

# COMP4030

## DATA MODELLING AND ANALYSIS

Lecture 4: Exercises

1

### LECTURE OUTLINE

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1. Lecture Outcomes
  2. Previously in DMA
  3. Exercises
  4. Early Module Feedback

2

## LECTURE OUTCOMES



- At the end of this lecture, you should be able to:
  - Build a model
  - Implement a model
  - Simulate a model
  - Interpret a model

3

## PREVIOUSLY IN DMA: MATHEMATICAL MODELS (DEFINITION)

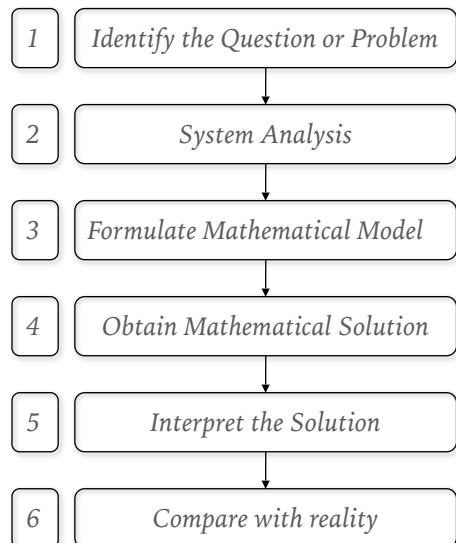
- Mathematical models are used to solve problems (or answer questions) about a system.

**Definition 2.4 (Mathematical Model)** A mathematical model is a triplet  $(S, Q, M)$  where  $S$  is a system,  $Q$  is a set of questions  $Q = \{Q_1, Q_2, \dots, Q_m\}$  relating to  $S$ , and  $M$  is a set of mathematical statements  $M = \{\Sigma_1, \Sigma_2, \dots, \Sigma_n\}$  which can be used to answer  $Q$ .

- The order of  $(S, Q, M)$  follows chronology
- The model is linked to its *purpose*

4

## PREVIOUSLY IN DMA: STEPS IN MODEL CONSTRUCTION



5

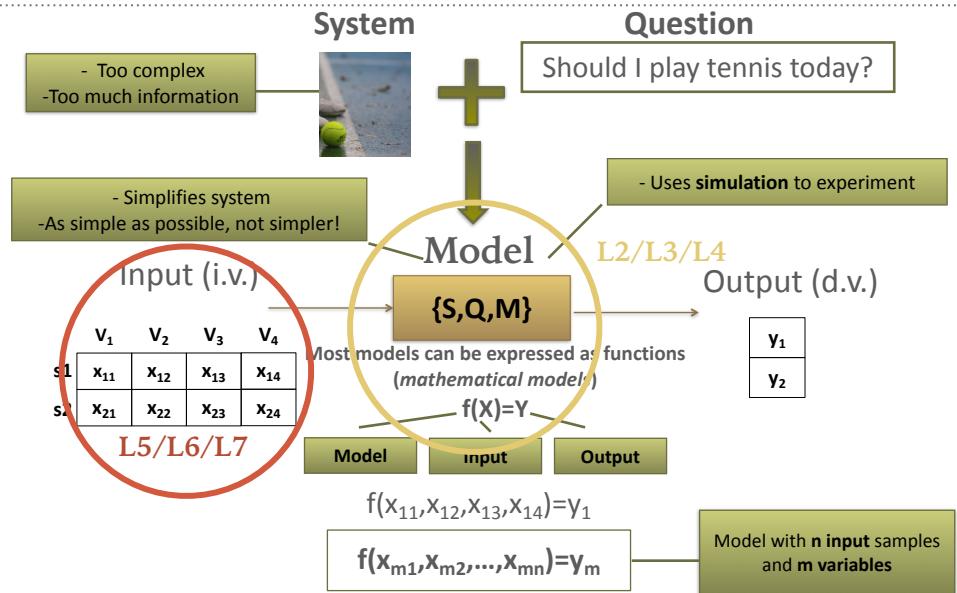
## PREVIOUSLY IN DMA: SIMULATION DEFINITION

**Definition 3.1 (Simulation)** *Simulation is the application of a model with the objective to derive strategies that help solve a problem or answer a question pertaining to a system.*

- The term *simulation* originates from the Latin word “*simulare*”, which means “to pretend”
  - In a simulation, the model *pretends* to be the real system.
- This definition of a *simulation* is again purpose oriented
  - Similar to our previous definition of a model
- Different authors might define the term differently according to their objectives

6

## DMA: THE BIG PICTURE



7

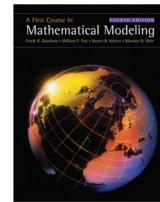
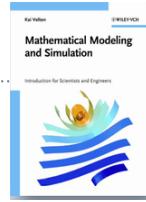
## MATHEMATICAL MODELS AND SIMULATION

- Prepare pen and paper!
- Today, we are going to combine everything we have seen:
  - Lab 1, Lab 2, and Lab 3
  - Lecture 2, and Lecture 3
- We are going to build two models:
  - Population Growth
  - Disease Spread
- You can find the specs for these models in Moodle.

8

## READING MATERIAL

- Books used in this lecture:
  - Velten, K. (2009), “*Mathematical Modeling and Simulation: Introduction for Scientists and Engineers*”; Wiley-VCH
  - Giordano, F.R., et al (2009) “*A First Course in Mathematical Modeling*” (4th ed.); Brooks/Cole, Cengage Learning
  - Edwards, D., Hamson M (2001) “*Guide to Mathematical Modelling - 2nd edition*”, Palgrave Mathematical Guides



THE END

Questions 