ECE 7650: APPLIED COMPUTATIONAL INTELLIGENCE

COURSE OUTLINE

Fall 2019

COURSE DESCRIPTION:

This course applies computationally intelligent algorithms to solve difficult computer engineering and computer science problems. This course consists of the following components: standard lecture delivery, hands-on, and project based. The theory of several computationally intelligent algorithms will be presented in class. Along with receiving the theory in class, students are required to demonstrate their understanding by implementing the algorithms in software to solve given difficult engineering problems, which have shown to be intractable with the application of conventional algorithms.

Learning Outcomes

1. Ability to choose the appropriate machine learning algorithm to solve a computational intelligent demanding problem.
2. Develop Matlab programs to implement computationally intelligent algorithms.
3. Identify, define, and describe the components of the computationally intelligent algorithms studied in this course.
4. Create and design novel methods to implement parts of given algorithms.

PRE-REQUISITES:

This course has the following pre-requisites:

- Software languages in C, Java, and Matlab.

CONTACT HOURS:

An equivalent of 3 lectures /week (3 credit hours).

COURSE CONTENT:

This course has the following content:

1. Introduction to machine learning.
2. Linear and logistic regression.
5. Artificial Neural Network (ANN).
7. Particle Swarm Optimization (PSO)
8. Ant Colony Optimization (ACO).
9. Data Sets.

PROJECTS:

The following topics may be covered in the labs:

- Application of Linear Regression.
- Application of Logistic Regression.
- Analysis of the Backpropagation algorithm in ANNs.
- Investigation of the SVM algorithm in classification problems.
- Investigation and novel addition to the simulate annealing and genetic algorithms for classification problems.
TEXTBOOK:
This course provides online lecture notes and list of papers.

EVALUATION:
Your final course grade is determined by your performance in assignments, term test, and a final examination. The weighting of each of these components is as follows:

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<th>COMPONENT</th>
<th>NO</th>
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<tbody>
<tr>
<td>Term Test</td>
<td>1</td>
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<tr>
<td>Project</td>
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<td>Final Exam</td>
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INSTRUCTOR INFO:
Prof. K. Ferens, Ph.D., P.Eng.
E1-544
474-8517
Ken.Ferens@umanitoba.ca

OFFICE HOURS:
TBA.

VOLUNTARY WITHDRAW:
TBA, 2019

REQUIREMENTS/REGULATIONS
- Student Responsibilities: It is the responsibility of each student to contact the instructor if he/she is uncertain about his/her standing in the course and about his or her potential for receiving a failing grade. Students should also familiarize themselves with Sections 4 and 6 of the Regulations dealing with incomplete term work, deferred examinations, and attendance and withdrawal. Attendance at lectures is essential for successful completion of this course. Students must satisfy each evaluation component in the course.

ACADEMIC INTEGRITY:
Students are expected to conduct themselves in accordance with the highest ethical standards of the Profession of Engineering and evince academic integrity in all their pursuits and activities at the university. As such, in accordance with the General Academic Regulations and Requirements of the University of Manitoba, Section 7.1, students are reminded that plagiarism* or any other form of cheating is subject to serious academic penalty (e.g. suspension or expulsion from the faculty or university) regardless of media
- examinations
- assignments
- laboratory reports
- term exams
A student found guilty of contributing to cheating in examinations or term assignments is also subject to serious academic penalty

*Plagiarism:* to steal and pass off (the ideas or words of another) as one's own; use (another's production) without crediting the source.