QR 26: Choice and Chance
The Mathematics of Decision Making

Unit IV Exercises
Due: in class, Thursday, April 6.

References:

- [R&P1] Raiffa, Howard, and John Winsor Pratt. "An Informal Treatment of Foundations," *Introduction to Statistical Decision Theory*, p. 11-46. (In sourcebook.)
- [R&P2] Raiffa, Howard, and John Winsor Pratt. "Analysis of Decision Trees," *Introduction to Statistical Decision Theory*, p. 11-46. (In sourcebook.)
- [R] Raiffa, Howard. "Analysis of Your Basic Problem," "The Use of Judgemental Probability," *Decision Analysis*, p. 7-38, 104-128.
- [SC] Hammond, et al., *Smart Choices*. Chapters 7, 8, 10.
- [CDA] Weinstein and Feinberg, *Clinical Decision Analysis*, selections.

IV.A. Interpret the following statements about probabilities from the classical, frequentist, and Bayesian perspectives. Please be concise. If an interpretation doesn't make sense in a given situation, state briefly what the problem is.

(1) The probability of this coin falling heads is .5, and the probability of its falling tails is .5.
(2) There's a ninety percent chance that any given Aeroflot plane will get you to your destination in one piece.
(3) It's just as likely that the Dow will fall at least fifty points tomorrow as it is that the Dow will rise at least a hundred.
(4) There's an even chance that the British won the battle of Ungava Gorge during the Zulu wars.

IV.B. (R&P ch. 2 ex. 2). On the basis of your current information, assign a judgemental probability to the following events. Briefly describe how you formed your personal estimate.

(1) From the opening of the stock market on Monday of next week until the closing of the stock market on Friday of next week, the Dow-Jones Average will rise, and at the same time, IBM stock will fall.
(2) The winner of the first game of the next World Series will also win the second game.
(3) George W. Bush will obtain between 50 and 55 percent of the popular vote in the presidential election.
(4) Mrs. Abraham Lincoln was left-handed.

IV.C. Assigning π-BRiLTs. Do exercise 12 in [R&P1] ch. 2. Bear in mind that most decisions don't depend on knowing $\pi(c)$ precisely: having a good estimate is usually enough.

IV.D. Evaluating Lotteries. Do exercises 8-10 of [R&P1] ch. 2. Don't forget to read the introduction to the problems (cunningly concealed at the bottom of the previous page!)

IV.E. Decision-tree notation and diagramming problems. Do exercises 3&4 from [CDA] (p. 18 in sourcebook). Be sure to read the previous chapter on "Structuring Clinical Decisions under Uncertainty" before you begin.

IV.F. Do exercise 15, parts (a) and (b) from [R&P1] ch. 2.