



MONASH University

FIT4019
Neural and evolutionary computing

Unit guide

Semester 2, 2008

Last updated : 27 Jun 2008

Table of Contents

<u>FIT4019 Neural and evolutionary computing - Semester 2 , 2008</u>	1
<u>Unit leader</u> :.....	1
<u>Lecturer(s)</u> :.....	1
<u>Gippsland</u>	1
<u>Introduction</u>	2
<u>Unit synopsis</u>	2
<u>Learning outcomes</u>	2
<u>Workload</u>	2
<u>Unit relationships</u>	2
<u>Prerequisites</u>	2
<u>Relationships</u>	2
<u>Continuous improvement</u>	3
<u>Student Evaluations</u>	3
<u>Improvements to this unit</u>	3
<u>Unit staff - contact details</u>	4
<u>Unit leader</u>	4
<u>Lecturer(s)</u> :.....	4
<u>Teaching and learning method</u>	5
<u>Communication, participation and feedback</u>	5
<u>Unit Schedule</u>	5
<u>Unit Resources</u>	7
<u>Prescribed text(s) and readings</u>	7
<u>Recommended text(s) and readings</u>	7
<u>Required software and/or hardware</u>	7
<u>Equipment and consumables required or provided</u>	7
<u>Study resources</u>	7
<u>Library access</u>	8
<u>Monash University Studies Online (MUSO)</u>	8
<u>Assessment</u>	9
<u>Unit assessment policy</u>	9
<u>Assignment tasks</u>	9
<u>Examinations</u>	10
<u>Assignment submission</u>	10
<u>University and Faculty policy on assessment</u>	11
<u>Due dates and extensions</u>	11
<u>Late assignment</u>	11
<u>Return dates</u>	11
<u>Plagiarism, cheating and collusion</u>	11
<u>Register of counselling about plagiarism</u>	12
<u>Non-discriminatory language</u>	12
<u>Students with disabilities</u>	12
<u>Deferred assessment and special consideration</u>	12

FIT4019 Neural and evolutionary computing - Semester 2 , 2008

Unit leader :

Gour Karmakar

Lecturer(s) :

Gippsland

- Gour Karmakar

Introduction

Welcome to FIT4019 Neural and evolutionary computing. The content of this unit has been designed in order to give emphasis on real-world business and economic applications and to provide the sound theoretical and practical knowledge of recent neural network and evolutionary computing techniques.

Unit synopsis

ASCED : 020119

Introduction to neural networks and their applications. Simple neural networks for pattern classification. Multilayered neural networks (backpropagation and its variations for faster training and adaptive architectures). Unsupervised neural networks (Kohonen Self Organising Maps). Case studies. Introduction to evolutionary computation and its possible applications. Genetic algorithms. Modeling and simulation with genetic algorithm in economic systems. Genetic programming and design issues of evolutionary algorithms. Hands-on experience to solve real-world business and economic problems using available software tools.

Learning outcomes

Upon successfully completion of this unit, students will:

- understand the underlying theories of neural networks and evolutionary computation and their typical applications.
- be familiar with the basic tools and terminology in the fields.
- have the skills required to identify the type of problems and subsequently select the most suitable technique.
- be able to analyse, solve, model, and simulate real-world business and economic problems using the acquired knowledge.
- have practical experience using the required tools to solve business and economic problems.

Workload

Students are expected to spend an average of *12 hours* per week on this unit.

Since off-campus students generally do not attend lecture and tutorial sessions, you should plan to spend equivalent time working through the relevant resources and participating in discussion groups each week.

Unit relationships

Prerequisites

This unit is assumed that students should have preliminary knowledge of mathematics and computer programming.

Relationships

This unit is assumed that students should have preliminary knowledge of mathematics and computer programming.

You may not study this unit and BUS5650, Translation set GCO4015 in your degree.

Continuous improvement

Monash is committed to 'Excellence in education' and strives for the highest possible quality in teaching and learning. To monitor how successful we are in providing quality teaching and learning Monash regularly seeks feedback from students, employers and staff. Two of the formal ways that you are invited to provide feedback are through Unit Evaluations and through Monquest Teaching Evaluations.

One of the key formal ways students have to provide feedback is through Unit Evaluation Surveys. It is Monash policy for every unit offered to be evaluated each year. Students are strongly encouraged to complete the surveys as they are an important avenue for students to "have their say". The feedback is anonymous and provides the Faculty with evidence of aspects that students are satisfied and areas for improvement.

