

INST 354 - DECISION MAKING FOR INFORMATION SCIENCE

Spring 2019
ONLINE

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Office:

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:

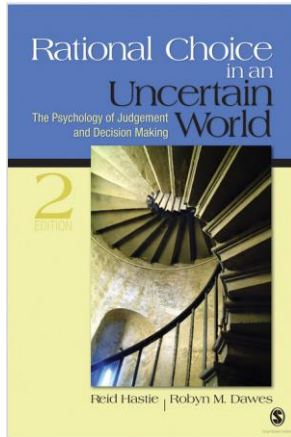
- Use decision analysis to facilitate rational choice
- Recognize different descriptive judgment and decision-making strategies
- Solve an optimization problem
- Use classification models to inform decision making

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/>).

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

Discussion Forum Participation (15%): Participation is a vital component of this course. You are expected to participate by posting to a weekly discussion forum. You will be asked to respond to a discussion question that I post about the readings. Your post is due by 11:59 PM on Sundays. There will be no discussion forums on the weeks that exercises are due.

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 11:59 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 11:59 PM on the day that they are due. Dates for each quiz are indicated below under “Course Schedule.”

Case Study Report (15%):

You will write a report in response to a case study about a decision that an individual or organization must make. The project deliverable is a written report (2-3 pages double-spaced). It should not exceed 1,000 words of text, excluding figures, tables, references, and appendices

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	
1	Jan 28-Feb1	Introduction and Course Overview; What is a “Decision”? Readings: RC Chapter 1 RC Chapter 2, p 23-26 Discussion Forum 1
Module 1: Decision Analysis		
2	Feb 4- 8	What is Decision Analysis?; Payoff Matrix Readings: R-1 (1 st half: p 803-817) R-2 (p 736 – 751) Discussion Forum 2
3	Feb 11- 15	Decision Trees Readings: RC Chapter 2, p 26-32 R-2 (p 751 – 753) R-3 Discussion Forum 3
4	Feb 18- 22	Decision Trees cont. Readings: R-2 (p 759 – 775) Discussion Forum 4 Exercise 1 and Quiz 1 posted on Feb 24
5	Feb 25 – March 1	Considerations/Pitfalls in Decision Analysis Readings: RC Chapter 2, p 32-42 R4 R5 <i>Quiz #1 (due Thur Feb 28 by 11:59 PM)</i> <i>Exercise #1 (due Sun Mar 3 by 11:59 PM)</i>
Module 2: Decision Theories		
6	Mar 4 - 8	Utility Theory; Prospect Theory; and Decision Weights Readings: R-6 RC Chapter 11, p 237-241 RC Chapter 12 Discussion Forum 5
7	Mar 11 - 15	Automatic vs. Controlled Thinking Readings: R-7 Exercise 2 and Quiz 2 posted on Mar 17 Discussion Forum 6

8 Mar 17 - 24 **Spring Break**

Mar 25 - 29 **Heuristics**
Readings:
RC Chapter 4
RC Chapter 5

Quiz #2 (due Thur Mar 28 by 11:59 PM)
Exercise #2 (due Sun Mar 31 by 11:59 PM)

****Module 3: Mathematical Techniques to Inform Decisions****

9 Apr 1-5 Optimization/Linear Programming
Readings:
R-8
Discussion Forum 7

10 Apr 8 -12 ***Solving Optimization Problems in a Spreadsheet***
Video:
<https://goo.gl/AFcC7V>
Readings:
R-9
R-10
R-11
Discussion Forum 8
Exercise 3 and Quiz 3 posted on Apr 14

11 Apr 15-19 ***Sensitivity Analysis***
Readings:
R-12
Quiz #3 (due Thur Apr 18 by 11:59 PM)
Exercise #3 (due Sun Apr 21 by 11:59 PM)

****Module 4: Statistical Models to Inform Decisions****

12 Apr 22 -26 **Statistical Modeling; Data-Driven Decision Making; Models vs. Human Judgment**
Readings: R-13, R-14
Discussion Forum 9

13	Apr 29 - May 3	Classification and Decision Tree Models Readings: R-15 Discussion Forum 10 Exercise 4, Quiz 4, and Case Study assignment posted on May 5
14	May 6- May 10	<i>Classification and Decision Tree Models cont.</i> <i>Quiz #4 (due Thur May 9 by 11:59 PM)</i> <i>Exercise #4 (due Sun May 12 by 11:59 PM)</i> <i>Case Study Report (due Sun May 19 by 11:59 PM)</i>

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: Johnson, S. (Sep. 1, 2018). How to make a big decision. *The New York Times*. Available here: <https://www.nytimes.com/2018/09/01/opinion/sunday/how-make-big-decision.html>
- R-5: Rothman, J. (Jan. 21, 2019). The art of decision-making. *The New Yorker*. Available here: <https://www.newyorker.com/magazine/2019/01/21/the-art-of-decision-making>
- R-6: Chand, S. The Concept of Utility: It's Meaning, Total Utility and Marginal Utility | *Economics*. Available here: <http://www.yourarticlelibrary.com/economics/the-concept-of-utilityits-meaning-total-utility-and-marginal-utility-economics/8866>
- R-7: Kahneman, D. (2011) *Thinking, Fast and Slow*, p 19-58
- R-8: Ragsdale, C. (2014), *Spreadsheet Modeling and Decision Analysis: A Practical Introduction to Business Analytics*, 7th Edition, Chapter 2.
- R-9: Introductory guide on Linear Programming for (aspiring) data scientists. Available here <https://www.analyticsvidhya.com/blog/2017/02/introductory-guide-on-linear-programmingexplained-in-simple-english/>
- R-10: *Optimization Methods in Management Science/Operations Research*. Excel Techniques.
- R-11: *Linear Programming with Excel Solver*. Available here http://faculty.sfasu.edu/fisherwarre/lp_solver.html
- R-12: Sensitivity analysis: strategies, methods, concepts, examples. Available here: <http://dpannell.fnas.uwa.edu.au/dpap971f.htm>
- R-13: McAfee, A. (2014). When Human Judgment Works Well, and When it Doesn't. *Harvard Business Review*.
- R-14: Provost and Fawcett (2013). "Data Science and its Relationship to Big Data and DataDriven Decision Making." *Big data*, pp. 51-59.
- R-15: A Complete Tutorial on Tree Based Modeling from Scratch (in R & Python). Available here: <https://www.analyticsvidhya.com/blog/2016/04/complete-tutorial-tree-based-modelingscratch-in-python/>