ELEC9782 Session II, 2018 Special Topics: Data Science

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UOC: 6
Class Times: Thursday, 6pm-9pm Room: TBA
Prerequisites: Undergraduate Signal Processing Course & Undergraduate Control Course

Course Organisation
There are two parts to the course
Part I: weeks 1-6: Visualisation & Time Series
Part II: weeks 8-12: Pattern Recognition & Software Engineering

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) 15% each
Exams (one for each part) (Take-home) 35% each
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.

Assignment & Exam Timetable
Assignment 1: out - week 4; due - week 6
Exam 1: out - week 6; due - week 8
Assignment 2: out - week 10; due - week 12
Exam 2: out - week 13; due - week 15
Resources

**Part I**

**Software:** Matlab & R

**Reference**

**Part II**

**Software:** Matlab & Python

**Reference**
none.


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**
The 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 heath and safety, enrolment, rights, and general expectations of students, please refer to the School policies, on the School webpage.
### Part I Topics

<table>
<thead>
<tr>
<th>Week</th>
<th>Topic</th>
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<tbody>
<tr>
<td>1a</td>
<td>Introduction to Data Science.</td>
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<tr>
<td>1b</td>
<td>Matrix Methods Review: emphasizing e.g. eigen-analysis.</td>
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<tr>
<td>2</td>
<td>Information Visualization: Principles &amp; Practice.</td>
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<tr>
<td>3</td>
<td>Introduction to System Identification.</td>
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<tr>
<td>4</td>
<td>Stochastic Processes and Spectra in System Identification.</td>
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<tr>
<td>5</td>
<td>Kalman Filter, Wiener Filter.</td>
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<td>6</td>
<td>Guest Lecture.</td>
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### Part II Topics

<table>
<thead>
<tr>
<th>Week</th>
<th>Topic</th>
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<tbody>
<tr>
<td>7</td>
<td>No Lecture (work on Exam 1).</td>
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<tr>
<td>8a</td>
<td>Introduction to Machine Learning.</td>
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<tr>
<td>8b</td>
<td>Feature Representations: e.g. speech and image features</td>
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<tr>
<td>9</td>
<td>Linear Methods for Regression and Classification.</td>
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<tr>
<td>10</td>
<td>Generative Models and Support Vector Machines.</td>
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<td>11</td>
<td>Deep Learning.</td>
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<td>12</td>
<td>Hardware and Software Considerations: e.g. databases, toolboxes, GPUs, etc.</td>
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