ENG*6570 Advanced Soft Computing
Fall 2014

1 Instructor

Instructor: Simon Yang, Ph.D.
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Office hours: by appointment

2 Learning Resources

2.1 Course Website

http://www.uoguelph.ca/~syang/Engg6570

2.2 Resources

No specific textbooks will be assigned. Follow lecture notes and use the following references:


2.3 Additional Resources

Additional resources will be posted on the course web site.
3 ASSESSMENT

3.1 Dates and Distribution

Assignments: 10%
Quizzes: 10%
Project: 60%
\begin{itemize}
  \item Proposal: 10% (due: Tuesday, Oct. 7, in class)
  \item Interim Report: 10% (due: Tuesday, Oct. 28, in class)
  \item Final Presentation: 10% (Tuesday, Nov. 25, in class)
  \item Final Report: 30% (due: Tuesday, Nov. 25, in class)
\end{itemize}

Note: You can work on your project by yourself, or with a group of 2 or 3 students. You can select your project topic of your interest, or select a topic from the given list of suggested project topics. Your project topic must be in the general area of soft computing.

Final Exam: 20%

9:00-11:00, Tuesday, Dec. 2, THRN 1126.

Note: all submissions must be in hard copy.

3.2 Course Grading Policies

When You Cannot Meet a Course Requirement: When you find yourself unable to meet an in-course requirement because of illness or compassionate reasons, please advise the course instructor in writing, with your name, id#, and e-mail contact. See the graduate calendar for information on regulations and procedures for Academic Consideration: http://www.uoguelph.ca/registrar/calendars/graduate/current/genreg/sec_d0e1400.shtml

Accommodation of Religious Obligations: If you are unable to meet an in-course requirement due to religious obligations, please email the course instructor within two weeks of the start of the semester to make alternate arrangements. See the undergraduate calendar for information on regulations and procedures for Academic Accommodation of Religious Obligations:

http://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-accomrelig.shtml
4 AIMS & OBJECTIVES

4.1 Calendar Description

Neural dynamics and computation from a single neuron to a neural network architecture. Advanced neural networks and applications. Soft computing approaches to uncertainty representation, multi-agents and optimization.

4.2 Course Aims

This course presents advanced soft computing methodologies and their applications. The main goals of this course are: (1) make students aware of the intelligent systems approaches in comparison to the traditional modeling and analysis methods; and (2) enable student capable of applying these intelligent systems approaches to specific applications.

4.3 Learning Objectives

Students who successfully complete this course will be able to:

- Have a general understanding of soft computing methodologies, including biological and artificial neural networks, fuzzy sets and fuzzy logic systems, and hybrid neuro-fuzzy systems;
- Develop computational neural network models for some simple biological systems;
- Develop fuzzy models for engineering systems, particularly for control systems;
- Combine neural networks and fuzzy systems to design neuro-fuzzy control and inference systems;
- Appreciate the pros and cons of intelligent control systems and compare their performance to that of classical control systems.

4.4 Instructor’s Role and Responsibility to Students

The instructor’s role is to develop and deliver course material in ways that facilitate learning for a variety of students. Selected lecture related materials will be made available to students on the course web site. During lectures, the instructor will explain the fundamental knowledge and applications. Scheduled classes will be the principal venue to provide information and feedback for tests and project.

4.5 Students’ Learning Responsibilities

Students are expected to take advantage of the learning opportunities provided during lectures. Students, especially those having difficulty with the course content, should also make use of other resources recommended by the instructor. Students who may fall behind due to illness, work, or extra-curricular activities are advised to keep the instructor informed. This will allow the instructor to recommend extra resources in a timely manner and/or provide consideration if appropriate.
E-mail Communication: As per university regulations, all students are required to check their <uoguelph.ca> e-mail account regularly: e-mail is the official route of communication between the University and its students.

Recording of Materials: Presentations which are made in relation to course work—including lectures—cannot be recorded in any electronic media without the permission of the presenter, whether the instructor, a classmate or guest lecturer.

4.6 Relationships with other Courses

Previous Courses: “ENGG*4430 Neuro-fuzzy and Soft Computing Systems” or equivalent

5 Teaching and Learning Activities

5.1 Timetable

Lectures:
9:00-12:00 Tuesday, THRN 1126

5.2 Course Topics and Schedule

The tentative topics and schedule of this course are listed as the following:

- **Introduction**: Introduction to soft computing; introduction to biological and artificial neural network; introduction to fuzzy sets and fuzzy logic systems. (Week 1)
- **Biological neural networks**: generalization of single neuron; neural dynamics; additive and shunting neural networks; short term and long-term memory. (Week 2-4)
- **Artificial neural networks and applications**: artificial neural network models; learning in artificial neural networks; neural network applications in control systems. (Week 5-8)
- **Fuzzy systems and applications**: fuzzy sets; fuzzy reasoning; fuzzy inference systems; fuzzy control; applications of fuzzy systems. (Week 9-11)
- **Neuro-fuzzy systems**: neuro-fuzzy modeling; neuro-fuzzy control. (Week 12)

5.3 Other Important Dates

Thursday, September 4, 2014: **First day of class**
Monday, October 13, 2014 **Holiday: no classes scheduled**
Tuesday, October 14, 2014: **Fall Study Break Day – no classes scheduled**
Friday, October 31, 2014: **40th class day, last day to drop**
Friday, November 28, 2014: **Last day of class**
6 Academic Misconduct

The University of Guelph is committed to upholding the highest standards of academic integrity and it is the responsibility of all members of the University community – faculty, staff, and students – to be aware of what constitutes academic misconduct and to do as much as possible to prevent academic offences from occurring. University of Guelph students have the responsibility of abiding by the University's policy on academic misconduct regardless of their location of study; faculty, staff and students have the responsibility of supporting an environment that discourages misconduct. Students need to remain aware that instructors have access to and the right to use electronic and other means of detection. The Academic Misconduct Policy is detailed in the Graduate Calendar:

https://www.uoguelph.ca/registrar/calendars/graduate/2014-2015/genreg/sec_d0e1780.shtml

6.1 Resources

A tutorial on Academic Misconduct produced by the Learning Commons can be found at:

http://www.academicintegrity.uoguelph.ca/

The School of Engineering has adopted a Code of Ethics that can be found at:

http://www.uoguelph.ca/engineering/undergrad-counselling-ethics

The Graduate Calendar is the source of information about the University of Guelph’s procedures, policies and regulations which apply to graduate programs:

http://www.uoguelph.ca/registrar/calendars/graduate/current/

7 Accessibility

The University of Guelph is committed to creating a barrier-free environment. Providing services for students is a shared responsibility among students, faculty and administrators. This relationship is based on respect of individual rights, the dignity of the individual and the University community's shared commitment to an open and supportive learning environment. Students requiring service or accommodation, whether due to an identified, ongoing disability for a short-term disability should contact the Centre for Students with Disabilities as soon as possible

For more information, contact CSD at 519-824-4120 ext. 56208 or email csd@uoguelph.ca or see the website: http://www.uoguelph.ca/csd/
8 RECORDING OF MATERIALS

Presentations which are made in relation to course work—including lectures—cannot be recorded or copied without the permission of the presenter, whether the instructor, classmate or guest lecturer. Material recorded with permission is restricted to use for that course unless further permission is granted.

9 RESOURCES

The Academic Calendars are the source of information about the University of Guelph’s procedures, policies and regulations which apply to undergraduate, graduate and diploma programs:

http://www.uoguelph.ca/registrar/calendars/index.cfm?index