Topics in Electrical Engineering: Predictive Modeling of Drug Sensitivity

ECE 5332 002
W 3 PM – 5:50 PM
Room Engineering Center 204

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Prerequisite:
ECE 3323 or permission of Instructor

Text:
• Lecture Notes
• Research Articles provided in class and online notes

Course Description:
Students will get an introduction to the current engineering research in drug sensitivity modeling. In recent years, the study of predictive modeling of drug sensitivities has received a boost due to the ever-growing interest in precision medicine and the availability of large-scale pharmacogenomics datasets. This discussion style course will attempt to cover the basic principles underlying the predictive modeling of drug efficacy for genetic diseases, especially cancer.

Course Outcomes:
The course will provide students the introductory skills required to take advanced courses and perform research in predictive modeling and personalized medicine.
Outcome #1: Basic understanding of drug sensitivity prediction issues
Outcome #2: Understanding of the engineering tools utilized in predictive modeling of drug sensitivity such as feature selection, validation techniques, ensemble models, dynamic networks and control design
Outcome #3: The techniques learnt in the course such as feature selection and regression modeling is applicable to multiple other engineering problems.

Outcomes Assessment:
Outcomes will be assessed through assignments and the final project. The overall understanding of the material will be determined based on the class participation where discussions and feedbacks on the course topics are highly encouraged.

Grade Components:
Assignments 30%
Final Project 50%
Class Participation 20%
Students can work individually or in small groups for the final project. The project can be computational such as application of algorithms to biological datasets or it can be comprehensive review of one specific course topic. Students can select a topic of their own interest or from provided sample project topics.
Grading Scale:
A = 90%-100%
B = 80%-89%
C = 70%-79%
D = 60%-69%
F = 0-59%

Course Outline

1. Introduction 1
2. Data Characterization 2
3. Feature Selection 3
4. Validation Methodologies 3
5. Tumor Growth Models 2
6. Overview of Predictive Modeling 3
7. Random Forests 3
8. Multivariate Random Forests 4
9. Integrated Predictive Modeling 3
10. Dynamic Network Inference 3
11. Combination Therapeutics 3
12. Online Resources and Challenges 2
13. Presentations 8

ADA STATEMENT: Any student who, because of a disability, may require special arrangements in order to meet the course requirements should contact the instructor as soon as possible to make any necessary arrangements. Students should present appropriate verification from Student Disability Services during the instructor’s office hours. Please note: instructors are not allowed to provide classroom accommodations to a student until appropriate verification from Student Disability Services has been provided. For additional information, please contact Student Disability Services in West Hall or call 806-742-2405.

ACADEMIC INTEGRITY STATEMENT: Academic integrity is taking responsibility for one’s own class and/or course work, being individually accountable, and demonstrating intellectual honesty and ethical behavior. Academic integrity is a personal choice to abide by the standards of intellectual honesty and responsibility. Because education is a shared effort to achieve learning through the exchange of ideas, students, faculty, and staff have the collective responsibility to build mutual trust and respect. Ethical behavior and independent thought are essential for the highest level of academic achievement, which then must be measured. Academic achievement includes scholarship, teaching, and learning, all of which are shared endeavors. Grades are a device used to quantify the successful accumulation of knowledge through learning. Adhering to the standards of academic integrity ensures grades are earned honestly. Academic integrity is the foundation upon which students, faculty, and staff build their educational and professional careers. [Texas Tech University (“University”) Quality Enhancement Plan, Academic Integrity Task Force, 2010]

RELIGIOUS HOLY DAY STATEMENT: "Religious holy day" means a holy day observed by a religion whose places of worship are exempt from property taxation under Texas Tax Code §11.20. A student who intends to observe a religious holy day should make that intention known in writing to the instructor prior to the absence. A student who is absent from classes for the observance of a religious holy day shall be allowed to take an examination or complete an assignment scheduled for that day within a reasonable time after the absence. A student who is excused under section 2 may not be penalized for the absence; however, the instructor may respond appropriately if the student fails to complete the assignment satisfactorily.
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Texas Tech University is committed to providing and strengthening an educational, working, and living environment where students, faculty, staff, and visitors are free from gender and/or sex discrimination of any kind. Sexual assault, discrimination, harassment, and other Title IX violations are not tolerated by the University. Report any incidents to the Office for Student Rights & Resolution, (806)-742-SAFE (7233) or file a report online at titleix.ttu.edu/students. Faculty and staff members at TTU are committed to connecting you to resources on campus. Some of these available resources are: TTU Student Counseling Center, 806-742-3674, https://www.depts.ttu.edu/sec/ (Provides confidential support on campus.) TTU 24-hour Crisis Helpline, 806-742-5555, (Assists students who are experiencing a mental health or interpersonal violence crisis. If you call the helpline, you will speak with a mental health counselor.) Voice of Hope Lubbock Rape Crisis Center, 806-763-7273, voiceofhopelubbock.org (24-hour hotline that provides support for survivors of sexual violence.) The Risk, Intervention, Safety and Education (RISE) Office, 806-742-2110, https://www.depts.ttu.edu/riise/ (Provides a range of resources and support options focused on prevention education and student wellness.) Texas Tech Police Department, 806-742-3931, http://www.depts.ttu.edu/tpd/ (To report criminal activity that occurs on or near Texas Tech campus.)

CIVILITY IN THE CLASSROOM STATEMENT:
Texas Tech University is a community of faculty, students, and staff that enjoys an expectation of cooperation, professionalism, and civility during the conduct of all forms of university business, including the conduct of student–student and student–faculty interactions in and out of the classroom. Further, the classroom is a setting in which an exchange of ideas and creative thinking should be encouraged and where intellectual growth and development are fostered. Students who disrupt this classroom mission by rude, sarcastic, threatening, abusive or obscene language and/or behavior will be subject to appropriate sanctions according to university policy. Likewise, faculty members are expected to maintain the highest standards of professionalism in all interactions with all constituents of the university (www.depts.ttu.edu/ethics/matadorchallenge/ethicalprinciples.php).

LGBTQIA SUPPORT STATEMENT:
I identify as an ally to the lesbian, gay, bisexual, transgender, queer, intersex, and asexual (LGBTQIA) community, and I am available to listen and support you in an affirming manner. I can assist in connecting you with resources on campus to address problems you may face pertaining to sexual orientation and/or gender identity that could interfere with your success at Texas Tech. Please note that additional resources are available through the Office of LGBTQIA within the Center for Campus Life, Student Union Building Room 201, www.lgbtqia.ttu.edu, 806.742.5433.”