> D | | |

| | | |
|---|---|---|
| {A, B} -> C | | |
| {A, B} -> D | | |
| {B, C} -> A | | |
| {B, C} -> D | | |
| {C, D} -> A | | |
| {C, D} -> B | | |
| {A, C} -> B | | |
| {A, C} -> D | | |

(Don't worry about the rest of the possible combinations.)

What do you conclude? Do we need a composite key or does one attribute suffice as a key?

Document your findings and upload.