Summer Semester December 2015 – early February 2016  Special Topics
Course

CSSE3080 – Special Topics in Computer Systems 3A (undergraduate) #2

CSSE7080 – Special Topics in Computer Systems A (postgraduate) #2

The course will be an enhanced version of the Coursera “Machine Learning” on-line course from Stanford, which has already been completed by more than 40,000 students worldwide.

Here is the Stanford course content which also describes this course:

*Machine learning is the science of getting computers to act without being explicitly programmed. In the past decade, machine learning has given us self-driving cars, practical speech recognition, effective web search, and a vastly improved understanding of the human genome. Machine learning is so pervasive today that you probably use it dozens of times a day without knowing it. Many researchers also think it is the best way to make progress towards human-level AI. In this class, you will learn about the most effective machine learning techniques, and gain practice implementing them and getting them to work for yourself. More importantly, you'll learn about not only the theoretical underpinnings of learning, but also gain the practical know-how needed to quickly and powerfully apply these techniques to new problems. Finally, you'll learn about some of Silicon Valley's best practices in innovation as it pertains to machine learning and AI.*

This course provides a broad introduction to machine learning, data mining, and statistical pattern recognition. Topics include: (i) Supervised learning (parametric/non-parametric algorithms, support vector machines, kernels, neural networks). (ii) Unsupervised learning (clustering, dimensionality reduction, recommender systems, deep learning). (iii) Best practices in machine learning (bias/variance theory; innovation process in machine learning and AI). The course will also draw from numerous case studies and applications, so that you'll also learn how to apply learning algorithms to building smart robots (perception, control), text understanding (web search, anti-spam), computer vision, medical informatics, audio, database mining, and other areas.

Students will firstly enrol in and complete the free online course from Stanford:

https://www.coursera.org/learn/machine-learning

The Stanford course is nominally 11 weeks self-paced (at about 4 hours per week), so we would require students to complete the “Coursera” part of the course in the first 5 weeks of the summer semester (i.e. by Monday 5 January), and to indicate their completion with the appropriate certificate of completion (pass/fail requirement). You can start the course at any time (you don’t need to wait until summer semester), but once you start you will need to complete each module in a maximum of about one week.

Additionally, in each of these first 5 weeks there would be an additional UQ-specific hand-in assignment requiring students to apply the materials from the module(s) completed that week. This will be submitted via Blackboard.

The course uses MATLAB, so many of these assignments would be MATLAB based. These hand-in assignments would be worth 10% each (7% for standard questions, 3% for a stretch goal each week).
Once you enrol in the Stanford course, you can get a 120 day free, single-user license for MATLAB (but beware – the download is 600MB+), or else you can use MATLAB on our UQ computers.

The remaining 50% of the marks would be for a final programming assignment, using MATLAB if you wish, or another programming language such as R, which would include an individual presentation of your project (20%). The presentation would be due in the summer semester “exam” week, 2-6 February, but you could complete and present it earlier if you wish.

The postgraduate students would additionally undertake a critical review of a research paper.

It is possible for students to complete the course remotely, provided that they could deliver their final presentation via skype or similar, and either get a free MATLAB license or remotely access MATLAB at UQ.

In addition to the on-line study materials, there will be a weekly optional drop-in session on campus, plus a remote “drop-in” session (maybe using google+ hangout?), to provide assistance to students, which will be held outside working hours to fit in with students doing vacation work.

**Recommended Pre-requisites:**

In terms of background, students will need some experience of programming to be able to use MATLAB, and will require some reasonable linear algebra (such as matrices) and statistics. There are background lectures on this pre-requisite material available via the Stanford course website. Engineering students should be fine, but arts, science, information technology or multimedia students should plan some extra time to pick up this mathematical background during the course.

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The course will be an approved elective for different ITEE programs as listed below:

Bachelor of Engineering (Electrical), including extended major
Bachelor of Engineering/Master of Engineering (Electrical)
– CSSE3080 will count as a part C “Coverage” elective

Bachelor of Engineering (Hons) (Electrical), including extended major
Bachelor of Engineering(Hons)/Master of Engineering (Electrical)
– CSSE3080 will count as a part C “Coverage” elective

Bachelor of Engineering (Software), including extended major
Bachelor of Engineering/Master of Engineering (Software)
– CSSE3080 will count as a part C “Coverage” elective

Bachelor of Engineering (Hons) (Software), including extended major
Bachelor of Engineering(Hons)/Master of Engineering (Software)
– CSSE3080 will count as a part C “Coverage” elective

Bachelor of Engineering (Electrical and Biomedical)
Bachelor of Engineering/Master of Engineering (Electrical and Biomedical)
– CSSE3080 will count as a level 3 part B elective

Bachelor of Engineering (Hons) (Electrical and Biomedical)
Bachelor of Engineering(Hons)/Master of Engineering (Electrical and Biomedical)
– CSSE3080 will count as a level 3 part B elective

Bachelor of Engineering (Electrical and Computer)
Bachelor of Engineering/Master of Engineering (Electrical and Computer)
– CSSE3080 will count as a level 3 part B elective

Bachelor of Engineering (Hons) (Electrical and Computer)
Bachelor of Engineering(Hons)/Master of Engineering (Electrical and Computer)
– CSSE3080 will count as a level 3 part B elective

Bachelor of Engineering (Mechatronics)
Bachelor of Engineering/Master of Engineering (Mechatronics)
– CSSE3080 will count as a level 3 part B1 elective

Bachelor of Engineering (Hons) (Mechatronics)
Bachelor of Engineering (Hons) / Master of Engineering (Mechatronics)
– CSSE3080 will count as a level 3 part B1 elective

Bachelor of Engineering (Mechatronics) single or double major pre-2012 rules.
– CSSE3080 will count as a part B3 coverage elective

Bachelor of Engineering (Electrical and Aerospace)
– CSSE3080 will count as a part B3 coverage elective

Bachelor of Engineering (Software Systems and Aerospace)
– CSSE3080 will count as a part B3 coverage elective

Bachelor of Information Technology
– CSSE3080 will count as a part C Advanced Elective
Bachelor of Multimedia Design
- CSSE3080 will count as a level 3 Part B elective.

Master of Engineering Science (Electrical) (including GCEngSc)
- CSSE7080 will count as a Part A elective

Master of Engineering Science (Software) (including GCEngSc)
- CSSE7080 will count as a Part A elective

Master of Engineering Science (Systems) (including GCEngSc)
- CSSE7080 will count as a Part A elective

Master of Engineering Science (Management) (Electrical) (including GCEngSc)
- CSSE7080 will count as a Part A elective

Master of Engineering Science (Management) (Software) (including GCEngSc)
- CSSE7080 will count as a Part A elective

Master of Computer Science
-- CSSE7080 is already listed as an elective in part A1

Master of Computer Science (Management)
-- CSSE7080 is already listed as an elective in part A1

Master of Information Technology
-- CSSE7080 is already listed as in Part C – advanced electives