This course will provide an introduction to the use of decision sciences in health care. In addition to developing a conceptual understanding of medical decision making, the course will emphasize technical skills in decision analysis including the creation and evaluation of decision trees, the use of sensitivity analysis, and the incorporation of specific patient preferences for various interventions and health states. The advantages and disadvantages of formal mathematical models for the analysis of clinical conditions will be presented; examples from the current medical literature will be discussed. Homework assignments will be used to practice concepts learned in the course; at the end of the course, students will complete a take-home final exam.

Course Mechanics

1.0-credit course; total of 8 sessions (2 hours per session)

Course Textbook

None. Assigned readings are based on journal articles and are listed in the syllabus for each class. Optional readings using the following textbook are provided where relevant:


Course Grading Policy

Course grades are assigned on the basis of homework assignments (60%) and a final exam (40%). The grading scale is as follows:

A: 93 – 100
B: 83 – 92
C: 74 – 82
D: 65 – 73

Homework Assignments (60 points)

There are 3 homework assignments, worth 20 points each. Assignments are available on Blackboard. Due dates are listed below and also is posted on Blackboard; late assignments will not be accepted.

Final Exam (40 points)

Students will complete a final take-home exam, which will be posted on Blackboard by the last day of class. Each student is expected to complete the final exam independently. The due date is listed below and also is posted on Blackboard; late exams will not be accepted.

IMPORTANT: Students are expected to show their work (e.g., formulas, calculations) on all assignments and the final exam; answers must be legible. When the steps or details of your answer are not provided (or are not clearly written), the point values will be awarded at the discretion of the instructor.
Class Deadlines

All assignments and the final exam are due at 5:00 on the dates specified (either in class or emailed to the TA).

University Policies: Academic Integrity and Disabilities

Academic Integrity

Students in this course will be expected to comply with the University of Pittsburgh’s Policy on Academic Integrity. Any student suspected of violating this obligation for any reason during the semester will be required to participate in the procedural process, initiated at the instructor level, as outlined in the University Guidelines on Academic Integrity. This may include, but is not limited to, the confiscation of the examination of any individual suspected of violating University Policy. Furthermore, no student may bring any unauthorized materials to an exam, including dictionaries and programmable calculators.

For Clinical Decision Analysis, students are encouraged to learn together and to help one another understand the material and the assignments. However, students are NOT permitted to complete assignments together or to submit collective assignments; copying solutions to assignments is a violation of the Academic Integrity policy. Students should and are expected to work on their final exam independently. Students may direct any questions about concepts, assignments, or the final exam to instructors or teaching assistants.

Disabilities

If you have a disability for which you are or may be requesting an accommodation, you are encouraged to contact both your instructor and Disability Resources and Services (DRS), 140 William Pitt Union, (412) 648-7890/(412) 383-7355 (TTY), as early as possible in the term. DRS will verify your disability and determine reasonable accommodations for this course.
Session 1  
Introduction and foundation of medical decision making

Concepts and Topics

1. Introduction to the need for decision analysis and conditions required for a problem to be appropriately addressed by a formal decision analysis
2. Prescriptive versus descriptive analysis of problems
3. Examples of clinical/social problems addressed by decision analysis
4. Basic elements of decision analysis (nodes, branches, probabilities, outcomes)

Required Reading (prior to session)


Optional Reading

- Sox, chapters 1-3

Session 2  
Mechanics of decision analysis and probability review

Concepts and Topics

1. Elements of a decision tree (nodes, branches, probabilities, outcomes)
2. Steps for solving a decision tree (averaging out/folding back)
3. Using contingency tables and probability rules in decision trees

Required Reading (prior to session)


Also CHOOSE 1 of the following articles:


Optional Reading

- Sox, chapter 3, 6
Concepts and Topics

1. Common structural errors and pitfalls in building decision trees
2. Using Bayes’ Theorem to compute probabilities for decision trees
3. Special case of diagnostic testing: 2x2 contingency tables
4. Measures of test performance (sensitivity, specificity, PPV, NPV, likelihood ratios)

Required Reading (prior to session)


Optional Reading

- Sox, chapters 3-5

Concepts and Topics

1. Receiver Operating Characteristic (ROC) curves
2. Uses of sensitivity analysis
   - Patient subgroups, examining outcomes in different risk sets
   - Testing the model’s robustness to errors in assumptions
   - Providing information on critical values and areas for further research
3. One-way sensitivity analysis, thresholds
4. Two- and three-way sensitivity analyses

Required Reading (prior to session)

Session 5  Psychology of decision making (biases and heuristics)

Concepts and Topics
1. Translating normative decision analysis to descriptive decision making, pitfalls and problems
2. Descriptive decision making (base rate neglect, heuristics, and limits of primate cognitive architecture)
3. Decision making under uncertainty and time pressure, overview of computational decision making models

Required Reading (prior to session)

Optional Reading

Session 6  Value nodes: caring about more than one outcome

Concepts and Topics
1. Incorporating multiple attributes into trees
2. Patient-centered outcomes: health status and quality of life
3. Overview of quality of life measures

Required Reading (prior to session)
- Watch the video clip (movie excerpt from *Deep Impact* (1998)), posted on Blackboard.
- Also CHOOSE 1 of the following articles:

Optional Reading
- Sox, chapters 7-8

Session 7 Assessing quality of life with preference-based measures

Concepts and Topics
1. Computing quality-adjusted life-years (QALYs) (or, “What health status measures cannot do”)
2. Utility theory, preferences, and the value of intermediate states
3. Direct and indirect methods of assessment

Required Reading (prior to session)

Optional Reading
• Sox, chapters 7-8

Optional Session Using software to elicit utility values for health states

This is an optional session. Students may find it helpful for completing the third homework assignment. It may also be of interest to students who plan to estimate quality of life in sample cohorts for research purposes.

Session 8 Markov processes

Concepts and Topics
1. Limitations of static trees/nodes for modeling events that occur over time or repetitively
2. Life expectancy models and survival analysis

Required Reading (prior to session)

Optional Reading