ECO 7938: Practical Computing in Economics
Syllabus

Instructor: Gunnar Heins

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Office Hours: W, 9-11 in MAT 320

Class Meeting Times: T & R, 9th & 10th period (4:05 - 6:00) in GER 228

Half-semester course: Aug 22 - Oct 12.

TA: Jeongwoo Lee (jeongwoo@ufl.edu)

Course Description

Computational skills have become more and more important in economics. This course serves as an applied and hands-on introduction to computing and data analysis for graduate students in economics and beyond. The goals of this class are to aquire basic programming skills as well as a working knowledge of two of the most commonly software packages (R and Matlab), to practice working with and analyzing data, and to become familiar with commonly used datasets. This course further provides an introduction to numerical optimization, and UF's computing resources.

Software and Prerequisites

This course will use two programming languages: R during the first half and Matlab during the second one. Prior knowledge of either is not necessary but certainly helpful. Please download and install both R and RStudio (a user interface for R) before the first session. R can be downloaded from *https://www.r-project.org/* and RStudio from *https://www.rstudio.com/*.

Please bring your laptop to each session and have it ready at the beginning of each class. I will for the most part be writing code in R and Matlab during each lecture and you should follow and understand each step by performing it yourself.

Textbooks and Readings

The course will build on multiple sources and does not follow a single textbook, especially for the second part. If you are thinking of getting a textbook on R or Matlab, I would recommend

the book by Norman Matloff "The Art of R Programming - A Tour of Statistical Software Design" for the first part. It is useful as an introduction to R but also illustrates quite detailed how R functions compared to other languages. For the basics of Matlab, I recommend the book by Stormy Attaway "Matlab - A Practical Introduction to Programming and Problem Solving".

Exams, Homework, and Grading

Homeworks are an important part of this course and essential in order to learn and practice programming. Especially if you have no or little experience you should use the problem sets as practice for the exams, future courses and ultimately your research. There will be weekly homeworks which have to be submitted individually. You can discuss your solutions with others, but do not take over someone else's code.

There will also be a Midterm and a Final exam. Both will be open-book exams in class and you will have to bring your laptops and use R and Matlab to complete them. It is your responsibility to ensure that your laptop and both programs run properly during the exam. You might also for example want to start important and potentially time-consuming updates before the exam. The final grade will consist of:

Problem Sets	30 %
Midterm	30 %
Final	40 %
Total	100 %

Tentative Course Schedule

PART I: PRACTICAL COMPUTING IN R

Week 1

Session 1 (Thursday, Aug 23):
- Course introduction and outline
- Introduction to R and RStudio
- A first R session, Vectors in R

Homework 1 (due: Aug 30)

Week 2

Session 2 (Tuesday, Aug 28):
- Loops, Matrices and Lists in R

Session 3 (Thursday, Aug 30):
- Installing and using packages
- Working with data: The data.table package
- Importing and saving data
- Summary statistics
- Merging datasets

Homework 2 (due: Sep 6)

Week 3

Session 4 (Tuesday, Sep 4):
- Introduction to regression analysis
- Standard errors
- Exporting results

Session 5 (Thursday, Sep 6):
- Dummy Variables
- Instrumental Variables, 2SLS
- Bootstrap

Homework 3 (due: Sep 13)

Week 4

Session 6 (Tuesday, Sep 11):
- Plots & Data Visualization
- The ggplot2 package

Session 7 (Thursday, Sep 13):
- Simulation
- Applied Empirical Research in Practice
- Further useful R packages
- Advantages and Disadvantages of R

Homework 4 (due: Sep 18)

Week 5

Session 8 (Tuesday, Sep 18):
Midterm

PART II: PRACTICAL COMPUTING IN MATLAB

Session 9 (Thursday, Sep 20):
- Introduction to Matlab, Differences to R, a first Matlab session

Homework 5 (due: Sep 27)

Week 6

Session 10 (Tuesday, Sep 25):
- Matrices, Loops, and Functions in Matlab

Session 11 (Thursday, Sep 27):
- Solving linear equations
- Solving nonlinear equations: Linearization

Homework 6 (due: Oct 4)

Week 7

Session 12 (Tuesday, Oct 2):
- Solving nonlinear equations

Session 13 (Thursday, Oct 4):

    - Introduction to LyX

    - Unconstrained Optimization

Homework 7 (due: Oct 9)

Week 8

Session 14 (Tuesday, Oct 9):

    - Constrained Optimization

    - Speeding up your code, UF's computing resources, HiPerGator

Session 15 (Thursday, Oct 11):

Final Exam