COMP3210

Big Data

Session 1, In person-scheduled-weekday, North Ryde 2022

School of Computing

Contents

Disclaimer

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General Information

Unit convenor and teaching staff
Unit Convenor/Lecturer
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Lecturer
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Credit points
10

Prerequisites
130cp at 1000 level or above including COMP2200 or COMP257

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. Special 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

Important Academic Dates

Information about important academic dates including deadlines for withdrawing from units are available at https://students.mq.edu.au/important-dates

General Assessment Information

All assignments will be submitted using iLearn. The results of all assignments will be available via iLearn.

Late Submission

Late submissions **will be accepted but will incur a penalty** unless there is an approved Special Consideration request. A 12-hour grace period will be given after which the following deductions will be applied to the awarded assessment mark: 12 to 24 hours late = 10% deduction; for each day thereafter, an additional 10% per day or part thereof will be applied until five days beyond the due date. After this time, a mark of zero (0) will be given. For example, an assessment worth 20% is due 5 pm on 1 January. Student A submits the assessment at 1 pm, 3 January. The assessment received a mark of 15/20. A 20% deduction is then applied to the mark of 15, resulting in the loss of three (3) marks. Student A is then awarded a final mark of 12/20.

Assessment Tasks

Name	Weighting	Hurdle	Due
Assignment 1	20%	No	Week 7
Assignment 2	20%	No	Week 13
Final Exam	60%	No	TBA

Assignment 1

Assessment Type [1]: Programming Task
Indicative Time on Task [2]: 30 hours
Due: **Week 7**
Weighting: **20%**

In this assignment you will implement MapReduce techniques for the processing of Big Data. You will build your assignment on top of Hadoop.

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.

Assignment 2

Assessment Type [1]: Programming Task
Indicative Time on Task [2]: 30 hours
Due: **Week 13**
Weighting: **20%**

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

On successful completion you will be able to:

- Explain the key Big Data concepts and techniques.

- Apply techniques for handling high-dimensional big data.

Final Exam

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.

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[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

For details of days, times and rooms consult the timetables webpage.

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.mmds.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 COMP3210:

- Java 8
  - Download: https://www.oracle.com/technetwork/java/javase/downloads/jre10-downloads-4417026.html
  - 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 3.7 (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

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 login 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.

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). 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). 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) 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 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.

Changes since First Published

Date	Description
07/02/2022	Based on Gaurav's suggestion to resubmit it.