Instructor: Dr. A. Hamilton-Wright
Office hours: Mondays, 16:00-17:30, Reynolds 2223
Email: <andrew.hamilton-wright@uoguelph.ca>

## Class Timetable

Classroom Meetings: Mondays and Wednesdays and Fridays, 14:30–15:50 Reynolds 1101

## Student Learning Outcomes:

This course explores computing techniques whose design is based on uncertainty and stochasticism in computing, explored through fuzzy systems, neural networks and evolutionary computation. Students will become conversant in the mechanisms of construction, measurement, evaluation, and application of these techniques.

## Student Outcomes:

Students successfully completing this course will be able to:

- evaluate the utility of a number of soft computing techniques in application to common problem types
- construct implementations of several of the most common algorithmic strategies within the study soft computing
- measure the degree of success in which a given algorithm solves a given problem
- refine their understanding of the effects of randomness in a solution through analysis of the statistical results obtained through accuracy measurement
- describe the construction of a hybrid soft computing algorithm by identifying the interplay between the constituent portions of the system
- characterize the function of a soft computing algorithm
- construct and utilize software verification and validation strategies in order to ensure the correct implementation and functioning of a soft computing system

## Marking Scheme

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| Assignments: | | | 40 % |
| Paper 1 discussion and writeup | Sept 26 | 10 % | |
| Experimental Plan assignment | Oct 3 | 10 % | |
| Paper 2 discussion and writeup | Oct 10 | 10 % | |
| Genetic Algorithm Evaluation | Oct 19 | 10 % | |
| Presentations: | | | 25 % |
| Paired Critical Preparatory Analysis | Oct 29† | 5 % | |
| Selected Research Paper | Weeks 9 and,10‡ | 10 % | |
| Project Findings | Weeks 11 and 12 | 10 % | |
| Project: | | | 35 % |
| Project Proposal | Oct 31 | 15 % | |
| Project Results and Writeup | Nov 28 | 20 % | |
| Total: | | | 100 % |

Notes:

† Pairings chosen through Courselink.
‡ Time slots for all presentations will occur during the periods indicated above, however a specific slot for each student will be assigned via Courselink.
• There is no final examination scheduled for this course.

## Supplementary Textbook

Karray, F. and C. de Silva, *Soft Computing and Intelligent System Design*, Pearson/Prentice-Hall, 2004. ISBN 0-321-11617-8
Textbook for supplementary reference only.

### Deadlines and assignment submission

All assignments will be submitted electronically through Courselink. All deadlines fall at the beginning of class on the day indicated, or during class in the case of demonstrations and presentations, and are not accepted after the indicated due date and time.

### Schedule of Topics

The following is a tentative schedule of topics for this course:
**Week 1:** Course logistics and introduction, fuzzy logic
**Week 2:** Paper reading and criticism; experimental evaluation; modelling versus learning, experimental impacts
**Week 3:** Fuzzy logic (cont'd), in-class discussion of first paper
**Week 4:** Evolutionary computation
**Week 5:** Thanksgiving holiday, in-class discussion of second paper
**Week 6:** Rough sets, neural networks
**Week 7:** Neural networks + deep learning
**Week 8:** Presentation Practice, Experimental Analysis
**Week 9:** Presentations
**Week 10:** Presentations, Hybrid systems
**Week 11:** Applications, Project Presentations
**Week 12:** Project Presentations

## Ethical Behaviour

Ethical conduct in the classroom and in academic work are critical to a healthy learning environment. Ethical conduct in all areas of University work is taken very seriously at the University of Guelph.

### Code of Conduct

Our learning environment must be a friendly, safe and welcoming environment for all, regardless of ethnicity, gender, sexual orientation, ability, socioeconomic status, and religion (or lack thereof). As we wish to facilitate and encourage the fullest participation from everyone, this code of conduct outlines the expectations for all participants (including the instructor and other staff).[a]

[a] This code of conduct is based upon the citizen code of conduct available via `http://citizencodeofconduct.org/`, and is distributed under a Creative Commons Attribution-ShareAlike

This policy is aligned with the larger University policy on Non-Academic Misconduct.

### *Expected Behaviour*

- Participate in an authentic and active way. In doing so, you contribute to the health and value of this community.
- Exercise consideration and respect in your speech and actions.
- Attempt collaboration before conflict.
- Refrain from demeaning, discriminatory, or harassing behaviour and speech.
- Be mindful of your surroundings and of your fellow participants. Alert community leaders (for example, your instructor) if you notice a dangerous situation, someone in distress, or violations of this Code of Conduct, even if they seem inconsequential.

