

Subject Outline

Subject Name	MA5852 Master Class 2
Subject Code	MA5852 Master Class 2
Study Period	SP83 2021
Study Mode	External
Campus	JCU Online
Subject Coordinator	Dr. Kelly Trinh

We acknowledge the Traditional Owners of the lands and waters where our University is located and actively seek to contribute and support the JCU Reconciliation Statement, which exemplifies respect for Australian Aboriginal and Torres Strait cultures, heritage, knowledge and the valuing of justice and equity for all Australians.

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Pre-requisites

Before attending this course, you should have taken a college-level course in Data Mining and Machine Learning such as (MA5810-Introduction to Data Mining, MA5832-Data Mining and Machine Learning). Students should also have an understanding of the basics of computing, data management, different data types and python programming and neural networks.

This subject outline has been prepared by Dr. Kelly Trinh for the College of Science and Engineering, Division of DTES, James Cook University.

Q1. This subject is offered across more than one campus and/or mode and/or teaching period within the one calendar year.	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
Q2. If Yes (Q1), the design of all offerings of this subject ensure the same learning outcomes and assessment types and weightings.	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
Q3. If no (Q2), [Type here] has authorised any variations, in terms of equivalence.		

Subject Outline Peer Reviewer

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Staff Contact Details

Teaching Team	Staff Member	Email
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For email enquiries, **please type MA5852 in the subject line**, and ensure that your email is sent from your JCU email account

Online discussion board forums

- Any student or staff member can post or reply to posts on a discussion forum.
- The teaching team monitors and replies to comments on the discussion board once per day.
- Students are encouraged to participate in the online discussion board forums.
- There is no assessment attached to these forums, but you will find it helpful to post general questions about subject matter here.
- The subject coordinator reserves the right to remove any unprofessional comments from the discussion forum.
- The subject coordinator reserves the right to report any students for violating the [student code of conduct](#), [social media policy](#) and related policies to the appropriate administrators for actioning.

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1 Subject at a glance

1.1 Student participation requirements

The JCU [Learning, Teaching and Assessment Policy](#) (4.3) indicates that, “a **3 credit point subject** will require a **130 hour work load** of study-related participation including class attendance over the duration of the study period, **irrespective of mode of delivery**”. This work load comprises **timetabled hours** and **other attendance requirements**, as well as **personal study hours**, including completion of online learning activities and assessment requirements. Note that “attendance at specified classes will be a mandatory requirement for satisfactory completion of some subjects” (Learning, Teaching and Assessment Policy, 5.10); and that additional hours may be required per week for those students in need of **English language, numeracy** or **other learning support**.

For information regarding class registration, visit the [Class Registration Schedule](#).

1.2 Key dates

Key dates	Date
Census date	See 2021 Study Period and Census Dates
Last date to withdraw without academic penalty	See 2021 Study Period and Census Dates
Assessment task 1 [Video presentation] [15 %]	Released on Monday, Week 0. Due on Sunday 11:59pm (AEST) Week 2
Assessment task 2 [Report] [40 %]	Released on Monday, Week 2. Due on Sunday 11:59pm (AEST) Week 4
Assessment task 3 [Report] [45 %]	Released on Monday, Week 2. Due on Wednesday 11:59pm(AEST) Week 7

2 Subject details

2.1 Subject description

Communication skills and cloud computing are essential industry skills which are highly relevant to the data science profession. Model derivation and data insights are the products of data science and the communication of these products in business is key. In this subject, oral, video and project planning communication skills are developed in conjunction with learning Amazon Web Services (AWS) Sage Maker. Amazon is Australia, and the worlds, largest cloud provider of computational services, with over 85% of the Australian market, and over 40% globally.

While learning the Amazon Web Services platform, the mechanics of modern neural networks are extended from previous subjects. The concepts of regularisation, pooling, optimisation momentum and convolution are introduced and applied in the field of computer vision neural networks. Midway in the subject, Amazon is used to apply machine learning optimisation to machine learning tasks. This methodology of using machine learning for optimisation greatly enhances the outcomes of model development and removes some of the intuition needed for model development. At the conclusion of the subject, students will provide a detailed computer vision project plan using industry standard planning method.

2.2 Subject learning outcomes

Students who successfully complete this subject will be able to:

1. Apply and develop data science oral and video communication skills.
2. Develop multi-layer perceptron and convolution neural networks using regularisation and advance optimisers
3. Use the costings, S3 (data), Sage Maker and IAM (security) elements of Amazon Web Services (AWS)
4. Programmatically interact with AWS using Python Jupyter Notebooks
5. Develop and deploy machine learning models on AWS
6. Tune hyperparameters for machine learning models using AWS
7. Demonstrate and apply time and project management skills
8. Demonstrate and apply advanced theoretical and technical knowledge of data science to an industry or research problem.
9. Apply advanced research, consultancy, and presentation skills.
10. Communicate the findings of a formal piece of work and meet a deadline.
11. Reflect on knowledge learned of theory and business practices for future learning and ongoing professional development.

