INFS7901
Database Principles

Introduction

Hassan Khosravi & Ash Rahimi

A Little About Me

- **Name:** Ash Rahimi

- **Email:** **a.rahimi@uq.edu.au**

- **Teaching:** I have taught Machine Learning at The University of Melbourne to a class of about 250 students, and now I'm here with you at UQ to teach you Database Principles. Anyone mistakenly here for their Physics or Chemistry subject?

- **Research:** Natural Language Processing with applications in Social Media Analysis and Health.

Team

Dr Ash Rahimi

Email a.rahimi@uq.edu.au
Office Location 78-633
Office Hours Zoom Consultation Tuesdays 16-17 https://uqz.zoom.us/j/89209429983
Personal Link https://afshinrahimi.github.io
Notes

I'm the coordinator and lecturer for INFS7901, Database Principles. I'm passionate about research in the Natural Language Processing (NLP) field.

Looking forward to meeting you all.

Ms Tejeshvini Ashre

Email t.ashre@uq.net.au
Personal Link http://https://www.linkedin.com/in/tejeshvini-ashre/
Notes
Hey, I'm a second year Masters student pursuing Master of Data Science. My interests include DBMS, Data Warehousing, Data Mining and Data Visualization.

I will be your tutor for this semester. Feel free to contact me, in case you need help with the course.

Rischan Mafrur

Email r.mafrur@uq.edu.au
Office Location GP South 78-624
Office Hours By appointment
Personal Link https://pydatascience.org/contact/
Notes
I'm a PhD student @UQ. I am a member of the Data Science group, my research interests include Data Exploration, Mining and Visualization.

If you require any further information, feel free to contact me.

Talia Garrett-Benson

Email t.garrettbenson@uq.edu.au
Notes
I've just graduated from a Bachelor of Music (Hons)/Bachelor of Science majoring in computer science. I'm passionate about databases and opera singing.

A Little About You

- Introduce yourself to your neighbours
  - Shy? No worries we have examples for you.
    - Introduce yourself.
    - What major you're doing?
    - Which semester?
    - Which practical are you going? Today or tomorrow?
    - You didn't know? Practicals start from tomorrow.
    - Oh this lecturer is so boring, isn't he?
    - Would you like to join our team for the project?

Course Related Information

An Overview of Relational Database Management Systems (DBMSs)

Primary Goal of this Course

1. Reason with the logical foundation of the relational data model and understand the fundamental principles of correct relational database design.

2. Express natural language queries using relational algebra and SQL.

3. Analyse the fundamental techniques and algorithms applied for sorting, tree manipulation, and hashing on structured data.

4. Reason with the logical foundation on how data is indexed and how a query is executed and optimised.

5. Design relational databases with considerations of data integrity and system performance.

Course Introduction

Relational Databases

Data Access Methods

Indexing and Query Processing

Course Introduction

Relational Databases (Most of INFS1200)	
Duration	6 weeks
Main Topics	Relational Database Design, Relational Model, Functional Dependencies and Normal Forms, SQL

Data Access Methods (An intro to many of the topics covered in COMP3506)	
Duration	4 weeks
Main Topics	Asymptotic Analysis, Searching and Sorting, Abstract Data Types (Dictionary), Binary Search Trees, Hashing

Indexing and Query Processing (Some of the topics covered in INFS2200)	
Duration	2 weeks
Main Topics	Tree- and Hash-Based Indexes, Relational Algebra, Query Optimization,

