AAEC 6305: Dynamic Economic Optimization – Fall 2020

Instructor Information

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Teaching Assistant

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Course Objective

The purpose of the course is to study the applications of optimization models in agricultural and natural resource economics. Our focus is to develop the ability to formulate economizing problems mathematically, and learn computer algorithms to solve various types of optimization problems in agricultural production and natural resource management. Students will learn computer algorithms solving linear and nonlinear programming models, deterministic and stochastic dynamic models, and machine learning models.

Reference Books

Mario J. Miranda and Paul L. Fackler. *Applied Computational Economics and Finance.* The MIT Press. 2002.

Course Content

1. Introduction
   Week 1: Overview of optimization models and MATLAB
2. Static Optimization Models for LP and NLP Problems
   Week 2: Linear and nonlinear static models (HW1)
3. Deterministic Dynamic Models
   Week 3: Nonrenewable resource extraction and livestock feeding
4. Stochastic Dynamic Models
   Week 4: Water management and bio-economic model (HW2)
   Week 5: Renewable resource use under uncertainty and growth model with stochastic technological change

Week 6: Term paper proposal and take-home midterm exam
5. Machine Learning
   Week 7: Introduction to Python
   Week 8: Logistic regression and shallow neural networks (HW3)
   Week 9: Improving neural networks
   Week 10: Convolutional neural networks (HW4)
   Week 11-12: Applications in agricultural production and natural resource management (including invited Lectures by Dr. Amin and Dr. Badrudozza)
   Week 13: Project presentation
   Week 14: Project presentation

Expected Learning Outcomes

- Be able to formulate economizing problems into mathematical models;
- Be able to master computer algorithms provided to you for solving various optimization models;
- Be able to develop simulation analysis projects using solved optimization models;
- Be able to interpret the economic implications of an optimization model's solutions;
- Be able to master the basic optimization techniques used in Machine Learning models.

Methods for Assessing Expected Learning Outcomes

Methods for assessing learning outcomes include four homework assignments, an exam, and a term project. You will receive one homework assignment in about every two weeks, except for the week you have an exam or project presentations. A midterm exam will be given at the end of the sixth week to assess your overall learning outcomes in the first half of the course.

An important component of this class is to develop a term project in which you are to identify and study an economic problem with the aid of optimization models and machine learning techniques you learn from this course. You can use your own data or the datasets provided by the instructor. It is advisable that *you start developing your term project as early as you can.* You are expected to present your *completed work* in the last two weeks of the semester. The write-up of your work is due on December 9.

Specific Requirements for the term project:

The project must deal with an important economic problem. The importance of the problem is determined by its relevance to the society and its contribution to the literature. A simple way of evaluating the importance of your project is to ask yourself whether there are people in the society who are interested to know the answer to your question. And you need to conduct a careful review of related work in order to evaluate the contributions of your own research.

Your term paper should be within 15 double-spaced pages, and meet the basic requirements of a working paper. That is, it should contain all the information for your peers to understand and critically evaluate your work. More specifically, it should have an introduction section motivating your research questions, a complete review of related literature, a description of your

data, model, and results, conclusions, and the reference list. You need to submit the electronic files of your code and data as an appendix to your research paper, so that I will be able to replicate your analysis if needed.

Grade Components
Homework 4 X 10% = 40%
Midterm exam 20%
Term project presentation 10%
Term paper 30%

ACADEMIC INTEGRITY

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]

IMPORTANT NOTICE

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, you may contact the Student Disability Services office in 335 West Hall or 806-742-2405.

"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.