

COMP SCI 5401 - Evolutionary Computing

Fall Semester 2019 Syllabus

Description

Evolutionary Computing (EC) is the field that studies the theory and application of Evolutionary Algorithms (EAs). EAs are a class of stochastic, population-based, general-purpose problem-solving algorithms inspired by natural evolution. In this course, students will implement course concepts to tackle a variety of science, engineering, and/or business problems. Some popular types of EAs that will be reviewed are Genetic Algorithms, Evolution Strategies, Genetic Programming, Differential Evolution, and Learning Classifier Systems, as well as Hyper-heuristics. However, this course will follow a unified approach focusing on the general characteristics of all EA types. This course is the first in a two-course sequence on EC and is a prereq for the second course: COMP SCI 6401 - Advanced Evolutionary Computing. It also serves as one of several possible prereqs for COMP SCI 6400 - Advanced Topics in Artificial Intelligence.

Course Objectives

This course has five main objectives:

- (1) a solid understanding of core EC concepts and mechanisms,
- (2) the knowledge of how to identify (real-world) problems for which EC is appropriate,
- (3) the ability to implement custom EC solutions for those problems,
- (4) the capability to perform statistical analysis on stochastic algorithms such as EAs, and
- (5) the skills necessary to write formal technical reports in the field of EC.

Intended Audience & Prerequisites

This course is aimed at both undergraduate & graduate students in any science or engineering degree program who are proficient in a procedural programming language, have a solid understanding of data structures and algorithms, and have a basic understanding of statistics. If in doubt, contact the instructor! The programming language [Python](#) (or even better [Cython](#)) is the recommended language for this course, but C, C++, C#, and Java are also preapproved; other programming languages need instructor approval. The prereqs for this course are a "C" or better grade in *COMP SCI 2500 - Algorithms* and in a college level statistics course.

Course Policies & Campus Resources

S&Tconnect

The purpose of the S&Tconnect Early Alert system (see the S&Tconnect tab in Canvas) is to improve the overall academic success of students by improving communication among students, instructors and advisors; reducing the time required for students to be informed of their academic

status; and informing students of actions necessary by them in order to meet the academic requirements in their courses.

Disabilities

If you have a documented disability and anticipate needing accommodations in this course, you are strongly encouraged to meet with the instructor as early as possible in the semester. You will need to request that the [Disability Support Services](#) staff send a letter to the instructor verifying your disability and specifying the accommodation you will need before the instructor can arrange your accommodation. Disability Support Services is located in 203 Norwood Hall, their phone number is 573-341-6655, and their E-mail is dss@mst.edu. You can also initiate the accommodation process at <https://mineraccess.mst.edu>

The Burns & McDonnell Student Success Center

The Student Success Center is a centralized location designed for students to visit and feel comfortable about utilizing the campus resources available. The Student Success Center was developed as a campus wide initiative to foster a sense of responsibility and self-directedness to all S&T students by providing peer mentors, caring staff, and approachable faculty and administrators who are student centered and supportive of student success. Visit the B&MSSC at 198 Toomey Hall; phone: 573-341-7596; E-mail: success@mst.edu; facebook: <https://www.facebook.com/SandTssc>; web: <https://studentsuccess.mst.edu/>

Student Honor Code & Academic Integrity

Every student enrolled in this course is expected to be familiar with both the [Student Honor Code](#) and [Missouri S&T's Student Academic Regulations](#), including the section on *Conduct of Students* which on page 23 of the September 2017 revision, defines several forms of *Academic Dishonesty* such as *cheating*, *plagiarism*, and *sabotage*. Incidences of Academic Dishonesty will typically result in zero grades for the respective course components, notification of the student's advisor, the student's department chair, and the campus undergraduate studies office, and further academic sanctions may be imposed as well in accordance with the regulations. Note that those who allow others to copy their work are just as guilty of plagiarism and will be treated in the same manner.