Tentative Course Schedule

Dates	Face-to-Face Learning Activities			Additional Learning Resources	Assessment Project and exams	RiPPLE
	Lecture	Tutorial	Practical			
Week 1 24 Feb	Intro + ER Diagrams	Setup and installment required Software (guide 1 & 2)		ER diagrams worksheet Elmasri: Chapters 3 and 4		Round 1 (10 March)
Week 2 3 March	Relational Model and Mapping	Developing web apllications (guide 3 & 4)		Relational Model and Mapping worksheets Elmasri: Chapters 5 and 9		
Week 3 10 March	FD and Normalization	SQL with PHPMyAdmin and MySQL (guide 5 and self-learning)		FD and Normalization worksheets Elmasri: Chapter 14 and 15		
Week 4 17 March	Basic SQL	Practical work + Work on project		Basic SQL worksheet Elmasri: Chapter 6 and 7	Project Proposal (17 March)	Round 2 (31 March)
Week 5 24 Mar	Advance SQL			Advanced SQL worksheet Elmasri: Chapter 6 and 7		
Week 6 31 March	Midterm Quiz	Work on Project			Quiz	
7 April (5 -11 April)	Mid-semester Break					
Week 7 14 Apr	Asymptotic Analysis	Notebook on Asymptotic Analysis	Work on Project	interactivepython: Chapter 2	Formal Specification (14 April)	Round 3 (28 Apr)
Week 8 21 Apr	Sorting	Notebook on Sorting	Work on Project	interactivepython: Chapter 5		
Week 9 28 Apr	Binary Trees	Notebook on Trees	Work on Project	interactivepython: Section 6		
Week 10 5 May	Hashing	Notebook on Hashing	Work on Project	interactivepython: Section 5.5		Round 4 (26 May)
Week 11 12 May	Indexing	Work on Project		Elmasri: Chapter 18		
Week 12 19 May	Relational Algebra & Query Optimization	Work on Project		Elmasri: Chapter 19		
Week 13 26 May	Review and Final notes	Project Presentation			Completed Project (26 May)	
Exam Period					Final exam	

Available on the Learning Resources page on Blackboard

Primary Goal of this Course

- You'll learn the most by *doing*. To help, we'll provide:
  - **Active Lectures**: many in-class activities

  - **Practicals**: hands on experience in implementing small scale information systems

  - **Project:** work individually towards the design and implementation of an information system.

  - **Additional practice questions and solutions:** To give you more practice for exams.

  - **Adaptive Learning**: a big repository of questions built in partnership with you.

For requests related to signing up to Tutorials and Practicals email
signon@eait.uq.edu.au

Active Learning

- We will regularly be using active learning activities in this course.
  - Pre-lecture notes: usually posted a week before each module starts
  - Post-lecture notes: posted shortly after each lecture.

- In-class activities to get you to thinking about the course content.

Project

- You are required to select an application that would benefit from a database and build a database application from start to finish.

- You will be working in teams of **four** members. Please fill **this form** to help me assign you to diverse groups.

- The project has three deliverables.

- Please review the project description, which is posted on Blackboard under Assessment

phpMyAdmin

- phpMyAdmin is a free software tool intended to handle the administration of [MySQL](#) over the Web.

- It will be used for running SQL queries as well as your project.

Hands on labs in IPython Notebook

- [IPython](#) provides a rich architecture for interactive computing with:
  - A powerful interactive shell.
  - A kernel for Jupyter, which is a web application that allows you to create and share documents that contain live code, equations, visualizations and explanatory text.
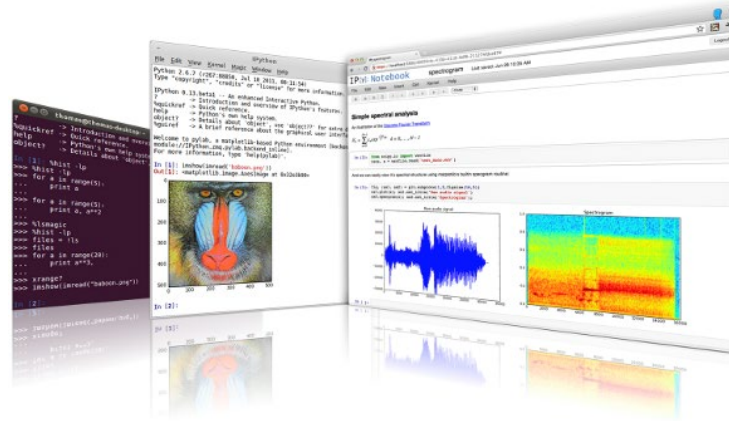
The RiPPLE Platform

- [RiPPLE](#) recommends personalised learning resources to you based on your knowledge from a repository of learning resources that are generated by instructors and the students themselves

Piazza – Discussion Board

- Piazza is a Q&A web service. It can be described as "mixture between a wiki and a forum.

