MA417
Operations Research II
Decision Making Under Uncertainty

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- Office Hours: MWF 10:00-11:00

2 Room and Time

Tuesdays and Thursdays, 11:00-12:15 AM in CB 207

3 Text

The primary text we shall follow is Dynamic Programming by Eric V. Denardo. You can get both books for less than $20 on Amazon. There are many notes online about dynamic programming. Here are a few you might find useful. I also recommend the text Recursive Methods in Economic Dynamics by Stokey and Lucas. This book contains many example from economics, and you can get a used copy for about $50. Here are some links to notes online.

- Dynamic Programming Wiki. Wiki Wiki `http://en.wikipedia.org/wiki/Dynamic_programming`
- Optimization and Control. Optimization and Control Optimization `http://www.statslab.cam.ac.uk/~rrw1/oc/index.html`
- Alte Stout Stout `http://www.eecs.umich.edu/~qstout/dynamprog.html`

4 Grading

Your grade for the course will be based on a midterm exam, a project, a final exam, and homework. Each of the four components will count toward 25% of your grade. I will post sample problems for the midterm and final exams. If you are a graduate student and taking the course for graduate credit, I will expect your project to be more involved than what is required at the undergraduate level.

5 Software

First some comments on programming. Many students who have taken this course in the past expressed a reluctance to do much programming. It is difficult to get started, but the huge advantages basic programming skills will give you in a job or in graduate school cannot be overestimated. One of the first questions I am asked when companies contact me about prospective employees is "Does the individual have good programming skills?" I shall set aside enough time during the course of the semester for us to work problems in the computer lab. If you use one of the "interpreted" languages described below it is fairly easy to get started once you see a few examples. Only the very simplest examples of the problems we shall consider can be solved by paper and pencil. Therefore you will need access to a programming language on a computer. I shall provide code examples in some of the languages. Here is a list of possibilities.

- R. This language is very heavily used in statistical analysis. It is the open source version of S+ and is available free for download at Cran CRAN CRAN `http://cran.r-project.org/`. There is very good online documentaion and help. I shall provide sample code in R to help you get started. It is available for Linux, Mac, and Windoz. One big advantage of R is its "interpreted language" nature. This means that you can type in commands directly from a shell and get the output immediately - in other words the code does not have to be compiled as in C or Fortran. This feature makes it much easier to learn. Here are a few links that may help with learning R.
  - Programming in R `http://zoonek2.free.fr/UNIX/48_R/02.html`
  - A Brief Introduction to R `http://xweb.geos.ed.ac.uk/~hcp/r_notes/r_notes.html`
  - R Reference Card `http://www.rpad.org/Rpad/Rpad-refcard.pdf`
- Perl. Unless you are already fairly familiar with programming, I would not suggest using Perl to start with. However, if you have good programming skills, Perl is extremely useful.
- C and Fortran: Same comments as above. These are essentially required for solving big industrial strength problems. However, I think for a beginner R would be much easier to pick up quickly.

- Maple or Mathematica: These are high level languages that are aimed more at symbolic computation. They are both fairly easy to learn - at least for basic programming. If you are familiar with either one and have access to them, then they will work fine.
- Excel or Calc (the Open Office version of Excel). These are spreadsheet programs and you could work many of the problems using them. They have builtin solvers for optimization that work fine.

6 Topics and Goals

We will cover the material in the eight chapters of Denardo's book. Follwing his suggestion, we shall skip over most of the * sections that cover more advanced topics. In addition to the material in the book, I shall give a brief introduction/review to basic Markov processes. You may have seen these processes in a probability course under a different name. For example, a random walk left and right determined by a coin flip is a Markov process. I shall also give enough of an introduction to R with code examples so that you can write simple programs to gain experience with the algorithms of dynamic programming. Here are three basic goals for the course.

7 Tentative Course Schedule

- First Midterm shall be held during the 6th week of the course,
- Second Midterm shall be held during the 10th week of the course,
- Final shall be held during the time scheduled by the Registrar,
- Problem sets shall be assigned once per week and are due one week after they have been assigned.

8 Additional Course Policies

- Course policy of academic accommodations due to disability: If you have a documented disability that requires academic accommodations, please see me as soon as possible during scheduled office hours. In order to receive accommodations in this course, you must provide me with a Letter of Accommodation from the Disability Resource Center (Room 2, Alumni Gym, 257-2754, email address jkarnes@email.uky.edu) for coordination of campus disability services available to students with disabilities.
- Course policy for attendance: Attendance will be recorded by calling on students to answer questions in class. If you are called upon but are not present your absence will be recorded. You are allowed four unexcused absences during the semester. For each unexcused absence in excess of four,

two points will be deducted from your total course average that is used to determine your final letter grade. Excused absences will be given at instructor's discretion only with proof as defined by S.R. 5.2.4.2. For further information see http://www.uky.edu/StudentAffairs/Code/part2.html .

  - Make-up opportunities: The instructor shall give the student an opportunity to make up the work and/or the exam missed during an excused absence..." implies the student shall not be penalized for the excused absence.
  - Verification of Absences: Students missing work due to an excused absence bear the responsibility of informing the instructor about their excused absence within one week following the period of the excused absence (except where prior notification is required), and of making up the missed work.

- Course policy for submission of assignments: Students shall return all assignments on the due date. No late assignments shall be accepted without an excused absence.

- Course policy on academic integrity: All assignments, projects, and exercises completed by students for this class should be the product of the personal efforts of the individual(s) whose name(s) appear on the corresponding assignment. Misrepresenting others' work as one's own in the form of cheating or plagiarism is unethical and will lead to those penalties outlined in the University Senate Rules (6.3.1 & 6.3.2) at the following website: http://www.uky.edu/USC/New/rules_regulations/index.htm. The Ombud site also has information on plagiarism found at http://www.uky.edu/Ombud.

- Course policy on classroom civility and decorum: The university, college and department has a commitment to respect the dignity of all and to value differences among members of our academic community. There exists the role of discussion and debate in academic discovery and the right of all to respectfully disagree from time-to-time. Students clearly have the right to take reasoned exception and to voice opinions contrary to those offered by the instructor and/or other students (S.R. 6.1.2). Equally, a faculty member has the right – and the responsibility – to ensure that all academic discourse occurs in a context characterized by respect and civility. Obviously, the accepted level of civility would not include attacks of a personal nature or statements denigrating another on the basis of race, sex, religion, sexual orientation, age, national/regional origin or other such irrelevant factors.