Student Evaluations

The Faculty of IT administers the Unit Evaluation surveys online through the my.monash portal, although for some smaller classes there may be alternative evaluations conducted in class.

If you wish to view how previous students rated this unit, please go to <http://www.monash.edu.au/unit-evaluation-reports/>

Over the past few years the Faculty of Information Technology has made a number of improvements to its courses as a result of unit evaluation feedback. Some of these include systematic analysis and planning of unit improvements, and consistent assignment return guidelines.

Monquest Teaching Evaluation surveys may be used by some of your academic staff this semester. They are administered by the Centre for Higher Education Quality (CHEQ) and may be completed in class with a facilitator or on-line through the my.monash portal. The data provided to lecturers is completely anonymous. Monquest surveys provide academic staff with evidence of the effectiveness of their teaching and identify areas for improvement. Individual Monquest reports are confidential, however, you can see the summary results of Monquest evaluations for 2006 at <http://www.adm.monash.edu.au/cheq/evaluations/monquest/profiles/index.html>

Improvements to this unit

Solutions for all tutorial problems will be provided

Unit staff - contact details

Unit leader

Dr Gour Karmakar

Lecturer

Phone +61 3 990 26252

Lecturer(s) :

Dr Gour Karmakar

Lecturer

Phone +61 3 990 26252

Teaching and learning method

The following study materials will be provided:

- On-line study materials for each week.
- On-line tutorial problems that cover both theoretical and practical aspects in order to reflect the unit objectives and assess the students' knowledge.
- The printed unit guide outlining the subject objectives, requirements, and assessments.

The practical problems for both tutorial and assignments will be selected from real world business and economic applications. Software tools will be needed to solve those problems.

Newsgroups, emails, telephone and fax will be used for the interaction between the students and the lecturer. WebFace assignment systems will be used for assignment submission.

Communication, participation and feedback

Monash aims to provide a learning environment in which students receive a range of ongoing feedback throughout their studies. You will receive feedback on your work and progress in this unit. This may take the form of group feedback, individual feedback, peer feedback, self-comparison, verbal and written feedback, discussions (on line and in class) as well as more formal feedback related to assignment marks and grades. You are encouraged to draw on a variety of feedback to enhance your learning.

It is essential that you take action immediately if you realise that you have a problem that is affecting your study. Semesters are short, so we can help you best if you let us know as soon as problems arise. Regardless of whether the problem is related directly to your progress in the unit, if it is likely to interfere with your progress you should discuss it with your lecturer or a Community Service counsellor as soon as possible.

Unit Schedule

Week	Topic	Study guide	Key dates
1	Introduction to artificial neural networks (ANN) and their applications	Study Guide 1	
2	Mac-Culloch-Pitts Neuron and Simple ANN architecture (Hebb Net) for pattern classification	Study Guide 2	
3	Simple ANN for pattern classification: Perceptron and ADALINE	Study Guide 3	
4	Multilayered ANN: Backpropagation neural net.	Study Guide 4	
5	Case studies	Study Guide 5	
6	Variations of backpropagation learning: Faster training and adaptive architectures	Study Guide 6	
7	Unsupervised ANN learning	Study Guide 7	27 August 2008
8	Case study using Kohonen Self Organizing Maps	Study Guide 8	
9	Introduction to evolutionary computation and its possible applications	Study Guide 9	
10	Genetic Algorithms (GA)	Study Guide 10	

FIT4019 Neural and evolutionary computing - Semester 2 , 2008

11	Modelling and simulation with genetic algorithm in economic systems	Study Guide 11	
Mid semester break			
12	Genetic programming (GP) and design issues of evolutionary algorithms	Study Guide 12	8 October 2008

Unit Resources

Prescribed text(s) and readings

Prescribed Text:

Kate A.Smith, Introduction to neural networks and data mining for business applications, Eruditions Publishing, 1999, ISBN 1-86491-004-6.

You also need to read one of the recommended books for this unit is *Fundamentals of neural networks: architectures, algorithms, and applications*, Laurence Fausett, Prentice-Hall, 1994. This is available at Monash libraries. Limited number of relevant pages of this book considering the copyright rule will be uploaded in the unit home page.

