



COMP6210

Big Data

Session 1, In person-scheduled-weekday, North Ryde 2023

School of Computing

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General Information

Unit convenor and teaching staff

Lecturer and Unit Convener

Guanfeng Liu

guanfeng.liu@mq.edu.au

Lecturer

Amin Beheshti

amin.beheshti@mq.edu.au

Credit points

10

Prerequisites

COMP6200 or Admission to MInfoTechNetworking

Corequisites

Co-badged status

Unit description

Even simple tasks like counting elements can seem impossible when the amount of data to process is huge. This unit explores some of the key aspects related to processing and mining information from large volumes of data. We present technology commonly used in industry such as map-reduce, and show how a range of data processing methods can be realised using map-reduce. Especial emphasis will be placed in the adaptation of data mining techniques for large volumes of data and for data streaming.

Important Academic Dates

Information about important academic dates including deadlines for withdrawing from units are available at <https://www.mq.edu.au/study/calendar-of-dates>

Learning Outcomes

On successful completion of this unit, you will be able to:

ULO1: Explain the key Big Data concepts and techniques.

ULO2: Apply techniques for storing large volumes of data.

ULO3: Apply Map-reduce techniques to a number of problems that involve Big Data.

ULO4: Apply techniques for handling high-dimensional big data.

General Assessment Information

Requirements to Pass this Unit

To pass this unit you must:

- Achieve a total mark equal to or greater than 50%.

Late submission

Unless a Special Consideration request has been submitted and approved, a 5% penalty (of the total possible mark of the task) will be applied for each day a written report or presentation assessment is not submitted, up until the 7th day (including weekends). After the 7th day, a grade of '0' will be awarded even if the assessment is submitted. The submission time for all uploaded assessments is 11:55 pm. A 1-hour grace period will be provided to students who experience a technical concern. The late submission rule was changed to align with the new Faculty policy.

For any late submission of time-sensitive tasks, such as scheduled tests/exams, performance assessments/presentations, and/or scheduled practical assessments/labs, please apply for [Special Consideration](#).

Assessments where Late Submissions will be accepted

- Assessment 1 – YES, Standard Late Penalty applies
- Assessment 2 – YES, Standard Late Penalty applies

Special Consideration

The [Special Consideration Policy](#) aims to support students who have been impacted by short-term circumstances or events that are serious, unavoidable, and significantly disruptive, and which may affect their performance in assessment. If you experience circumstances or events that affect your ability to complete the assessments in this unit on time, please inform the convenor and submit a Special Consideration request through ask.mq.edu.au.

Details for each assignment will be available via iLearn

You are encouraged to:

- Set your personal deadline earlier than the actual one
- Keep backups of all your important files
- Ensure that no-one else picks up your printouts

Assessment Tasks

| Name | Weighting | Hurdle | Due |
|------------------------------|-----------|--------|--------|
| Assignment 1 | 20% | No | Week 6 |

| Name | Weighting | Hurdle | Due |
|-----------------------------------|-----------|--------|---------|
| Assignment 2 | 20% | No | Week 12 |
| Final examination | 60% | No | TBA |

Assignment 1

Assessment Type ¹: Programming Task

Indicative Time on Task ²: 30 hours

Due: **Week 6**

Weighting: **20%**

In this assignment, you will implement scalable algorithms (e.g. using Hadoop MapReduce and DASK) to process Big Data.

On successful completion you will be able to:

- Explain the key Big Data concepts and techniques.
- Apply techniques for storing large volumes of data.
- Apply techniques for handling high-dimensional big data.

Assignment 2

Assessment Type ¹: Programming Task

Indicative Time on Task ²: 30 hours

Due: **Week 12**

Weighting: **20%**

In this assignment you will implement a non-trivial problem that processes Big Data.

On successful completion you will be able to:

- Apply techniques for storing large volumes of data.
- Apply Map-reduce techniques to a number of problems that involve Big Data.

Final examination

Assessment Type ¹: Examination

Indicative Time on Task ²: 15 hours

Due: **TBA**

Weighting: **60%**

The final exam will focus on the theoretical aspects of the unit, including algorithms and implementation issues.

On successful completion you will be able to:

- Explain the key Big Data concepts and techniques.
- Apply techniques for storing large volumes of data.
- Apply Map-reduce techniques to a number of problems that involve Big Data.
- Apply techniques for handling high-dimensional big data.

¹ If you need help with your assignment, please contact:

- the academic teaching staff in your unit for guidance in understanding or completing this type of assessment
- the [Writing Centre](#) for academic skills support.

² Indicative time-on-task is an estimate of the time required for completion of the assessment task and is subject to individual variation

Delivery and Resources

Classes

Each week has two hours of lectures and two hours of workshops. For details of days, times and rooms consult the [timetables webpage](#). There is no workshop/practical class for this unit.

Required and Recommended Texts

Some of the contents of the unit will be based on the following books:

- J. Leskovec, A. Rajaraman, J. Ullman, Mining of Massive Datasets. The book is free and available from <http://www.mmids.org/>, where you can also find links to a MOOC, slides, and videos.
- C. Coronel, S. Morris. Database Systems: Design, Implementation and Management. 13th edition. Chapter 14 is the most relevant chapter. This chapter will be made available to students attending the classes.

Additional material including lecture notes will be made available during the semester. See the unit schedule for a listing of the most relevant reading for each week.

