SYLLABUS: AGEC 685 – Advanced Quantitative Methods

Instructors

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Statement of purpose

This course in quantitative methods provides a survey of techniques that can broadly characterized as “modeling.” As opposed to statistical analyses, ‘modeling’ is a more encompassing term, spanning the process from problem statement to quantified results. A previous course on statistical methods with focus on distribution of variables and estimation of correlative relations is assumed in the presentation of course material, though where necessary refresher material is included.

As a survey course, the material here is most aptly aimed at “consumers” or “users” of model outputs for purposes of better informed decision making. We will consistently revisit the scope and limitations of model design, implementation, and outputs. Practical experience in the course will be gained through lectures, labs, and assignments that dissect decision making into quantitative sub-problems that can be analyzed under a variety of modeling techniques. Model methods covered will focus generically on an “optimization” criterion, choosing the “best” from a set of alternatives. By extension, we will consider the probabilistic nature of outcomes as related to choices, identifying the key points where uncertainty enters into the system and how that may be quantified.

Class Schedule

At the beginning of each module a new detailed outline will be posted that includes the order in which materials should be completed as well as some additional notes on motivation and module specific learning objectives. Final assignments for each module (group assignments) are due on the Monday following the close of the module. Module topics are subject to change from this document. Please refer to the module outline that is posted along with the new module’s materials before beginning that module’s work (readings, lectures, etc).

Modular Layout of Course

Module 1 [1 week] Basics & Dry Run (Math and Computing)
Module 2 [2 weeks] Introduction to Optimization Models
Module 3 [2 weeks] Expanding on the Optimization Criterion
Module 4 [2 weeks] Probabilistic Modeling
Module 5 [2 weeks] Games, Complex Criteria Models
Module 6 [2 weeks] Simulation
Module R [Residency Week] Special topics/labs
Module Example

Each module (after the 1st) will contain the following

- Master Handout
  - Outline for module
  - Reference items and additional notes for lectures
  - Lab instructions (Group or Individual deliverable)
  - Assignment instructions (Group or Individual deliverable)

- Master Spreadsheet
  - Demonstration of any problems from lecture
  - Setup for lab work
  - Setup for assignment work

- Lectures (voice over slides)

- Readings (selections from various textbooks and popular press)

- Semester project tasks (Group of individual deliverable)
  - These will typically be offset from the due date on lab and assignment work
  - Deliverable is a group presentation on Friday morning of Residency

Course grading

Grading in the course is based on performance in the following:

- Quizzes & other daily work (e.g. required discussion board postings)
  - By ‘daily work’ I mean short items that you are required to submit after completing a lecture or lab exercise. Note that these may have due dates that are not the same as the modular assignment.
- Module assignments (rubrics provided each week)
- Semester project work

The final grade in the course will be weighted as follows:

- Module assignments (average of 5 best) = 50% of final grade
- Daily work (average of all) = 30% of final grade
- Semester project (½ final pres.; ½ other) = 20% of final grade

Course text:

There is no assigned or optional text for this course. Readings are selected from a variety of sources and provided to students via scanned pdf on the course web portal. These scans are excerpts and provided to students under a policy of fair educational use. At the conclusion of each module an annotated list of references appropriate for extended study may be provided without prompting. If a topic seems particularly relevant to you (e.g. for your capstone project) please request additional information; there’s a good chance I can point you toward some relevant readings.