MONASH University
Information Technology

FIT3020
Information visualisation

Unit Guide

Semester 2, 2012

The information contained in this unit guide is correct at time of publication. The University has the right to change any of the elements contained in this document at any time.

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With the increasing amount of data available, it is important to be able to represent large collections from a wide range of domains in forms that more readily convey embedded information. The human sense of vision is a powerful tool for pattern recognition - this sense can be harnessed via multimedia interactive presentations. This unit will examine the fundamental principles of information visualisation and the range of tools and methods which are available to represent large data sets. These techniques can be applied across a wide range of fields including geographical, medical, statistical and scientific visualisation. The unit will examine in detail the visualisation of geospatial data in GIS (Geographic Information Systems).

Mode of Delivery

Berwick (Day)

Contact Hours

2 hrs lectures/wk, 2 hrs laboratories/wk

Workload

You are expected to spend 12 hours per week on various activities including reading, communication with other students and unit lecturers, and preparation for learning tasks and formal assessments.

Unit Relationships

Prerequisites

Completion of 12 points at level 2 from FIT

Chief Examiner

Dr Matthew Butler

Campus Lecturer

Berwick

Matthew Kairys

Consultation hours: See the unit website for consultation details

Tutors

Berwick

Matthew Kairys

Consultation hours: See the unit website for consultation details

Academic Overview

Outcomes

At the completion of this unit students will have -
A theoretical and conceptual understanding of:

- the basic concepts of human visual perception and its impact on cognition;
- the functions of visualisation with respect to amplifying cognition;
- the properties of data and the rules for mapping data to images;
- the role of factors such as pattern, space, color, interactivity and animation in visualisation;
- the range of applications to which visualisation approaches can be applied, particularly with respect to geospatial data.

Developed attitudes that enable them to:

- critically select from the range of available visualisation techniques and apply the one that is best for the domain at hand.

Developed the skills to:

- evaluate a given data set and infer valid conclusions based on a supplied visualisation;
- design and construct an appropriate type of visualisation for a given data set;
- manipulate visual variables such as color and size to optimise a visualisation;
- identify the principle components of a map and describe map projections commonly used;
- import, display and manipulate data within a Geographic Information System (GIS).

Demonstrated the teamwork skills necessary to:

- work as a member of a project team.

Graduate Attributes

Monash prepares its graduates to be:

1. responsible and effective global citizens who:

a. engage in an internationalised world
b. exhibit cross-cultural competence
c. demonstrate ethical values

critical and creative scholars who:

a. produce innovative solutions to problems
b. apply research skills to a range of challenges
c. communicate perceptively and effectively

Assessment Summary

Examination (2 hours): 40%; In-semester assessment: 60%

Assessment Task	Value	Due Date
Assignment 1 - Information Visualisation Domains and Applications	20% (presentation 5% and report 15%)	Presentation and report due Week 5 Tutorial
Assignment 2 - Information Visualisation Prototype Application	30% (proposal 5%, application submission 20% and presentation 5%)	Proposal due Week 7 Tutorial, application submission and presentation due Week 11 Tutorial
Weekly Contribution to Discussion	10% (overall for the whole semester)	Ongoing. Comments are expected to be made weekly.
Examination 1	40%	To be advised

Teaching Approach

Lecture and tutorials or problem classes

This teaching and learning approach provides facilitated learning, practical exploration and peer learning. Both lectures and tutorial classes will rely heavily on student participation in the discussion of information visualisation principles and case studies.

Feedback

Our feedback to You

Types of feedback you can expect to receive in this unit are:

- Informal feedback on progress in labs/tutes
- Graded assignments with comments
- Solutions to tutes, labs and assignments

Your feedback to Us

Monash is committed to excellence in education and regularly seeks feedback from students, employers and staff. One of the key formal ways students have to provide feedback is through SETU, Student Evaluation of Teacher and Unit. The University's student evaluation policy requires that every unit is evaluated each year. Students are strongly encouraged to complete the surveys. The feedback is anonymous and provides the Faculty with evidence of aspects that students are satisfied and areas for improvement.

For more information on Monash's educational strategy, and on student evaluations, see:
http://www.monash.edu.au/about/monash-directions/directions.html
http://www.policy.monash.edu/policy-bank/academic/education/quality/student-evaluation-policy.html

Previous Student Evaluations of this unit

Previous feedback highlighted that the nature of the overall content as well as assignments was a strength of the unit. Students in the previous offering suggested tightening the the lab/tutorial classes to be more focused and explicit, rather than broader and exploratory in nature. As a consequence lab/tutorial exercises have been modified to provide more opportunity for explicit and tangible visualisation example outcomes.

If you wish to view how previous students rated this unit, please go to
https://emuapps.monash.edu.au/unitevaluations/index.jsp

Recommended Resources

While the unit does not focus on particular technologies, several technologies will be discussed and used for the creation of visualisations. Two key software resources are Google Sketchup (http://sketchup.google.com/intl/en/) and Google Earth (http://www.google.com/earth/index.html).