These outcomes will contribute to your overall achievement of **course learning outcomes**. Your course learning outcomes can be located in the entry for your course in the electronic JCU [Course Handbook 2020](#) (see *Academic Requirements for Course Completion*).

2.3 Learning and teaching in this subject

Week 1. Develops data science oral communication and video presentation

- Week 2. Exploring the AWS web console by learning S3 data services, IAM security and SDK's in Python, R and command line.
- Week 3. Develop Python Jupyter Notebooks to train and tune neural networks on the cloud platform AWS Sage Maker
- Week 4. Deeper understanding in Neural Network
- Week 5. Extend optimisation, activation function and regulation methods for neural networks
- Week 6. Develop Convolution Neural Networks (CNN) for computer vision applications

2.4 Student feedback on subject

As part of our commitment at JCU to improving the quality of our courses and teaching, we regularly seek feedback on your learning experiences. Student feedback informs evaluation of subject and teaching strengths and areas that may need refinement or change. **Your JCU Subject and Teaching Surveys** provide a formal and confidential method for you to provide feedback about your subjects and the staff members teaching within them. You will receive an email invitation when the survey opens. We value your feedback and ask that you provide constructive feedback about your learning experiences for each of your subjects, in accordance with responsibilities outlined in the [Student Charter](#). Refrain from providing personal feedback on topics that do not affect your learning experiences. Malicious comments about staff are deemed unacceptable by the University.

2.5 Subject resources and special requirements

2.5.1 Subject resources

This subject will use the following:

1. Amazon Web Services. A student account will be available for the duration of the subject. The AWS free tier is highly recommended for assessments and additional practice.
2. Ebooks available at JCU library:
 - a. "Machine Learning in the AWS Cloud", Mishra, Abhishek (2019): eISBN:9781119556749
 - b. "AWS certified cloud practitioner study guide : CLF-C01 exam", Piper, Ben (2019): eISBN: 9781119490692
 - c. "Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow, 2nd Edition", Aurélien Géron. ISBN: 9781492032649
3. You may also find it handy to obtain a copy of "Deep Learning" by Ian Goodfellow, Yoshua Bengio, and Aaron Courville (2016): ISBN 9780262035613

2.5.2 AWS reimbursement

College of Science and Engineering will reimburse **up to \$40** per student for AWS service. Any additional cost will not be approved for reimbursement. Therefore, please follow the instructions by the academic team to ensure the cost is within \$40. **The reimbursement request will only be processed when an invoice is received from AWS. Further information on how to receive the reimbursement will be provided in Week 0.**

3 Assessment details

3.1 Requirements for successful completion of subject

In order to pass this subject, you must:

- Attain an aggregate score of 50% or higher across all assessed elements
- Submit at least 80% of total assessment weights.
- Submit only original, non-plagiarised work for assessment

RW Grades: *Non-submission of any assessment task will lead to a grade of RW (Result Withheld). Following the official release of results each study period, students have two weeks to make arrangements with their examiner to submit the missing material or an alternative assessment (at the discretion of the examiner). After two weeks any unresolved RW grades may be converted to fail grades.*

Assessment items and final grades will be reviewed through moderation processes ([Learning, Teaching and Assessment Policy](#), 5.13-5.18). It is important to be aware that assessment “is always subject to final ratification following the examination period and that no single result represents a final grade in a subject” ([Learning, Teaching and Assessment Policy](#), 5.22.).

3.2 Feedback on student learning

Feedback for students will be provided on all assessment items.

3.3 Assessment tasks

ASSESSMENT TASK 1: VIDEO REVIEW

Aligned subject learning outcomes	<ol style="list-style-type: none">1. Introduce cloud computing platforms: AWS, Amazon SageMaker2. Understand the procedure of building, training and deploying a machine learning model in Amazon SageMaker.3. Communicate data science concepts orally and in video formats
Group or individual	Individual
Weighting	15%
Date	Refer to Key dates

ASSESSMENT TASK 1: DESCRIPTION

During this assessment, you will produce a video presentation reviewing Amazon- the common platform used to build, train and deploy a machine learning model. Additionally, you will review the Machine Learning services of the ML cloud platforms

ASSESSMENT TASK 1: CRITERIA SHEET

See assessment document for detail and rubrics.

ASSESSMENT TASK 2: CLOUD COMPUTATION

Aligned subject learning outcomes	<ol style="list-style-type: none">1. Analyse real world tasks using machine learning methods, in particular describing, choosing, and applying appropriate supervised machine learning methods for descriptive data mining tasks2. Develop and deploy machine learning models in AWS-SageMaker3. Tune hyperparameters for machine learning models using AWS-SageMaker4. Programmatically interact with AWS using Python Jupyter Notebooks5. Synthesise and communicate the method and findings to diverse audiences
Group or individual	Individual
Weighting	40%
Due date	Refer to Key dates

ASSESSMENT TASK 2: DESCRIPTION

During this assessment, you will produce a written report showing how to build, train and deploy a neural network in Amazons' SageMaker.

