Course Syllabus: ISE 562

Decision Analysis

Catalog Description

562 Decision Analysis (4, Sp). Decisions under uncertainty; utility theory; multiattribute utility; probability elicitation; conjugate distributions; decision analysis applications, framing, modeling using spreadsheets or software; cognitive biases, behavioral decision theory.

Instructor – Ali Abbas

Office: OHE-310
Office Hours: TBD
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Class Time and Location

Class Time: Mo/We 12:00 – 1:50 pm
Location: OHE 120

Textbooks

Howard, R. and Abbas, A. Foundations of Decision Analysis. (2015). New York: Pearson.

Overview

This class is an introduction to decision analysis, including the foundations and models of decision-making, decision tree analysis, single and multiattribute utility theory, probability theory, and behavioral decision theory. Throughout the class, we will emphasize the applications of these theories in the form of decision analysis, including practical methods for utility and probability modeling and assessment and the use of several modeling tools for decisions including spreadsheets or software. Students will form small groups to conduct a decision analysis project and to get hands-on experience.

Objectives

- Understand the basic concepts of decision analysis
- Understand the theory, models and tools of decision analysis
- Learn how to structure decision problems
- Understand the models and methods of single attribute utility theory
- Understand the models and methods of multiattribute utility analysis

- Learn how to elicit, model and revise probabilities using spreadsheets
- Understand the concepts of perfect and imperfect value of information
- Learn how to conduct probabilistic simulations
- Learn how to model complex decisions using spreadsheets or decision analysis software
- Understand the relationship between individual and group decision-making
- Understand behavioral research and its impact on decision analysis

Prerequisite(s):

Recommended preparation: MATH 108 or MATH 116 or equivalent. Some knowledge of Excel is recommended.

Class Format

The lecture style features a mix of Socratic dialogue, demonstration, lecture, and directed inquiry. The lecture demonstrations capture the essence of applying decision analysis to 'real' problems. The lectures have been carefully designed to demonstrate the need for decision-making tools. They are a compilation of lessons learned through the practice and teaching of decision analysis to executives, graduate students, undergraduate students, gifted teens, and at-risk youth.

Try to appreciate the philosophy and depth behind what is being taught in the lectures and demonstrations, even if (at times) they may appear deceptively simple. There is a deep meaning in every conversation. Listen carefully to the questions posed and the responses provided. The course is interactive: contribute your enthusiasm and energy and you will be rewarded many times over. Before asking or answering a question in the lectures, please say your name. I would like to know you throughout the semester just like you know me. I typically make announcements at the beginning of class about assignments and other course-related information. Please come on time.

Every other class will have an individual homework (or group) assignment. Assignments include building a decision tree for a decision or probabilistic assessments of the topics covered in class. Some assignments will include modelling complex decisions using spreadsheets or decision analysis software or Excel plugins. No prior knowledge of software is required although familiarity with Excel is recommended. In addition, students will conduct a decision analysis project in small groups. The groups should consist of three to four students. There will be a mid-term and one final project.

Grading Scale (Course final grades will be determined using the following scale)

A 95-100
A- 90-94

B+ 87-89
B 83-86
B- 80-82
C+ 77-79
C 73-76
C- 70-72
D+ 67-69
D 63-66
D- 60-62
F 59 and below

Total points will be curved for the final letter grade. Letter grade with minus and plus are also considered

Grades
Grades will be assigned as follows:
Participation 5%
Homework assignments 25%
Mid Term: 20%
Group assignments: 20%
Final group project: 30%

Tentative Class Schedule ISE 562 (Subject to Changes Per Class Discussions)

	Topics/Daily Activities	Readings and Homework	Deliverable/ Due Dates
Week 1 Dates	**Decision Demonstration** • What is a Decision? • Thumbtack vs Medallion • Sunk Cost • Value of Info	Weekly readings and HW assignments from the text and other readings will be assigned.	Wednesday after class
Week 2 Dates	**Structuring a decision** • The six elements of decision quality. • Creating distinctions • Precise decision language	**Weekly readings and HW assignments from the text and other readings will be assigned.**	Wednesday after class
Week 3 Dates	**Structuring a decision** • Decision Diagrams	Weekly readings and HW assignments from the text and other readings will be assigned.	Wednesday after class
Week 4 Dates	**Handling Uncertainty:** • Probabilistic relevance • Probabilistic inference Associate logic errors	Weekly readings and HW assignments from the text and other readings will be assigned.	Wednesday after class

Week 5
Dates
	Handling Uncertainty:
	• Probabilistic assessment - Probabilistic relevance -Probabilistic inference
	  Probability encoding
	  20 Questions
		Weekly readings and HW assignments from the text and other readings will be assigned.	Wednesday after class

Week 6 Dates	**Tools for Framing a Decision** • Decision Hierarchies • Strategy Tables • Decision Diagrams	Weekly readings and HW assignments from the text and other readings will be assigned.	Wednesday after class
Week 7 Dates	**Structuring Preferences:** • Utility theory and risk preference • Certain equivalents	Weekly readings and HW assignments from the text and other readings will be assigned.	Wednesday after class
Week 8 Dates	**Structuring Preferences:** • Direct and indirect values	Weekly readings and HW assignments from the text and other readings will be assigned.	Wednesday after class
Week 9 Dates	**Information Gathering:** • Value of perfect and imperfect information • Value of control • Value of experimentation	Weekly readings and HW assignments from the text and other readings will be assigned.	Wednesday after class