Unit Schedule

Week	Activities	Assessment
0		No formal assessment or activities are undertaken in week 0
1	Information Visualisation Introduction: A History of Information Visualisation, and an Information Visualisation Primer	
2	Tufte's Design Principles, Visual Design Principles	
3	Types of Data: Quantitative, Qualitative, and Links Between Data Sets	
4	Information Visualisation Techniques 1: Data Ink, Chart Junk and Aesthetics	
5	Information Visualisation Techniques 2: Colour, Layering and Separation	Assignment 1 - Info Vis Analysis Report and Presentation due Week 5 Tutorial
6	Information Visualisation Techniques 3: Micro/Macro readings, and Small Multiples	
7	Information Visualisation Techniques 4: Narratives, and Misleading with Data	Assignment 2 - Initial Proposal due Week 7 Tutorial
8	Domains and Case Studies 1: Physical Sciences	
9	Domains and Case Studies 2: Social Sciences	
10	Domains and Case Studies 3: Maps and GIS	
11	In Class Presentations of Visualisation Projects	Assignment 2 - Info Vis Application and Presentation due Week 11 Tutorial
12	Exam Revision	
	SWOT VAC	No formal assessment is undertaken SWOT VAC
	Examination period	LINK to Assessment Policy: http://policy.monash.edu.au/policy-bank/academic/education/assessment/assessment-in-coursework-policy.html

*Unit Schedule details will be maintained and communicated to you via your MUSO (Blackboard or Moodle) learning system.

Assessment Requirements

Assessment Policy

Faculty Policy - Unit Assessment Hurdles
(http://www.infotech.monash.edu.au/resources/staff/edgov/policies/assessment-examinations/unit-assessment-hu

Academic Integrity - Please see the Demystifying Citing and Referencing tutorial at
http://lib.monash.edu/tutorials/citing/

Assessment Tasks

Participation

- **Assessment task 1**

    Title:
    Assignment 1 - Information Visualisation Domains and Applications
    Description:
    In this assignment you are to write a research report of 2000 words, accompanied with
    referenced images, on an information visualisation application domain area of your
    choice. Examples will be provided in the formal assignment brief.

    Your report should provide insight into the information needs of the domain, and the data
    available. The report should then address the way in which the visualisation translates the
    information into a comprehensible form and how it achieves this end using either novel or
    more established visualisation techniques.

    This report will form the basis for a short 5-10 minute presentation to the class in week 5
    that illustrates your key findings.

    A full brief, including examples, will be provided on the unit website, as will detailed
    assessment criteria.
    Weighting:
    20% (presentation 5% and report 15%)
    Criteria for assessment:
    Students will be assessed on a number of criteria:

    - Quality of research
    - Analysis and synthesis of material
    - Consistency in format and presentation
    - Writing style
    - Bibliography and referencing

    Further detail on the assessment criteria is available on the assignment specification.
    Due date:
    Presentation and report due Week 5 Tutorial

- **Assessment task 2**

Title:
Assignment 2 - Information Visualisation Prototype Application
Description:
In this assignment, you are to build an information visualisation prototype application that allows basic visual manipulation of a data set.

A series of key objectives will be presented in the assignment brief, however the core data set and domain that is the focus of the developed information visualisation is negotiated between lecturer and student. The visualisation will be expected to meet key criteria such as interactivity, insight into data difficult to obtain without the use of info vis techniques, domain specific purpose, and innovation.

Students will be required to present their working prototype to the class in week 11 in a short presentation of 5-10 minutes.

A full brief, including examples, will be provided on the unit website, as will detailed assessment criteria.
Weighting:
30% (proposal 5%, application submission 20% and presentation 5%)
Criteria for assessment:
Students will be assessed on a number of criteria:

- The prototype application being well suited to the chosen domain
- Clear purpose for the visualisation
- Good application of design principles discussed throughout the semester
- Good and accurate use of domain data
- Demonstration of sound HCI principles in the interaction design
- Innovative approach to the visualisation

Due date:
Proposal due Week 7 Tutorial, application submission and presentation due Week 11 Tutorial

- **Assessment task 3**

Title:
Weekly Contribution to Discussion
Description:
All students will be expected to contribute to online discussion of information visualisation examples. Each week an example information visualisation will be presented along with a number of key discussion questions. Students will be expected to provide small insights each week to demonstrate their understanding of the relevant information visualisation techniques. Comments will be considered on criteria such as quality of insight, relating back to discussed info vis theories, and critiques of success.

A full description will be provided on the unit website, as will detailed assessment criteria.
Weighting:
10% (overall for the whole semester)
Criteria for assessment:
Students will be assessed on a number of criteria:

- Application of Information Visualisation principles
- Quality of the critical analysis conducted

◆Responding to other students comments in a constructive manner
◆Frequency of contributions

Full details will be posted on the unit website.

