

# ECON 3818-030

## INTRODUCTION TO STATISTICS WITH COMPUTER APPLICATIONS

Fall 2018

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| <b>Instructor:</b>   | Ali Almelhem                                                     | <b>Time:</b>   | Tues & Thurs 12:30pm – 1:45pm |
| <b>Email:</b>        | <a href="mailto:alal7557@colorado.edu">alal7557@colorado.edu</a> | <b>Room:</b>   | ECON 117                      |
| <b>Office Hours:</b> | Tues & Wed 10:30am – 12:00pm<br><i>or by appointment</i>         | <b>Office:</b> | ECON 304                      |

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| <b>TA:</b>         | Youngeun Choi                                                    | <b>Office Hours:</b> | Mon 10:30am – 12:00pm <i>and</i>                  |
| <b>Recitation:</b> | Tues 5:00pm – 5:50pm <i>or</i><br>Thurs 8:00am – 8:50am          |                      | Thurs 3:20pm – 4:50pm<br><i>or by appointment</i> |
| <b>Email:</b>      | <a href="mailto:yoch9823@colorado.edu">yoch9823@colorado.edu</a> | <b>Office:</b>       | ECON 309B                                         |

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**“The sexy job in the next ten years will be statisticians. Because now we really do have essentially free and ubiquitous data. So the complimentary factor is the ability to understand that data and extract value from it. – Hal Varian, Chief Economist at Google, January 2009”**

### Why Study Statistics?

From medical studies to research experiments, from satellites continuously orbiting the globe to ubiquitous social network sites like Facebook or LinkedIn, from polling organizations to United Nations observers, data are being collected everywhere and all the time. Knowledge in statistics provides you with the necessary tools and conceptual foundations in quantitative reasoning to extract information intelligently from this sea of data.

We live in an information age. Computers allow us to collect and store information in quantities that previously would not even have been dreamed of. What is this information? It might be costs, values, sales volumes, measurements, ratings, distances, prices, percentages, counts, times, or market shares. But raw, undigested data stored on computer disks is of no use until we can start to make sense of it. Statistics is the human side of the computer revolution, an information science, the science (and art!) of extracting meaning from seemingly incomprehensible data. In your future life and career, you will need to be able to make good use of such information to make sound decisions.

## 1 Course Information

**Course Websites:** <https://learn.colorado.edu/>, [sapling.com](https://www.sapling.com)

**Required Textbook:** David S. Moore, William I. Notz, and Michael A. Fligner, *The Basic Practice of Statistics*, W. H. Freeman, 8th ed., 2017.

**Prerequisites:** ECON 2010, ECON 2020, and either ECON 1088 or MATH 1081 or MATH 1300 or MATH 1310 or APPM 1350 (all minimum grade C-).

**Access to Sapling** Access to Online Homework and Textbook via <http://www.saplinglearning.com/>. This course requires a keycode for access. The keycode is your instructor's last name in lower case letters.

**Computer Application: R** is a free programming language available on Mac, Windows, and Unix operating systems. It is pre-installed on most University computer labs and downloadable from the internet. Every other week or so we will spend time in class to work on **R** exercises through the **RStudio** interface. We will do a brief introduction in class during the first week, but you are responsible for knowing the language syntax otherwise. Thankfully **R** has fantastic documentation in the base installation.

## 2 Course Policies

### General policies

- *No makeup homework assignments or exams will be given.*
- No late homework assignments will be accepted under any circumstances.
- It is the student's responsibility to inform me of any accommodations two weeks before an exam.
- Please allow 24 hours for me to respond to emails. I will not discuss grades over email per FERPA guidelines.
- You will only be allowed the use of a basic statistical calculator during an exam (graphing calculators and **R** are not allowed on exams).

