Syllabus
CS 5970 - Evolutionary Computation - Fall 2010

Course Title: Evolutionary Computation

Instructor: Prof. Dean Hougen, Devon Energy Hall 242, 405-325-3150, hougen@ou.edu

Class Hours: Monday & Wednesday, 4:30-5:45, Felgar Hall 319

Office Hours: TBD

Required Text Books:
Each student is required to have his or her own copy of the following textbook:

In addition to the textbook, there will be readings from the primary, peer-reviewed literature in the field.
Students should read ahead the chapters and other materials that are expected to be covered in the class period. Students should always bring their textbooks with them to class, including lectures/discussions, group work days, and exams.

Communication:
The primary means of transmitting class information to the students will be through announcements and discussions during class time and web pages. You are responsible for announcements made through either or both of these means.

Occasionally, urgent information may be sent via email. You must ensure that the email address the University has on file for you is valid and is monitored by you. A test of the email addresses provided by the University will be made during the second week of class. You are responsible for notifying the instructor if you do not receive this test email.

The best way for students to communicate with the teaching staff is to come to scheduled office hours. If you cannot attend office hours in person, phone calls can be accepted during office hours but students present in the office will get priority. Email can also be used but a quick or detailed personal response is unlikely as we get a lot of email and responding to email can be very time consuming. Students present in the office or on the phone will get priority over emailed questions.

Students may communicate with one another using the discussion forums in Desire2Learn or by other means outside of class as mutually agreed to by the students involved.

Details of all of the communication methods follow:

WWW:
Information about this class will be found on the class website. The URL is http://www.cs.ou.edu/~hougen/classes/Fall-2010/EC/ This page will contain links to the directory of class materials and other important information.

Email:
Students should use the email addresses listed above. Note that we get a lot of email. Do not expect a reply in minutes; one or two days is more likely in most cases. If you have not heard back within five days, please resend your message, if it is still relevant.

Expectations and Goals:
The prerequisite for this course is CS 2413 (Data Structures) or instructor permission. You are expected to have a sufficient background in Computer Science to be able to support team projects involving evolutionary computation. You are expected to have a working knowledge of Java (or another high-level, object-oriented language and a willingness to learn Java). Your programming projects will require the use of Java. A background in AI or Machine Learning such as that provided by CS 4013 (Artificial Intelligence) or CS 4033/5033 (Machine Learning) is not a
This course will introduce students to the state of the art in Evolutionary Computation and cover the principles involved.

Topics:
- Fundamentals of Evolution
- History of Evolutionary Computation (EC)
- Common EC Methods
  - Genetic Algorithms
  - Genetic Programming
  - Evolution Strategies
  - Grammatical Evolution
- Components of EC
  - Framework
  - Populations
  - Selection Operators
  - Genetic Operators
- EC Problem Solving
  - Search
  - Optimization
  - Machine Learning
  - Automated Programming
  - Adaptation
- EC Theory
  - Dynamics
  - Selection
  - Reproduction
  - Representation
  - Fitness Landscapes
- Advanced Topics (Possible)
  - Evolutionary Robotics
  - Evolutionary Neural Networks
  - Dynamic Landscapes
  - Parallel EC
  - Multi-objective EC

Requirements:
The graded assignments and their contribution to a student's grade are given in the table below. (Subject to change.)

<table>
<thead>
<tr>
<th>Item</th>
<th>Portion of Grade</th>
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<tbody>
<tr>
<td>Exam (1)</td>
<td>30%</td>
</tr>
<tr>
<td>Homework</td>
<td>5%</td>
</tr>
<tr>
<td>Small (Individual) Projects</td>
<td>10%</td>
</tr>
<tr>
<td>Large (Group) Project &amp; Presentation</td>
<td>25%</td>
</tr>
<tr>
<td>Technical Paper Review &amp; Presentation</td>
<td>5%</td>
</tr>
<tr>
<td>Technical Paper Comparison</td>
<td>15%</td>
</tr>
</tbody>
</table>

During roughly the first half of the semester, we will cover Chapters 1-6 of the textbook, as well as a few outside readings (on grammatical evolution, fitness landscapes, etc.). You will have several homeworks and small projects based on this material and this half of the course will conclude with an examination. During this portion of the semester, you will also review individual papers from the primary, peer-reviewed literature on advanced topics in EC.

During roughly the second half of the semester, you will present papers on advanced topics in EC, write comparison papers on these topics, and complete large projects based on these topics. This half of the semester will conclude with presentations on your large projects.
All homework, exams, small projects, and technical paper reviews in this course are to be done ALONE; the work submitted by a student MUST be the student's own.

Group work is REQUIRED for the large projects and technical paper comparisons; students will select their own groups and each group will give specific roles and tasks to its group members. You are responsible for the material covered during the lectures sessions, whether or not it is also found in your textbooks or other assigned reading materials. Similarly, you are responsible for the material found in your textbooks and other assigned reading materials, whether or not it is also covered during the lectures sessions. In other words, you are responsible for the UNION of these sources of knowledge, as depicted by the shaded region of the Venn diagram below, not merely their intersection.

You may write your programs from scratch or may start from programs for which the source code is freely available on the web or through other sources (such as friends or student organizations). If you do not start from scratch, you must give a complete and accurate accounting of where all of your code came from and indicate which parts are original, which are changed, and which you got from which other source. Failure to give credit where credit is due is academic fraud and will be dealt with accordingly.

All work must properly cite sources. For example, if you quote a source in one of your technical paper reviews, you must include the quotation in quotation marks and clearly indicate the source of the quotation.

Late assignments will be penalized 20% per day late. (All parts of days will be rounded up.) After five days, you will not be able to turn in that assignment for credit. If you are worried about turning in the assignment late and losing points, turn in the assignment ahead of time. You will be turning in electronic and paper copies of group projects. It is the electronic copy that must be turned in by class time on the day that it is due. The paper copy is due twenty four hours after the electronic copy. The paper copy may be submitted in class or turned in during office hours or by slipping it under my office door.

All exams will be open book/open notes. NO electronic devices will be permitted in the testing area.

Copying another's work, or possession of electronic computing or communication devices in the testing area, is cheating and grounds for penalties in accordance with school policies. Please see the Provost's web pages on academic integrity.

Accommodations:
Any student with a disability should contact the instructor so that reasonable accommodations may be made for that student.

Drop Policy:
Any student who fails to attend the first week of class may be dropped from the class.

Student Evaluations:
"The College of Engineering utilizes student ratings as one of the bases for evaluating the teaching effectiveness of each of its faculty members. The results of these forms are important data used in the process of awarding tenure, making promotions, and giving salary increases. In addition, the faculty uses these forms to improve their own teaching effectiveness. The original request for the use of these forms came from students, and it is students who eventually benefit most from their use. Please take this task seriously and respond as honestly and precisely as possible, both to the machine-scored items and to the open-ended questions."

Related Documents:
Students should also read the related documents on Replacement Assignments or Extensions and Discussions of Scores and Grades.