Recommended text(s) and readings

Recommended Texts:

- Laurence Fausett, Fundamentals of neural networks: architectures, algorithms, and applications, Prentice-Hall, 1994.
- David Fogel, Evolutionary Computation: Toward A New Philosophy Of Machine Intelligence, 2nd ed., IEEE Press, 2000.
- T. Back, D. B. Fogel, and T. Michalewicz (Editors), Evolutionary Computation 1: Basic Algorithms and Operators, Institute of Physics Publishing, Bristol and Philadelphia, 2000.
- Herbert Dawid, Adaptive Learning by Genetic Algorithms: Analytical Results and Applications to Economic Models, 2nd Edition, Springer, 1999, ISBN 3-540-65607-3.

Required software and/or hardware

Software Tools:

- NeuNet Pro 2.2 or neural network toolbox of Matlab 6.0.
- The Nenet version 1.1 for Kohonen Self Organizing Maps.
- An optimisation tool based on genetic algorithm (GOAL).

Equipment and consumables required or provided

Students studying off-campus are required to have the minimum system configuration specified by the Faculty as a condition of accepting admission, and regular Internet access. On-campus students, and those studying at supported study locations may use the facilities available in the computing labs. Information about computer use for students is available from the ITS Student Resource Guide in the Monash University Handbook. You will need to allocate up to 12 hours per week for use of a computer, including time for newsgroups/discussion groups.

Study resources

Study resources we will provide for your study are:

- Weekly detailed lecture notes outlining the learning objectives, discussion of the content and required readings;
- Weekly Study Guide

- Weekly tutorial or laboratory tasks and exercises with sample solutions provided one to two weeks later;
- Assignment specifications and sample solutions;
- A sample examination and suggested solution
- Access to past examination papers;
- Discussion groups;
- This Unit Guide outlining the administrative information for the unit;
- The unit web site on MUSO, where resources outlined above will be made available.

Library access

The Monash University Library site contains details about borrowing rights and catalogue searching. To learn more about the library and the various resources available, please go to <http://www.lib.monash.edu.au>. Be sure to obtain a copy of the Library Guide, and if necessary, the instructions for remote access from the library website.

Monash University Studies Online (MUSO)

All unit and lecture materials are available through MUSO (Monash University Studies Online). Blackboard is the primary application used to deliver your unit resources. Some units will be piloted in Moodle. If your unit is piloted in Moodle, you will see a link from your Blackboard unit to Moodle (<http://moodle.monash.edu.au>) and can bookmark this link to access directly. In Moodle, from the Faculty of Information Technology category, click on the link for your unit.

You can access MUSO and Blackboard via the portal: <http://my.monash.edu.au>

Click on the Study and enrolment tab, then Blackboard under the MUSO learning systems.

In order for your Blackboard unit(s) to function correctly, your computer needs to be correctly configured.

For example:

- Blackboard supported browser
- Supported Java runtime environment

For more information, please visit: <http://www.monash.edu.au/muso/support/students/downloadables-student.html>

You can contact the MUSO Support by: Phone: (+61 3) 9903 1268

For further contact information including operational hours, please visit:

<http://www.monash.edu.au/muso/support/students/contact.html>

Further information can be obtained from the MUSO support site:

<http://www.monash.edu.au/muso/support/index.html>

Assessment

Unit assessment policy

Nominally, the assignments will have a weighting of 40% and the exam a weighting of 60%.

However, your final mark cannot be more than 10 marks higher than either your assignment work percentage or exam percentage, as shown in the following formula:

$$\text{Final grade} = \min (A+10, E+10, E*R+A*(1-R))$$

Where **A** = overall assignment percentage

E = examination percentage

R = exam weighting (0.6)

Assignment tasks

- **Assignment Task**

Title : Assignment 1

Description :

Assignment 1 will consist of theoretical and practical aspects of neural networks.

Weighting : 20%

Criteria for assessment :

Assignment 1 will be assessed based on the theoretical concepts especially design of neural networks and experimental results using a neural network.

Due date : 27 August 2008

- **Assignment Task**

Title : Assignment 2

Description :

Assignment 2 will consist of theoretical and practical aspects of evolutionary computing.

Weighting : 20%

Criteria for assessment :

Assignment 2 will be assessed based on the theoretical concepts of evolutionary computing and experimental results using genetic algorithm.

Due date : 8 October 2008

Examinations

- **Examination**

Weighting : 60%

Length : 2 hours

Type (open/closed book) : Closed book

Assignment submission

Assignments will be submitted by **electronic** submission to <http://wfs submit.its.monash.edu.au/>

University and Faculty policy on assessment

Due dates and extensions

The due dates for the submission of assignments are given in the previous section. Please make every effort to submit work by the due dates. It is your responsibility to structure your study program around assignment deadlines, family, work and other commitments. Factors such as normal work pressures, vacations, etc. are seldom regarded as appropriate reasons for granting extensions. Students are advised to NOT assume that granting of an extension is a matter of course.