### Grades

- **Distribution:** Below is the weight given to each of the assignments you are expected to complete:

|                    |     |            |     |
|--------------------|-----|------------|-----|
| Recitation         | 10% | Midterm 1  | 20% |
| Sapling Homework   | 10% | Midterm 2  | 20% |
| <b>R</b> Exercises | 10% | Final Exam | 30% |
| Extra Credit       | 5%  |            |     |

- **Reporting:** Grades will be uploaded to D2L as assignments are graded.
- **Curving:** Midterms *may* be curved individually, and a curve *may* be applied to the overall course grade to conform to departmental standards. I will automatically increase final course grades that are 0.5% below any grade cutoff after any final grading curve has been applied.
- **Letter Grade Cutoffs:** Below is the letter grade you will receive for the final score given in the class:

|           |    |         |    |         |    |         |    |             |   |
|-----------|----|---------|----|---------|----|---------|----|-------------|---|
| $\geq 93$ | A  | 87-89.9 | B+ | 77-79.9 | C+ | 67-69.9 | D+ | $\leq 59.9$ | F |
| 90-92.9   | A- | 83-86.9 | B  | 73-76.9 | C  | 63-66.9 | D  |             |   |
|           |    | 80-82.9 | B- | 70-72.9 | C- | 60-62.9 | D- |             |   |

- **Grade Adjustments:** Other than the 0.5% bump discussed above, *I will not grant any request to increase your grade to meet a certain cutoff*. You will receive the grade that *you* earned throughout the course. If you are concerned about your grade(s) you should immediately come talk to me. I will do everything I can to help you be successful in this course.

## Assignments

- **Sapling Homework:** There will be a brief problem set assignment every week. It will be due each Sunday at midnight. You are responsible for knowing when homework is due. Late homework will not be accepted. Your lowest homework grade will be dropped.
- **R Exercises:** There will be five simple assignments for you to complete in **R** and one data project. We will work on each one in class the week before the assignment is due. The data project will give you hands on experience cultivating and analyzing a data set of your choice. The first exercise will not be graded. The remaining 4 exercises and data project are each 2% of your final grade.
- **Recitation:** This is a four credit course. Recitation attendance is mandatory. Your TA is responsible for your recitation grade (**10%**) . The TA for recitation is PhD student Youngeun Choi. There is no recitation the first week of the semester. Recitation times and meeting locations are on myCU. Make sure you attend the correct recitation.
- **Extra Credit:** The *only* extra credit opportunity is through iClicker questions during lecture. A maximum of five percent (**5%**) will be added to your grade for clicker participation and correctness. You must register your iClicker to receive credit. <http://www.colorado.edu/oit/tutorial/cuclickers-iclicker-remote-registration>

## Exams

- **Midterms:** Midterms will be predominately multiple choice with one or two free response questions. You are allowed a 3x5" index card of hand written notes for reference during the exam. You will also be allowed to bring any tables of values relevant to the topic(s) being tested.
- **Final Exam:** The final exam is cumulative. The exam date and location is on myCUinfo.
- Partial credit will be awarded wherever possible on all exams.

## Cheating

If you are caught cheating in any fashion (on exams or homework) you will be given an *F* for the semester and your case will be reported to the Honor Code Council for review.

## 3 University Policies

- **DISABILITY POLICY:** I am committed to providing everyone the support and services needed to participate in this course. If you qualify for accommodations because of a disability, please submit to your instructor a letter from Disability Services in a timely manner so that your needs can be addressed. Disability Services determines accommodations based on documented disabilities. Contact Disability Services at 303-492-8671 or by e-mail at [dsinfo@colorado.edu](mailto:dsinfo@colorado.edu).

- **HONOR CODE:** Students of the University of Colorado at Boulder are responsible for knowing and adhering to the academic integrity policy of this institution. Violations of this policy may include: cheating, plagiarism, aid of academic dishonesty, fabrication, lying, bribery, and threatening behavior. Incidents of academic misconduct will be reported to the Honor Code Council (honor@colorado.edu; 303-725-2273). Students who are found to be in violation of the academic integrity policy will be subject to both academic sanctions from myself and non-academic sanctions (including but not limited to university probation, suspension, or expulsion).
- **RELIGIOUS OBSERVATION POLICY:** Campus policy regarding religious observances requires that faculty make every effort to reasonably and fairly deal with all students who, because of religious obligations, have conflicts with scheduled exams, assignments, or required attendance. If you have a conflict, please make arrangements with me no later than the first week of the semester.
- **CODE OF BEHAVIOR POLICY:** Students and faculty each have responsibility for maintaining an appropriate learning environment. Students who fail to adhere to such behavioral standards may be subject to discipline. Faculty has the professional responsibility to treat all students with understanding, dignity and respect, to guide classroom discussion and to set reasonable limits on the manner in which we express opinions. Professional courtesy and sensitivity are especially important with respect to individuals and topics dealing with differences or race, culture, religion, politics, sexual orientation, gender variance and nationalities.
- **DISCRIMINATION AND HARASSMENT POLICY:** CU Boulder's policy on Discrimination and Harassment can be found on the university website. The policy on Sexual Harassment and on Amorous Relationships applies to all students, staff and faculty. Any student, staff or faculty member who believes s/he has been the subject of discrimination or harassment based upon race, color, national origin, sex, age, disability, religion, sexual orientation, or veteran status should contact the Office of Discrimination and Harassment (ODH) at 303-492-2127 or the Office of Judicial Affairs at 303-492-5550. Information about the ODH and the campus discrimination and harassment resources can be obtained at <http://www.colorado.edu/odh>.