### *Citizenship and Participation*

Communities mirror the societies in which they exist and positive action is essential to counteract the many forms of inequality and abuses of power that exist in society.

If you see someone who is making an extra effort to ensure our community is welcoming, friendly, and encourages all participants to contribute to the fullest extent, we want to know.

### *Unacceptable Behaviour*

Unacceptable behaviours include: intimidating, harassing, abusive, discriminatory, derogatory or demeaning speech or actions by any participant in our community, either in person, online, at any related events, or in one-on-one communications carried out in the context of community business.

Harassment includes: harmful or prejudicial verbal or written comments related to race, religion, disability, sex, gender, sexual orientation; inappropriate use of nudity and/or sexual images in public spaces (including computer labs and presentation slides); deliberate intimidation, stalking or following; harassing photography or recording; sustained disruption of talks or other events; inappropriate physical contact, and unwelcome sexual attention.

### *Consequences of Unacceptable Behaviour*

Unacceptable behaviour from any community member, including the course instructor and those members with decision-making authority, will not be tolerated.

Anyone asked to stop unacceptable behaviour is expected to comply immediately.

If a community member engages in unacceptable behaviour, action *will* be taken to ensure that such behaviour ends, beginning with action on the part of the course instructor, and escalating if necessary.

Additional information on University policy regarding harassment, conduct and human rights is available at the University Human Rights Office.

### *If You Witness or Are Subject to Unacceptable Behaviour*

If you are subject to or witness unacceptable behaviour, or have any other concerns, please notify the course instructor as soon as possible.

If you feel that the course instructor cannot or will not provide remedy for the situation, please contact any of these alternate resources:

- Associate Director (Undergraduate) <ugraddir@socs.uoguelph.ca>
- Director of the School <director@socs.uoguelph.ca>
- Associate Dean (Academic) <cpesada@uoguelph.ca>
- Office of Diversity and Human Rights <dhrinfo@uoguelph.ca> or extension 53000
- Campus Community Police at extension 52245

## 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.

Please note: Whether or not a student intended to commit academic misconduct is not relevant for a finding of guilt. Hurried or careless submission of assignments does not excuse students from responsibility for verifying the academic integrity of their work before submitting it. Students who are in any doubt as to whether an action on their part could be construed as an academic offence should consult with a faculty member or faculty advisor.

In particular, it is your responsibility to accurately and clearly indicate the work of *any and all contributing people*, including yourself, in all presented and submitted materials. By handing in any work for this course, unless you have specifically identified any other authorship, *you are claiming that the sole authorship is your own.* Including work from any other person without directly indicating the source of such work constitutes academic fraud of some type.

If you have any questions about what academic fraud such as plagiarism entails, or about any other forms of academic misconduct, please ask your course instructor.

# Important University-Wide Information

## E-mail Communication

As per university regulations, all students are required to check their <mail.uoguelph.ca> e-mail account regularly: e-mail is the official route of communication between the University and its students.

## 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 Undergraduate Calendar for information on regulations and procedures for Academic Consideration.

## Drop Date

Courses that are one semester long must be dropped by the end of the fortieth class day; two-semester courses must be dropped by the last day of the add period in the second semester. The regulations and procedures for dropping courses are available in the Undergraduate Calendar.

## Copies of Out-of-Class Assignments

Keep paper and/or other reliable back-up copies of all out-of-class assignments: you may be asked to resubmit work at any time.

## Mental Health

University of Guelph course instructors and student services cooperate to assist in helping students manage course and life stressors. Additionally, help is available through counselling services. Please see the Mental Health Resources page for details.

## Accessibility

The University promotes the full participation of students who experience disabilities in their academic programs. To that end, the provision of academic accommodation is a shared responsibility between the University and the student.

When accommodations are needed, the student is required to first register with Student Accessibility Services (SAS). Documentation to substantiate the existence of a disability is required, however, interim accommodations may be possible while that process is underway.

Accommodations are available for both permanent and temporary disabilities. It should be noted that common illnesses such as a cold or the flu do not constitute a disability.

Use of the SAS Exam Centre requires students to book their exams at least 7 days in advance, and not later than the 40th Class Day.

More information: www.uoguelph.ca/sas

## 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, a classmate or guest lecturer. Material recorded with permission is restricted to use for that course unless further permission is granted.