

# MATH 7002 ADVANCED STATISTICAL METHODS

**Credit Points** 10

**Legacy Code** 301115

**Coordinator** Paul Hurley ([https://directory.westernsydney.edu.au/search/name/Paul Hurley/](https://directory.westernsydney.edu.au/search/name/Paul%20Hurley/))

**Description** There has been a significant trend away from simple statistical models for complex and Big Data. Advanced Statistical Methods is a technical unit that looks at computer intensive statistical techniques for modelling complex data. Students will learn about methods including Density Estimation, the Expectation-Maximisation (EM) algorithm, Bayesian, Markovian and Hidden Markov Models, enabling them to apply sophisticated statistical tools in a Data Science setting.

**School** Computer, Data & Math Sciences

**Discipline** Statistics

**Student Contribution Band** HECS Band 2 10cp

**Level** Postgraduate Coursework Level 7 subject

**Pre-requisite(s)** MATH 7012 AND MATH 7016

**Co-requisite(s)** COMP 7006

**Restrictions**

Students must be enrolled in a postgraduate program.

## Learning Outcomes

On successful completion of this subject, students should be able to:

1. Describe the axioms of probability and the principle of maximum likelihood.
2. Use density estimation to model continuous data.
3. Apply the EM algorithm (Expectation-Maximisation Algorithm) to maximise complex likelihood functions.
4. Evaluate models using computational techniques
5. Analyse data using Bayesian statistical models and MCMC (Markov-Chain Monte Carlo)

## Subject Content

1. Review of Probability Theory and Likelihood
2. Density Estimation
3. Maximum Likelihood and EM algorithm
4. Jack-knife, Bootstrap and Cross-validation
5. Introduction to Bayesian Methods
6. Markovian and Hidden Markov Models

## Assessment

The following table summarises the standard assessment tasks for this subject. Please note this is a guide only. Assessment tasks are regularly updated, where there is a difference your Learning Guide takes precedence.

| Item            | Length         | Percent | Threshold | Individual/Group Task |
|-----------------|----------------|---------|-----------|-----------------------|
| Online Quizzes  | 5 x 30 minutes | 20      | N         | Individual            |
| Case Study      | 2,000 words    | 40      | N         | Individual            |
| Applied Project | 2,000 words    | 40      | N         | Individual            |

Teaching Periods

## Spring

### Parramatta - Victoria Rd

#### Day

**Subject Contact** Paul Hurley ([https://directory.westernsydney.edu.au/search/name/Paul Hurley/](https://directory.westernsydney.edu.au/search/name/Paul%20Hurley/))

View timetable ([https://classregistration.westernsydney.edu.au/even/timetable/?subject\\_code=MATH7002\\_22-SPR\\_PS\\_D#subjects](https://classregistration.westernsydney.edu.au/even/timetable/?subject_code=MATH7002_22-SPR_PS_D#subjects))