Due date:
Ongoing. Comments are expected to be made weekly.

Examinations

- **Examination 1**

Weighting:
40%
Length:
2 hours
Type (open/closed book):
Closed book
Electronic devices allowed in the exam:
None

Assignment submission

It is a University requirement
(http://www.policy.monash.edu/policy-bank/academic/education/conduct/plagiarism-procedures.html) for
students to submit an assignment coversheet for each assessment item. Faculty Assignment
coversheets can be found at http://www.infotech.monash.edu.au/resources/student/forms/. Please check
with your Lecturer on the submission method for your assignment coversheet (e.g. attach a file to the
online assignment submission, hand-in a hard copy, or use an online quiz).

Online submission

If Electronic Submission has been approved for your unit, please submit your work via the VLE site for
this unit, which you can access via links in the my.monash portal.

Extensions and penalties

Submission must be made by the due date otherwise penalties will be enforced.

You must negotiate any extensions formally with your campus unit leader via the in-semester special
consideration process:
http://www.infotech.monash.edu.au/resources/student/equity/special-consideration.html.

Returning assignments

Students can expect assignments to be returned within two weeks of the submission date or after
receipt, whichever is later.

Other Information

Policies

Monash has educational policies, procedures and guidelines, which are designed to ensure that staff and students are aware of the University's academic standards, and to provide advice on how they might uphold them. You can find Monash's Education Policies at:
http://policy.monash.edu.au/policy-bank/academic/education/index.html

Key educational policies include:

- Plagiarism
  (http://www.policy.monash.edu/policy-bank/academic/education/conduct/plagiarism-policy.html)
- Assessment
  (http://www.policy.monash.edu/policy-bank/academic/education/assessment/assessment-in-coursework-po
- Special Consideration
  (http://www.policy.monash.edu/policy-bank/academic/education/assessment/special-consideration-policy.h
- Grading Scale
  (http://www.policy.monash.edu/policy-bank/academic/education/assessment/grading-scale-policy.html)
- Discipline: Student Policy
  (http://www.policy.monash.edu/policy-bank/academic/education/conduct/student-discipline-policy.html)
- Academic Calendar and Semesters (http://www.monash.edu.au/students/key-dates/);
- Orientation and Transition (http://www.infotech.monash.edu.au/resources/student/orientation/);
  and
- Academic and Administrative Complaints and Grievances Policy
  (http://www.policy.monash.edu/policy-bank/academic/education/management/complaints-grievance-policy.
- Codes of Practice for Teaching and Learning
  (http://www.policy.monash.edu.au/policy-bank/academic/education/conduct/suppdocs/code-of-practice-tea

Student services

The University provides many different kinds of support services for you. Contact your tutor if you need advice and see the range of services available at www.monash.edu.au/students. For Sunway see http://www.monash.edu.my/Student-services, and for South Africa see http://www.monash.ac.za/current/

The Monash University Library provides a range of services and resources that enable you to save time and be more effective in your learning and research. Go to http://www.lib.monash.edu.au or the library tab in my.monash portal for more information. At Sunway, visit the Library and Learning Commons at http://www.lib.monash.edu.my/. At South Africa visit http://www.lib.monash.ac.za/.

Academic support services may be available for students who have a disability or medical condition. Registration with the Disability Liaison Unit is required. Further information is available as follows:

- Website: http://monash.edu/equity-diversity/disability/index.html;
- Email: dlu@monash.edu
- Drop In: Equity and Diversity Centre, Level 1 Gallery Building (Building 55), Monash University, Clayton Campus, or Student Community Services Department, Level 2, Building 2, Monash University, Sunway Campus
- Telephone: 03 9905 5704, or contact the Student Advisor, Student Commuity Services at 03 55146018 at Sunway

Reading list

There are no mandatory text books for this unit, however the following texts provide a valuable resource to your study:

Key recommended texts:

Tufte, E. R. (1990). Envisioning information, Cheshire, Connecticut, Graphics Press

Supplementary recommended texts:

Chen, C. (2004). Information visualization: Beyond the horizon (2 ed.). London: Springer-Verlag. ***Electronic Resource**

Dykes, J., Dykes, MacEachren, A.M. and Kraak M. J. (2005), Exploring Geovisualization, Elsevier ***Electronic Resource**

Suda, B. (2010), A Practical Guide to Designing with Data, Five Simple Steps

Tufte, E. R. (1997) Visual explanations : images and quantities, evidence and narrative, Cheshire, Connecticut, Graphics Press

Tufte, E. R. (2001). The Visual Display of Quantitative Information, Cheshire, Connecticut, Graphics Press

Tufte, E. R. (2006) Beautiful Evidence, Cheshire, Connecticut, Graphics Press

Ware, C. (2004). Information visualization: Perception for design (2 ed.). San Francisco: Morgan Kaufmann ***Electronic Resource**