- It will be used by the Teaching team to communicate with you

- You can use it to ask questions, and to respond to other students' questions.
  - Please actively participate and answer questions yourselves.
  - Please don't email or send private posts to instructors about course content so that others benefit from discussions.

- Register via the BlackBoard webpage (now)

[INFS1200/7900] Introduction to Information Systems (St Lucia). Semester 2, 2018 (INFS1200S_6860_60602)

Announcements

Course Profile (ECP)

Course Staff

Course Help

Learning Resources

Assessment

My Grades

Library Links

RiPPLE

Piazza Sign up

Piazza Discussion
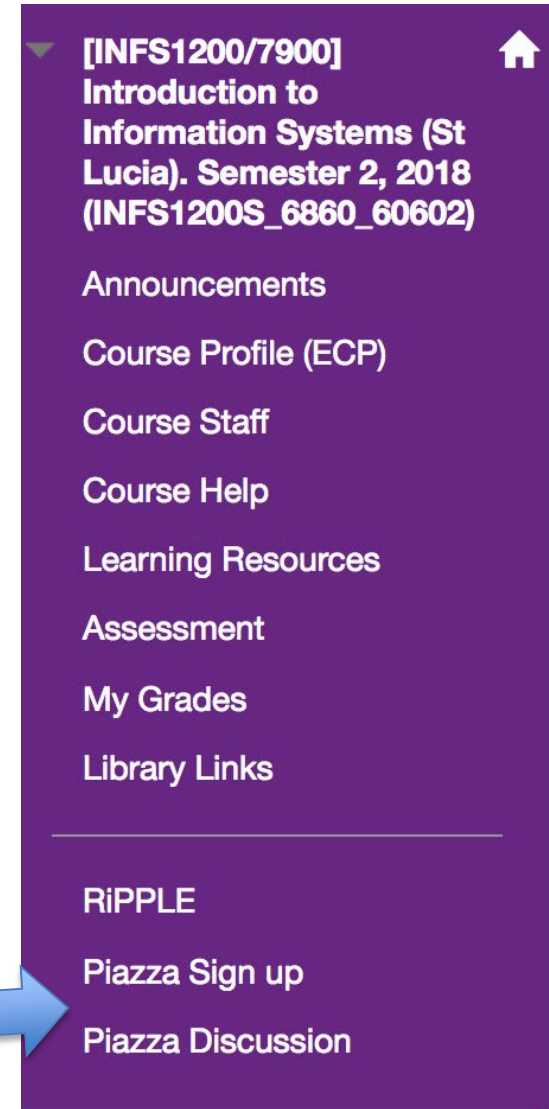
Planned Assessments

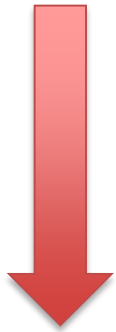| Assessment Task	Due Date	Weighting
In-class quiz	31 March	20%
RiPPLE	Various due dates	10%
Project	Various due dates	35%
Final exam	Examination period	35%

Get Organised

- Read the course profile

- Make sure that you can access the blackboard site for the course

- Sign up for a Tutorial and Practical session

- Sign up for Piazza

- Review the project description
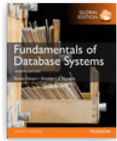
- Start using RiPPLE to practice.

Additional Learning Resources

Fundamentals of Database Systems

Available in digital at UQ Library

Online Resource: Problem Solving with Algorithms and Data Structures using Python
http://interactivepython.org/runestone/static/pythonds/index.html

Anonymous Feedback

- You can use <u>this form</u> to provide anonymous feedback to me.
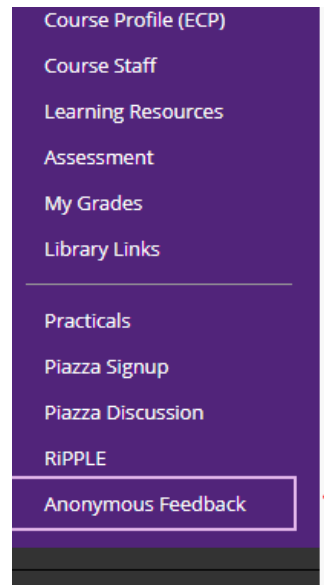
  – My main intention is to provide you with the opportunity to express what you like or dislike about the course anonymously.

