

INST 354 - DECISION MAKING FOR INFORMATION SCIENCE

Fall 2018

ONLINE

Instructor: Dr. Christopher Antoun

E-mail: antoun@umd.edu

Office: 4015 Hornbake, South Wing

Office Hours: Thursdays, 2:30– 4:30 PM. Online sign-up form: <https://goo.gl/49ujb8>

A critical determinant of success for individuals and organizations is making good decisions. But why is it that we don't always make rational and logical choices? How can we improve the quality of our judgments and choices? To address these questions, the course will review:

- strategies for making rational choices;
- the psychology of judgment and decision making, including the roles of thinking strategies known as heuristics; and
- quantitative techniques for decision making, including optimization/linear programming and classification tree models.

Learning Outcomes

After completing this course you will be able to:

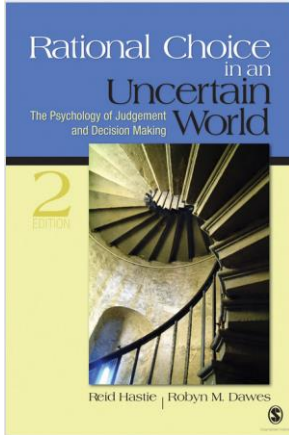
- Use decision analysis to facilitate rational choice
- Recognize different descriptive judgment and decision-making strategies
- Solve an optimization problem
- Use classification models to inform decision making

The Pre-requisites for this course are: MATH 115 Precalculus, AND STAT 100 Elementary Statistics and Probability, AND PSYC 100 Introduction to Psychology, AND INST 314 Statistics for Information Science.

Required Resources

The following resources are necessary for you to successfully complete this course.

- The course website, www.elms.umd.edu
- One text book:



Reid Hastie & Robyn Dawes, *Rational Choice in an Uncertain World*, 2nd Edition. Sage. Electronic version for sale here:

<https://us.sagepub.com/en-us/nam/rational-choice-in-an-uncertain-world/book231783>

(Hereafter **RC**)

Completing the required readings is essential to understanding the course material.

Required Software

The following software is necessary for you to successfully complete the course.

Microsoft Excel. For Macintosh users it is available through the university's TERPware website (<https://terpware.umd.edu>).

R software. It is free and available online (<https://www.r-project.org/>). You may want to use R Studio (the free version), which is an integrated development environment for R (<https://www.rstudio.com/>).

My Teaching Philosophy

To understand how I view my role as a teacher, please read my statement of teaching philosophy: <https://sites.google.com/site/chrisantoun/teaching-philosophy>

Campus Policies

Please visit <http://www.ugst.umd.edu/courserelatedpolicies.html> for the Office of Undergraduate Studies' full list of course related policies and follow up with me if you have questions. It is our shared responsibility to abide by the University of Maryland's policies.

Academic Integrity – Cases of academic misconduct will be referred to the Office of Student Conduct irrespective of scope and circumstances, as required by university rules and regulations. Thus, it is important that you complete your own work on the assignments and exams. Please visit <http://osc.umd.edu/OSC/Default.aspx> for more information about academic integrity.

Special Needs — Students with disabilities should inform me of their needs at the beginning of the semester. Please also contact the Disability Support Services (301-314-7682 or www.counseling.umd.edu/DSS). DSS will make arrangements with you and me to determine and implement appropriate academic accommodations. Students encountering psychological problems that hamper their course work are referred to the Counseling Center (301-314-7651 or www.counseling.umd.edu) for expert help.

Learning Assessments

Participation (15%): Participation is a vital component of this course. You are expected to participate by posting to discussion forums on Canvas/ELMS every week. Participation will consist of two main components:

- 1.) “Prompted Discussion”: Posting a response to a discussion question (due by 1 PM on Wednesdays).
- 2.) “Open Discussion”: Posting one question in response to the week's readings (due by 1 PM on Thursdays). Alternatively, you may comment on a question that has already been posted by another student.

Exercises (40%): There will be four exercises. Each exercise will be graded on a scale of 0-10. You may work with your colleagues to figure out the underlying concepts and problem-solving processes, but are expected to work individually to answer the specific problems that are assigned. Completed assignments will be submitted via Canvas/ELMS. They are to be submitted by 1 PM on the day that they are due. Due dates are indicated below under “Course Schedule.”

The day before each exercise is due, I will create an “Instructor Discussion” forum. You may post questions about the exercises for me to answer. Participation in this discussion forum is optional.

Quizzes (30%): There will be four short quizzes to test your understanding of the concepts covered in the readings and lectures. They will be open book and open notes. We will drop your poorest quiz and the remaining 3 quizzes make up 30% of your grade. They are to be submitted by 1 PM on the day that they are due. Dates for each quiz are indicated below under “Course Schedule.”

Group Project (15%): In small groups you will use classification trees to analysis a dataset and report on how the results can inform a decision. The project deliverable is a written report (4-5 pages double-spaced). It should not exceed 1,5000 words of text, excluding figures, tables, references, and appendices. Additional details about the group project will be discussed in class.

Letter Grades

Final letter grades are assigned based on the percentage of total assessment points earned. To be fair to everyone I have to establish clear standards and apply them consistently, so please understand that being close to a cutoff is not the same thing as crossing it (89.9 \neq 90.0). It would be unfair to make exceptions for some and not others.