Technology Used and Required

The following software is used in COMP6210:

- Java 8
 - Download: <https://www.java.com/en/download/>
 - Installation instructions to set JAVA_HOME:
 - https://www.java.com/en/download/help/download_options.xml
 - https://docs.oracle.com/cd/E19182-01/820-7851/inst_cli_jdk_javahome_t/
- Python 3.9 (Anaconda version)
 - Download: <https://www.anaconda.com/download>
 - Installation instructions: <https://docs.anaconda.com/anaconda/install/>
- MongoDB
 - Installation instructions: <https://docs.mongodb.com/v3.2/tutorial/install-mongodb-on-windows/>
- Studio 3T
 - Here is an online tool to access MongoDB and MapReduce. It has a 30 day Trial but if you need more time you can also apply for a student license.
 - Download: <https://studio3t.com/download/>
- Hadoop
 - Download: <https://hadoop.apache.org/releases.html>
 - Installation instructions: <https://wiki.apache.org/hadoop/Hadoop2OnWindows>
- DASK
 - Install: <https://docs.dask.org/en/stable/install.html>
 - Tutorial: https://tutorial.dask.org/00_overview.html

This software is installed in the labs; you should also ensure that you have working copies of all the above on your own machine. Note that some of this software requires internet access.

Many packages come in various versions; to avoid potential incompatibilities, you should install versions as close as possible to those used in the labs.

Unit Web Page

The unit web page will be hosted in iLearn, where you will need to log in using your Student One ID and password. The unit will make extensive use of discussion boards also hosted in iLearn. Please post questions there, they will be monitored by the staff on the unit.

Methods of Communication

We will communicate with you via your university email or through announcements on iLearn. Queries to convenors can either be placed on the iLearn discussion board or sent to the unit convenor from your university email address.

COVID Information

For the latest information on the University's response to COVID-19, please refer to the Coronavirus infection page on the Macquarie website: <https://www.mq.edu.au/about/coronavirus-faqs>. Remember to check this page regularly in case the information and requirements change during the semester. If there are any changes to this unit in relation to COVID, these will be communicated via iLearn.

Unit Schedule

Week 1: Data and Big Data

Week 2: Organizing Big Data

Week 3: Curating Big Data

Week 4: Processing Big Data (Cloud Computing)

Week 5: Processing Big Data (MapReduce)

Week 6: Big Data Platforms (Guest Lecture)

Week 7: Big Data with High Dimensions

Week 8: Indexing Big Data

Week 9: Searching Big Data

Week 10: Multidimensional Divide and Conquer

Week 11: Grid Decomposition in Big Data

Week 12: Advanced Topic in Big Data (Guest Lecture)

Week 13: Unit Review

Policies and Procedures

Macquarie University policies and procedures are accessible from [Policy Central \(https://policies.mq.edu.au\)](https://policies.mq.edu.au). Students should be aware of the following policies in particular with regard to Learning and Teaching:

- [Academic Appeals Policy](#)
- [Academic Integrity Policy](#)
- [Academic Progression Policy](#)
- [Assessment Policy](#)
- [Fitness to Practice Procedure](#)
- [Assessment Procedure](#)
- [Complaints Resolution Procedure for Students and Members of the Public](#)

- [Special Consideration Policy](#)

Students seeking more policy resources can visit [Student Policies \(https://students.mq.edu.au/support/study/policies\)](https://students.mq.edu.au/support/study/policies). It is your one-stop-shop for the key policies you need to know about throughout your undergraduate student journey.

To find other policies relating to Teaching and Learning, visit [Policy Central \(https://policies.mq.edu.au\)](https://policies.mq.edu.au) and use the [search tool](#).

Student Code of Conduct

Macquarie University students have a responsibility to be familiar with the Student Code of Conduct: <https://students.mq.edu.au/admin/other-resources/student-conduct>

Results

Results published on platform other than [eStudent](#), (eg. iLearn, Coursera etc.) or released directly by your Unit Convenor, are not confirmed as they are subject to final approval by the University. Once approved, final results will be sent to your student email address and will be made available in [eStudent](#). For more information visit ask.mq.edu.au or if you are a Global MBA student contact globalmba.support@mq.edu.au

Academic Integrity

At Macquarie, we believe [academic integrity](#) – honesty, respect, trust, responsibility, fairness and courage – is at the core of learning, teaching and research. We recognise that meeting the expectations required to complete your assessments can be challenging. So, we offer you a range of resources and services to help you reach your potential, including free [online writing and maths support](#), [academic skills development](#) and [wellbeing consultations](#).

Student Support

Macquarie University provides a range of support services for students. For details, visit <http://students.mq.edu.au/support/>

The Writing Centre

[The Writing Centre](#) provides resources to develop your English language proficiency, academic writing, and communication skills.

- [Workshops](#)
- [Chat with a WriteWISE peer writing leader](#)
- [Access StudyWISE](#)
- [Upload an assignment to Studiosity](#)
- [Complete the Academic Integrity Module](#)

The Library provides online and face to face support to help you find and use relevant information resources.

- [Subject and Research Guides](#)

- [Ask a Librarian](#)

Student Services and Support

Macquarie University offers a range of [Student Support Services](#) including:

- [IT Support](#)
- [Accessibility and disability support](#) with study
- Mental health [support](#)
- [Safety support](#) to respond to bullying, harassment, sexual harassment and sexual assault
- [Social support including information about finances, tenancy and legal issues](#)
- [Student Advocacy](#) provides independent advice on MQ policies, procedures, and processes

Student Enquiries

Got a question? Ask us via [AskMQ](#), or contact [Service Connect](#).

IT Help

For help with University computer systems and technology, visit http://www.mq.edu.au/about_us/offices_and_units/information_technology/help/.

When using the University's IT, you must adhere to the [Acceptable Use of IT Resources Policy](#). The policy applies to all who connect to the MQ network including students.