

# ELEC9782<sub>Term II, 2019</sub> Special Topics: Data Science

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**UOC:** 6  
**Class Times:** Wednesday (wks 1-10) & Friday (Wks 1, 7, 10) , 6pm-9pm Room: EE G23  
**Prerequisites:** Undergraduate Signal Processing Course  
& Undergraduate Control Course

## Course Organisation

There are two parts to the course  
Part I: weeks 1-5: Visualisation & Time Series  
Part II: weeks 7-10: Pattern Recognition

## Aims:

Provide an introduction to Data Science principles and practice from a Control and a Signal Processing point of view.

## Assessment :

To pass, students must obtain a pass level in each part of the course

Assignments (one for each part) 2×15% each

Exams (for Part I) (Take-home) 35%

Keep a copy of your assignment

Late assignments will be penalised at 10% of the maximum value per day late.

Exam The same arrangements apply as for Assignments.

Project (for Part II) (Take-home) 35%

You will have to make a 20 min project presentation including Q&A

## Assignment & Exam Timetable

Assignment 1: out - week 3 ; due - week 5

Exam 1: out - week 5 ; due - week 7

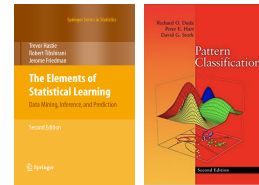
Assignment 2: out - week 9 ; due - week 11

Project 2: out - week 9 ; due - end of term unless otherwise negotiated

## Resources

<b>Software:</b>	<b>Part I</b> Matlab & R	<b>Part II</b> Matlab & Python
<b>Textbook:</b>	none.	none.
<b>Reference</b>	R. Shumway & D. Stoffer (2011) Time Series Analysis and its Applications. 3rd. ed. Springer.	(i) T. Hastie, R. Tibshirani, J. Friedman The Elements of Statistical Learning, 2nd ed. Springer (2009). (ii) R.O. Duda, D.G. Stork, P.E.Hart (2001) Pattern Classification 2nd.ed., J. Wiley.

All three  
available Online



## Teaching Strategies

Lectures	To give the basic material in written form, and to highlight the importance of different sections, and help with the formation of schema.
Assignments	To give practice in problem solving, and to assess your progress.
Examination & Project	Final test of competency.

## Learning Outcomes

At the end of the course the student will be familiar with basic aspects of Data Science from both a Control and a Signal Processing point of view  
And will be able to use this knowledge to solve basic problems in Data Science

## Academic Honesty and Plagiarism

Plagiarism means copying. You cannot copy other people's work of any kind; you cannot copy from any source. Plagiarism is a serious offence and (severe) penalties will apply; see <https://student.unsw.edu.au/plagiarism>

## Administrative Matters

On issues and procedures regarding such matters as special needs, equity and diversity, occupational health and safety, enrolment, rights, and general expectations of students, please refer to the School policies, on the School webpage.

## Part I Topics

### Week      Topic

- 1a Introduction to Data Science.
- 1b Matrix Methods Review:  
emphasizing e.g. eigen-analysis.
- 2 Information Visualization: Principles & Practice.
- 3 Introduction to System Identification.
- 4 Stochastic Processes and Spectra in System Identification.
- 5 Kalman Filter, Wiener Filter.

## Part II Topics

### Week      Topic

- 6 No Lecture (work on Exam 1).
- 7a Introduction to Machine Learning.
- 7b (Friday) Feature Representations:  
e.g. speech and image features
- 8 Linear Methods for Regression and Classification.
- 9 Generative Models and Support Vector Machines.
- 10a Deep Learning.
- 10b (Friday) Hardware and Software Considerations:  
e.g. databases, toolboxes, GPUs, etc.