Attendance & Classroom Egress Map

There is no attendance requirement, although attendance is highly recommended. Please familiarize yourself with the egress map for the classroom (room 209 in the Computer Science Building) posted at: <http://designconstruction.mst.edu/media/campusupport/designconstruction/secure/floorplan/R0055.pdf>

Makeups & Extensions

There will be no makeups; however, your worst exam grade will be dropped. For distance students: if a posted exam date or assignment deadline is known in advance to pose an irresolvable conflict, then with sufficient notice the instructor will attempt to accommodate all reasonable requests for alternative dates (example of reasonable request: a working professional distance student being sent out of town on business by their boss).

Exams

There will be three exams during the semester and one comprehensive final exam during finals week which counts double. Distance students will use a proctoring service approved by the instructor. The cumulative exam grade will be determined as follows:

$Max((Exam1+Exam2+Exam3)/3, (Exam1+Exam2+Exam3+2*Final-$

$Min(Exam1, Exam2, Exam3))/4)$ This means that students happy with their grade at the end of the semester can skip taking the comprehensive final exam, but it also means that taking the final exam can only improve your grade, never lower it.

Submission Guidelines

Unless specified otherwise, all assignments are due at 11:59pm of their respective due dates and are to be submitted via Canvas.

All code should be properly commented and documented. Technical reports need to be electronically typeset and submitted in either PDF or MSWord file format. PDF file format is preferred and you are encouraged to typeset using [LaTeX](#). Unless specified otherwise, the default penalty for late submission is a 5% point deduction for the first 24 hour period and a 10% point deduction for every additional 24 hour period. So 1 hour late and 23 hours late both result in a 5% point deduction, 25 hours late results in a 15% point deduction, etc.

Instructor

Name	Daniel Tauritz, Ph.D.
Office	325E Computer Science Building [Egress map (emergency exit route)]
Office hours	By appointment or according to the following "open door" policy: if the instructor's office door is wide open, you are welcome to drop by; if the instructor's office door is only slightly ajar, only knock in case of an important, time-critical circumstance; finally, if the door is closed, knock only in case of an absolute emergency.
E-mail	tauritzd@mst.edu
WWW	http://web.mst.edu/~tauritzd
Office phone	(573) 341-7218
Department phone	(573) 341-4491

Course Information

Required textbook	A.E. Eiben and J.E. Smith, Introduction to Evolutionary Computing, Second Edition, Springer, 2015, ISBN 978-3-662-44873-1 [Companion website: http://evolutionarycomputation.org]
Course website	http://web.mst.edu/~tauritzd/courses/ec/cs5401fs2019

Lecture times	Tuesdays & Thursdays 9:30-10:45 AM
Lecture venue	209 Computer Science Building [Egress map (emergency exit route)]
Course Schedule	Dynamic schedule

Grading Information

Exams (3 during semester + 1 comprehensive final)	40% of total grade
Assignments	60% of total grade
Final grade for undergraduate students	[90-100]: A, [80-90>: B, [70-80>: C, [60-70>: D, <60: F
Final grade for graduate students	[90-100]: A, [80-90>: B, [70-80>: C, <70: F

Title IX

Missouri University of Science and Technology is committed to the safety and well-being of all members of its community. US Federal Law Title IX states that no member of the university community shall, on the basis of sex, be excluded from participation in, or be denied benefits of, or be subjected to discrimination under any education program or activity. Furthermore, in accordance with Title IX guidelines from the US Office of Civil Rights, Missouri S&T requires that all faculty and staff members report, to the Missouri S&T Title IX Coordinator, any notice of sexual harassment, abuse, and/or violence (including personal relational abuse, relational/domestic violence, and stalking) disclosed through communication including but not limited to direct conversation, email, social media, classroom papers and homework exercises. Missouri S&T's Title IX Coordinator is interim chief diversity officer Neil Outar. Contact him (naoutar@mst.edu; (573) 341-6038; Temporary Facility A-1200 N. Pine Street) to report Title IX violations. To learn more about Title IX resources and reporting options (confidential and non-confidential) available to Missouri S&T students, staff, and faculty, please visit <http://titleix.mst.edu>.