ASSESSMENT TASK 2: CRITERIA SHEET

See assessment document for detail and rubrics.

ASSESSMENT TASK 3 CAPSTONE REPORT)

Aligned subject learning outcomes	<ol style="list-style-type: none">1. Understand a structure of convolution neural network type used in computer vision2. Analyse real world computer vision tasks using machine learning techniques learnt in this subject3. Engage AWS cloud computing services4. Develop and deploy machine learning models in AWS-SageMaker5. Tune hyperparameters for machine learning models using AWS-SageMaker6. Construct a written communication and interpretation of machine learning methodologies7. Demonstrate and apply advanced theoretical and technical knowledge of data science to an industry or research problem.
Group or individual	Individual
Weighting	45%
Due date	Refer to Key dates

ASSESSMENT TASK 3: DESCRIPTION

In this assessment, you will produce a written report on reviewing a structure of convolution neural network and implementing a neural network for a computer vision project in AWS-SageMaker.

ASSESSMENT TASK 3: CRITERIA SHEET

See assessment document for detail and rubrics.

4 Submission and return of assessment

4.1 Submission of assessment

Note that students must not email assessment items without prior approval from the lecturer.

Note that the [Learning, Teaching and Assessment Policy](#) (5.22.3) outlines a uniform formula of penalties that will be imposed for submission of an assessment task after the due date. **This formula is 5% of the total possible marks for the assessment item per day including part-days, weekends and public holidays. Due to the dynamic nature and pace of the online delivery mode, no submission will be accepted after 1 week.**

Important policy information on Assessment Practices is available for all students at the following websites:

http://www.jcu.edu.au/policy/teaching/teaching/JCUDEV_016741.html

Students may ask for a review of any piece of assessable work within two weeks of receiving their assessment. Such review may involve a re-mark of the piece of work; however, any re-mark may also result in downgrading of the assessable work. Students who wish to appeal against an assessment should first consult the marker of the assessment. If the matter is not resolved, further appeal may be made to the Head of School. See the Policy on 'Review of Assessment and Student Access to Scripts and Materials' at:

http://www.jcu.edu.au/policy/teaching/teaching/JCUDEV_005333.html

POLICY ON LATE SUBMISSION OF ASSESSMENT

The College of Science and Engineering is committed to providing supportive and equitable learning environments for all students, and grading and reporting systems that provide fair, valid, reliable and accurate representations of student achievement. Your future employers regard effective time management skills and the capacity to work to timelines as essential competencies in a professional workplace. We are committed to supporting and encouraging all our students to develop these competencies and to succeed in their studies, and are also aware that many students have multiple demands on their time. All the special consideration requests are submitted via [the JCU website](#).

Accordingly, the approach to timely submission of assessment in this subject is as follows.

Prior to the due date, students can apply to the subject coordinator (or the campus-based lecturer in charge) for extensions, with supporting documentation such as medical or counsellor certificates. It is at the discretion of the subject co-ordinator that extensions will be granted.

On the due date, in the event of emergencies or in exceptional circumstances, students should contact the subject co-ordinator immediately and then provide substantiation of the event, for example with formal notice such as from medical practitioners or counsellors. Again, it is at the discretion of the subject co-ordinator that extensions will be granted.

Where no prior extension has been approved, late submissions will incur a penalty of 5% of the assignment value per day or part thereof. Assessment tasks will generally not be graded after 10 days past the due date.

4.2 Return of assessment

Feedback on marked assessments will be available in the Gradebook in Learn Ultra.

It is the responsibility of students to view their marks for each within-session assessment on Learn JCU within 20 working days of posting. If there are any discrepancies, students must contact the unit convenor immediately. Failure to do so will mean that queries received after the release of results regarding assessment marks will not be addressed.

Please see [The Learning Centre website](#) for other important student information pertaining to plagiarism and referencing, examinations advice and student support services.

5 Subject calendar

Please note, the sequence of some topics may change due to staff availability, resourcing, or due to unforeseen circumstances.

Week/Date/Module		Topics Covered
0	Orientation	
1	Storytelling and preparing for your assessment	<ol style="list-style-type: none"> 1. Storytelling Data Science 2. Uploading your video for assessment one
2	Introduction to AWS	<ol style="list-style-type: none"> 1. Cloud Concepts 2. Setting up an AWS account 3. AWS cloud security 4. AWS data storage S3 5. AWS CLI and SDK
3	AWS Sage Maker	<ol style="list-style-type: none"> 1. Introduction to AWS Sage Maker 2. Sage Maker Notebooks 3. Hyperparameter Optimization and Tuning
4	Extending neural networks	<ol style="list-style-type: none"> 1. ANN estimation 2. Choices for cost functions, hidden layers and output layers 3. Backpropagation algorithm
5	Regularisation and optimisers	<ol style="list-style-type: none"> 1. Regularisation 2. Optimisation algorithms
6	Computer vision tasks with neural networks	<ol style="list-style-type: none"> 1. CNN architecture 4. Convolution layer 5. Pooling layer 6. Practical examples