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FACULTY OF ENGINEERING AND BUILT ENVIRONMENT

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Computer Science 4 Schools

School of Electrical Engineering & Computer Science

Dr. Alex Mendes

A bit of history

- Grew up in Rio
  - World Cup 2014 and Olympic Games in a few days.

A bit of history

- Got my first computer at age 12. Programmed in BASIC.

```
 10 INPUT "What is your name: "; U$
 20 PRINT "Hello "; U$
 25 REM
 30 INPUT "How many stars do you want: "; N
 35 S$ = ""
 40 FOR I = 1 TO N
 50 S$ = S$ + "*"
 55 NEXT I
 60 PRINT S$
 65 REM
 70 INPUT "Do you want more stars? "; A$
 80 IF LEN(A$) = 0 THEN GOTO 70
 90 A$ = LEFT$(A$, 1)
100 IF (A$ = "Y") OR (A$ = "y") THEN GOTO 30
110 PRINT "Goodbye ";
120 FOR I = 1 TO 200
130 PRINT U$; " ";
140 NEXT I
150 PRINT
```

A bit of history

- Went to university at UNICAMP (State University of Campinas)

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A bit of history

- Institute of Mathematics, Statistics and Computer Science

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A bit of history

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- Arrived in Newcastle in 2003:
  - Research Assistant until 2006
  - Lecturer in 2007
  - Senior Lecturer in 2012
- Now
  - Married, one kid.
  - Still prefer soccer to rugby.

Studying Software/Computer Engineering and Computer Science

- Those programs focus on technical aspects of computing and the engineering of computer software and hardware

- They are taught in the:

  Bachelor of Computer Science

  Bachelor of Engineering (Software)

  Bachelor of Engineering (Computer)

  in the *Faculty of Engineering & Built Environment*

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What is Software Engineering?

- The study of how to implement large-scale, complex software systems on computers
  - Typically involves writing computer programs, with a strong focus on software design and project management practices.

- The “process” of developing good software
  - Analysis of requirements, design, implementation and maintenance.
  - Meeting requirements, bug-free, on-time, within budget.

What is Computer Science?

- The study of how to solve problems efficiently using computers:
  - Typically involves writing computer programs, with a strong focus on “effective and efficient algorithms” and the development of new computational tools.
- Identifying and analysing complex tasks
- Developing and analysing algorithms
- Experimenting with new technologies
- Investigating the theoretical foundations and applications of computing

What is Computer Science?

- Three Comp Sci majors are available:
  - **Data Science:** Students will specialise in computational algorithms and tools to solve complex, large-scale data analysis problems. There is a focus on mathematical methods and statistics, in addition to computer science foundation.
  - **Computer Systems & Robotics:** Students will specialise in systems design and algorithms for secure distributed computer systems, programming language systems, embedded systems, computer vision, machine learning and robotics.
  - **Software Development:** A more general software development major for all levels of industry and commerce, with a choice of topics to suit students' particular interests.

What is the difference?

- Another example: Game industry
- The SE will organise the whole game development process. Decide which groups will create each part of the game. A group will design the guns, another the physics of motion, and another the “intelligence” of the enemy. They will make sure it all works together and is tested thoroughly, so there are no bugs!
- The CS is likely to implement the individual parts of the game. Does that grenade fly as it should, in a parabolic movement? Is the enemy clever? That is, does it hide behind obstacles before trying to shoot me or does it just run towards me without “thinking”?

So, very, very important...

- Choosing either **Software Engineering** or **Computer Science** you will...
  - **Learn how to <u>create</u> the computer programs.**
  - **Instead of just use them, or simply apply them to specific situations.**
  - That is why there is a strong emphasis in software design and programming, and good maths background is recommended.

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What is Computer Engineering?

- The study of how to build the computer equipment that is used by Computer Scientists and Software Engineers
  - Typically involves working with digital logic and electronic components; building specialized hardware and software
  - E.g.: Onboard computers and sensors for cars, like anti-lock braking systems and traction control, life-support systems for ICUs, etc.
- Software design, particularly at the very low level
- Computer design
- The option of a combined degree **Computer Engineering / Computer Science** is quite popular because it gives students the knowledge of both software and hardware.

How long does it take to complete each degree?

- *BCompSc* takes 3 years for a degree
  - May be followed by an extra Honours year

- *BE(Software) and BE(Computer*) take 4 years for a degree
  - Honours is embedded and awarded based on merit

- Double degree *BE(Computer)* / *BCompSc* takes 5 years

International recognition

- All degrees have *internationally recognised* professional accreditation
  - *Bachelor of Engineering (Software) and Bachelor of Engineering (Computer)*
    - Professionally accredited by Engineers Australia and the Australian Computer Society
  - *Bachelor of Computer Science*
    - Professionally accredited by the Australian Computer Society

Study maths!

- Because of their technical nature, the *Bachelor of Computer Science,* the *Bachelor of Engineering (Computer)* and the *Bachelor of Engineering (Software)* assume some advanced HSC Mathematics
  - And 30 Units of Mathematics are included in the First Year of the degrees. So, students should do lots of maths!
  - But there is hope for those who don't! These is a bridging maths course in the 1st semester available that will not delay the completion of the degree.

- Other options: Minors and Masters.

THANK YOU

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DISCUSSION