Students requesting an extension must apply to the unit adviser *prior* to the due date. Extensions may be granted for medical or personal reasons. Students will be provided with electronic/written documentation of extensions, a copy of which should be attached to the assignment. Where possible please use email for extension requests.

Late assignment

Penalties are incurred from the due date at the rate of a **10% reduction in grade for each day the assignment is late**.

Return dates

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

Assessment for the unit as a whole is in accordance with the provisions of the Monash University Education Policy at <http://www.policy.monash.edu/policy-bank/academic/education/assessment/>

We will aim to have assignment results made available to you within two weeks after assignment receipt.

Plagiarism, cheating and collusion

Plagiarism and cheating are regarded as very serious offences. In cases where cheating has been confirmed, students have been severely penalised, from losing all marks for an assignment, to facing disciplinary action at the Faculty level. While we would wish that all our students adhere to sound ethical conduct and honesty, I will ask you to acquaint yourself with Student Rights and Responsibilities (<http://www.infotech.monash.edu.au/about/committees-groups/facboard/policies/studrights.html>) and the Faculty regulations that apply to students detected cheating as these will be applied in all detected cases.

In this University, cheating means seeking to obtain an unfair advantage in any examination or any other written or practical work to be submitted or completed by a student for assessment. It includes the use, or attempted use, of any means to gain an unfair advantage for any assessable work in the unit, where the means is contrary to the instructions for such work.

When you submit an individual assessment item, such as a program, a report, an essay, assignment or other piece of work, under your name you are understood to be stating that this is your own work. If a submission is identical with, or similar to, someone else's work, an assumption of cheating may arise. If you are planning on working with another student, it is acceptable to undertake research together, and discuss problems, but it is not acceptable to jointly develop or share solutions unless this is specified by your lecturer.

Intentionally providing students with your solutions to assignments is classified as "assisting to cheat" and students who do this may be subject to disciplinary action. You should take reasonable care that your solution is not accidentally or deliberately obtained by other students. For example, do not leave copies of your work in progress

on the hard drives of shared computers, and do not show your work to other students. If you believe this may have happened, please be sure to contact your lecturer as soon as possible.

Cheating also includes taking into an examination any material contrary to the regulations, including any bilingual dictionary, whether or not with the intention of using it to obtain an advantage.

Plagiarism involves the false representation of another person's ideas, or findings, as your own by either copying material or paraphrasing without citing sources. It is both professional and ethical to reference clearly the ideas and information that you have used from another writer. If the source is not identified, then you have plagiarised work of the other author. Plagiarism is a form of dishonesty that is insulting to the reader and grossly unfair to your student colleagues.

Register of counselling about plagiarism

The university requires faculties to keep a simple and confidential register to record counselling to students about plagiarism (e.g. warnings). The register is accessible to Associate Deans Teaching (or nominees) and, where requested, students concerned have access to their own details in the register. The register is to serve as a record of counselling about the nature of plagiarism, not as a record of allegations; and no provision of appeals in relation to the register is necessary or applicable.

Non-discriminatory language

The Faculty of Information Technology is committed to the use of non-discriminatory language in all forms of communication. Discriminatory language is that which refers in abusive terms to gender, race, age, sexual orientation, citizenship or nationality, ethnic or language background, physical or mental ability, or political or religious views, or which stereotypes groups in an adverse manner. This is not meant to preclude or inhibit legitimate academic debate on any issue; however, the language used in such debate should be non-discriminatory and sensitive to these matters. It is important to avoid the use of discriminatory language in your communications and written work. The most common form of discriminatory language in academic work tends to be in the area of gender inclusiveness. You are, therefore, requested to check for this and to ensure your work and communications are non-discriminatory in all respects.

Students with disabilities

Students with disabilities that may disadvantage them in assessment should seek advice from one of the following before completing assessment tasks and examinations:

- Faculty of Information Technology Student Service staff, and / or
- your Unit Coordinator, or
- Disabilities Liaison Unit

Deferred assessment and special consideration

Deferred assessment (not to be confused with an extension for submission of an assignment) may be granted in cases of extenuating personal circumstances such as serious personal illness or bereavement. Information and forms for Special Consideration and deferred assessment applications are available at <http://www.monash.edu.au/exams/special-consideration.html>. Contact the Faculty's Student Services staff at your campus for further information and advice.