+	97.00%	+	87.00%	+	77.00%	+	67.00%		
A	94.00%	B	84.00%	C	74.00%	D	64.00%	F	<60.0%
-	90.00%	-	80.00%	-	70.00%	-	60.00%		

Course Schedule

‘R-1’, ‘R-2’,... ‘R-5’ refer to assigned readings that are shown below under “Readings.”

Wk	Date	Tuesday
1	Aug 27-31	Introduction and Course Overview; What is a “Decision”? Readings: RC Chapter 1 RC Chapter 2, p 23-26
Module 1: Decision Analysis		
2	Sep 4-7	What is Decision Analysis?; Payoff Matrix Readings: R-1 (1 st half: p 803-817) R-2 (p 736 – 751)
3	Sep 10-14	Decision Trees Readings: RC Chapter 2, p 26-32 R-2 (p 751 – 753) R-3
4	Sep 17-21	Decision Trees cont. Readings: R-2 (p 759 – 775) Exercise 1 handed out on Sep 21
5	Sep 24-28	Considerations/Pitfalls in Decision Analysis Readings: RC Chapter 2, p 32-42 R-1 (2 nd half: p 817-832) Optional: Instructor discussion forum (Thurs Sep 27, 8-10 PM) Quiz #1 (due Fri Sept 28 by 1 PM) Exercise #1 (due Fri Sept 28 by 1 PM)
Module 2: Decision Theories		
6	Oct 1-5	Utility Theory; Prospect Theory; and Decision Weights Readings: RC Chapter 11, p 237-241 R-4 RC Chapter 12
7	Oct 8-12	Automatic vs. Controlled Thinking Readings: R-5 Exercise 2 handed out on Oct 12
8	Oct 15-19	Heuristics Readings: RC Chapter 4 RC Chapter 5 <i>(continued on next page...)</i>

		Optional: Instructor discussion forum (Thurs Oct 19, 8-10 PM) Quiz #2 (due Fri Oct 19 by 1 PM) Exercise #2 (due Fri Oct 19 by 1 PM)
Module 3: Mathematical Techniques to Inform Decisions		
9	Oct 22-26	Optimization/Linear Programming Readings: R-6
10	Oct 29-Nov 2	Solving Optimization Problems in a Spreadsheet Video: https://goo.gl/AFcC7V Readings: R-7 R-8 R-9 Exercise 3 handed out on Nov 2
11	Nov 5-9	Sensitivity Analysis Readings: R-10 Optional: Instructor discussion forum (Thurs Nov 8, 8-10 PM) Quiz #3 (due Fri Nov 9 by 1 PM) Exercise #3 (due Fri Nov 9 by 1 PM)
Module 4: Statistical Models to Inform Decisions		
12	Nov 12-16	Data-Driven Decision Making; Models vs. Human Judgment; Classification and Decision Tree Models Readings: R-11 RC Chapter 3, p 53-67 R-12 Final project introduced Assignment to project teams Exercise 4 handed out: complete DataCamp Course -“Machine Learning with Tree-Based Models in R”
13	Nov 19-21	Classification and Decision Tree Models cont. <i>Happy Thanksgiving</i>
14	Nov 26-30	Classification and Decision Tree Models cont. Optional: Instructor discussion forum (Thurs Nov 29, 8-10 PM) Quiz #4 (due Fri Nov 30 by 1 PM) Exercise #4 (due Fri Nov 30 by 1 PM)
15	Dec 3-7	<i>Project time</i> Optional: Instructor discussion forum (Thurs Dec 6, 8-10 PM) Final report (due Fri Dec 7 by 1 PM)

If there are updates to the schedule, they will be posted to ELMS/Canvas.

Readings (available on ELMS/Canvas if a URL is not provided)

R-1: Keeney, R. L. (1982). Decision analysis: an overview. *Operations research*, 30(5), 803-838.

R-2: Ragsdale, C. (2014), Spreadsheet Modeling and Decision Analysis: A Practical Introduction to Business Analytics, 7th Edition, Chapter 14

R-3: Magee, J. F. (1964). *Decision trees for decision making* (pp. 35-48). Harvard Business Review.

R-4: Gilboa, I. (2010). *Rational choice*. MIT press, Chapter 2, pp. 11-24.

R-5: Kahneman, D. (2011) Thinking, Fast and Slow, p 19-58

R-6: Ragsdale, C. (2014), Spreadsheet Modeling and Decision Analysis: A Practical Introduction to Business Analytics, 7th Edition, Chapter 2.

R-7: Introductory guide on Linear Programming for (aspiring) data scientists. Available here <https://www.analyticsvidhya.com/blog/2017/02/introductory-guide-on-linear-programming-explained-in-simple-english/>

R-8: Optimization Methods in Management Science/Operations Research. Excel Techniques.

R-9: *Linear Programming with Excel Solver*. Available here http://faculty.sfasu.edu/fisherwarre/lp_solver.html

R-10: *Sensitivity analysis: strategies, methods, concepts, examples*. Available here: <http://dpannell.fnas.uwa.edu.au/dpap971f.htm>

R-11: McAfee, A. (2014). *When Human Judgment Works Well, and When it Doesn't*. Harvard Business Review.

R-12: Provost and Fawcett (2013). "Data Science and its Relationship to Big Data and Data-Driven Decision Making." *Big data*, pp. 51-59.