  – Feedback of all kinds are welcome!

  – If appropriate, I might post your comment or a paraphrase of it on the discussion boards and respond to it (it will be anonymous).

Course Profile (ECP)
Course Staff
Learning Resources
Assessment
My Grades
Library Links

Practicals
Piazza Signup
Piazza Discussion
RiPPLE
Anonymous Feedback

Course Related Information

An Overview of Relational Database Management Systems (DBMSs)

Learning Outcomes

Description	Tag
Define the term database.	
Explain the purpose of having a database.	DBMS
Explain the high-level objectives of having a DBMS.	

Data is the
new fuel for the
global economy

WHERE is this data

WHAT can you do with it

WHY is data so important

WHO owns this data

HOW can you use it

Data Management

- Data Management is an essential skill for future workforce. It can be used to capture, store, retrieve, analyze, present and interpret (large amount of) data!

- **Ride sharing** is an example of an *application area* where data plays a central role.

> Think of another example and discuss with the person next to you how data plays a central role in your example application.
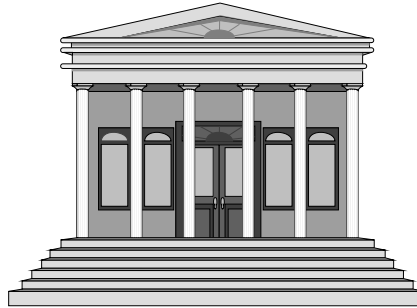
Possible Responses

Impact

Commerce	Government	Science and Engineering
Cash management	Law Enforcement	Health and Medicine
Pricing	Election Commission	Space Exploration
Employee records	Taxation	Geography (GIS)
Purchasing	Legal Systems	Architecture
Reordering	Transport & Utilities	Military and Defense
Trend analysis	City Councils	Telecommunications
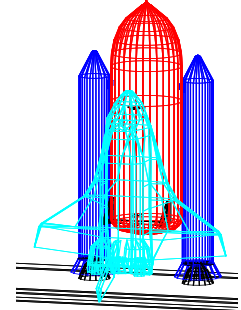
A Motivating Example

- Suppose you are building a system to store the information pertaining to a university from scratch. You have access to an operating system of your choice, but that's it. What are some the things you need to consider for building this system?

Discuss with the person next to you.

Potential Responses

What is a database?

- A <u>database</u> is an organized collection of related data, usually stored on disk. It is typically:
  - Important data
  - Shared
  - Secured
  - Well-designed (minimal redundancy)
  - Variable size

- A DB typically models some real-world <u>enterprise</u>
  - Entities (e.g., students, courses)
  - Relationships (e.g., Ting got 95% in CPSC 221)

What is a DBMS?

- A Database Management System (DBMS) is a software system designed to store and manage databases. It is used to:
  - Maintain integrity (Module 1.3)
  - Control redundancy (Module 1.4)
  - Create, modify, and query a database (Module 1.5)

  - Provide support for decision making
  - Control access   **Covered in future INFS courses**
  - Permit concurrent access
  - Provide loading, backup, and recovery

Questions

Which of the following is not a function of the DBMS

A. Enforce integrity constraints

B. Design the database to be used

C. Backup and Recovery of Database

D. Provide secure access to the database

Questions

Which of the following is not a function of the DBMS

A. Enforce integrity constraints

B. Design the database to be used

C. Backup and Recovery of Database

D. Provide secure access to the database

Learning Outcomes Revisited

Description	Tag
Define the term database.	
Explain the purpose of having a database.	DBMS
Explain the high-level objectives of having a DBMS.	