	• Advanced Information Gathering – • Valuing multiple sources of information		
Week 10 Dates	**Sensitivity Analysis:** erministic sensitivity analysis - Tornado rams babilistic sensitivity analysis – n loop and Closed loop sensitivity analysis	Weekly readings and HW assignments from the text and other readings will be assigned.	Wednesday after class
Week 11 Dates	**Biases in Decision Making:** • Decision Traps – • Anchoring – • Representativeness – • Availability Overconfidence	Weekly readings and HW assignments from the text and other readings will be assigned.	Wednesday after class
Week 12 Dates	**Decision Making in Organizations** • The decision analysis cycle and basis of analytical modeling • Formulate – Evaluate- Appraise –Decide • Handling Organizational Complexity	Weekly readings and HW assignments from the text and other readings will be assigned.	Wednesday after class
Week 13 Dates	**Auctions and Bidding** . Bidding as a decision . The Winner's Curse	Weekly readings and HW assignments from the text and other readings will be assigned.	Wednesday after class
Week 14 Dates	**Medical Decision Making** • Micromorts • Life and Death Decisions	Weekly readings and HW assignments from the text and other readings will be assigned.	Wednesday after class
Week 15 Dates	**Decisions and Ethics** • Ethical- Legal- Prudential • Building an Ethical Code	Weekly readings and HW assignments from the text and other readings will be assigned.	Wednesday after class
FINAL Date			Date: For the date and time of the final for this class, consult the USC *Schedule of Classes* at www.usc.edu/soc.

Statement on Academic Conduct and Support Systems

Academic Conduct:
Plagiarism – presenting someone else's ideas as your own, either verbatim or recast in your own words – is a serious academic offense with serious consequences. Please familiarize yourself with the discussion of plagiarism in *SCampus* in Part B, Section 11, "Behavior Violating University Standards" policy.usc.edu/scampus-part-b. Other forms of academic dishonesty are equally unacceptable. See additional information in *SCampus* and university policies on scientific misconduct, http://policy.usc.edu/scientific-misconduct.

Support Systems:

Student Counseling Services (SCS) – (213) 740-7711 – 24/7 on call
Free and confidential mental health treatment for students, including short-term psychotherapy, group counseling, stress fitness workshops, and crisis intervention. engemannshc.usc.edu/counseling

National Suicide Prevention Lifeline – 1 (800) 273-8255
Provides free and confidential emotional support to people in suicidal crisis or emotional distress 24 hours a day, 7 days a week. www.suicidepreventionlifeline.org

Relationship and Sexual Violence Prevention Services (RSVP) – (213) 740-4900 – 24/7 on call
Free and confidential therapy services, workshops, and training for situations related to gender-based harm. engemannshc.usc.edu/rsvp

Sexual Assault Resource Center
For more information about how to get help or help a survivor, rights, reporting options, and additional resources, visit the website: sarc.usc.edu

Office of Equity and Diversity (OED)- (213) 740-5086 | Title IX – (213) 821-8298
equity.usc.edu, titleix.usc.edu
Information about how to get help or help someone affected by harassment or discrimination, rights of protected classes, reporting options, and additional resources for students, faculty, staff, visitors, and applicants. The university prohibits discrimination or harassment based on the following protected characteristics: race, color, national origin, ancestry, religion, sex, gender, gender identity, gender expression, sexual orientation, age, physical disability, medical condition, mental disability, marital status, pregnancy, veteran status, genetic information, and any other characteristic which may be specified in applicable laws and governmental regulations. The university also prohibits sexual assault, non-consensual sexual contact, sexual misconduct, intimate partner violence, stalking, malicious dissuasion, retaliation, and violation of interim measures.

Bias Assessment Response and Support
Incidents of bias, hate crimes and microaggressions need to be reported allowing for appropriate investigation and response. studentaffairs.usc.edu/bias-assessment-response-support

The Office of Disability Services and Programs - (213) 740-0776 dsp.usc.edu
Support and accommodations for students with disabilities. Services include assistance in providing readers/notetakers/interpreters, special accommodations for test taking needs, assistance with architectural barriers, assistive technology, and support for individual needs.

Student Support and Advocacy – (213) 821-4710
Assists students and families in resolving complex issues adversely affecting their success as a student EX: personal, financial, and academic. studentaffairs.usc.edu/ssa
Diversity at USC
Information on events, programs and training, the Diversity Task Force (including representatives for each school), chronology, participation, and various resources for students. diversity.usc.edu
USC Emergency Information

Provides safety and other updates, including ways in which instruction will be continued if an officially declared emergency makes travel to campus infeasible. emergency.usc.edu

USC Emergency - UPC: (213) 740-4321, HSC: (323) 442-1000 – 24/7 on call dps.usc.edu, emergency.usc.edu
Emergency assistance and avenue to report a crime. Latest updates regarding safety, including ways in which instruction will be continued if an officially declared emergency makes travel to campus infeasible.

USC Department of Public Safety – UPC: (213) 740-4321 – HSC: (323) 442-1000 – 24-hour emergency or to report a crime.
Provides overall safety to USC community. [dps.usc.edu](dps.usc.edu)