## 4 Tentative Schedule

| Week | Dates     | Content                                                                                                                                                                                                                                                                                                           |
|------|-----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1    | Aug 27-31 | <ul style="list-style-type: none"> <li>• Topics: Administration, Population vs. Sample, Introduction to <b>R</b></li> <li>• Chapters: 1, 2</li> <li>• Due: Homework Ch 1 &amp; 2, Sunday at midnight</li> </ul>                                                                                                   |
| 2    | Sep 3-7   | <ul style="list-style-type: none"> <li>• Topics: What is Probability, Random Variables, Probability Rules</li> <li>• Chapters: 12, 13</li> <li>• Due: Homework Ch 12 &amp; 13, Sunday at midnight</li> <li>• Due: <b>R assignment 1, Thursday in class</b></li> <li>• <b>No class Labor Day, Sep 3</b></li> </ul> |
| 3    | Sep 10-14 | <ul style="list-style-type: none"> <li>• Topics: Binomial Distribution, Normal Distribution,</li> <li>• Chapters: 14, 3</li> <li>• Due: Homework Ch 14 &amp; 3, Sunday at midnight</li> </ul>                                                                                                                     |

|    |              |                                                                                                                                                                                                                                                                                |
|----|--------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 4  | Sep 17-21    | <ul style="list-style-type: none"> <li>• Topics: Mathematical Expectations, Variance, Data Generation</li> <li>• Chapters: Expectations Handout, 8, 9</li> <li>• Homework Ch 8 &amp; 9, Sunday at midnight</li> <li>• Due: <b>R assignment 2, Thursday in class</b></li> </ul> |
| 5  | Sep 24-28    | <ul style="list-style-type: none"> <li>• Topics: <b>Midterm 1</b>, Sampling Distributions</li> <li>• Chapters: 15</li> <li>• <b>Midterm 1, Thursday in class</b></li> </ul>                                                                                                    |
| 6  | Oct 1-5      | <ul style="list-style-type: none"> <li>• Topics: Estimation, Central Limit Theorem, Convergence</li> <li>• Chapters: 15</li> <li>• Due: Homework Ch 15, Sunday at midnight</li> </ul>                                                                                          |
| 7  | Oct 8-12     | <ul style="list-style-type: none"> <li>• Topics: Confidence Intervals, Intro to Hypothesis Testing</li> <li>• Chapters: 16, 17</li> <li>• Due: Homework Ch 16 &amp; 17, Sunday at midnight</li> </ul>                                                                          |
| 8  | Oct 15-19    | <ul style="list-style-type: none"> <li>• Topics: <math>p</math>-values, Size, Power, Inference</li> <li>• Chapters: 17, 18</li> <li>• Homework Ch 17 &amp; 18, Sunday at midnight</li> <li>• Due: <b>R assignment 3, Thursday in class</b></li> </ul>                          |
| 9  | Oct 22-26    | <ul style="list-style-type: none"> <li>• Topics: <math>t</math>-distribution, Single Sample Uses of <math>t</math>-distribution</li> <li>• Chapters: 20</li> <li>• Due: Homework Ch 20, Sunday at midnight</li> </ul>                                                          |
| 10 | Oct 29-Nov 2 | <ul style="list-style-type: none"> <li>• Topics: Two Sample Uses of <math>t</math>-distribution, <b>Midterm 2</b></li> <li>• Chapters: 20, 21</li> <li>• Due: Homework Ch 21, Sunday at midnight</li> <li>• <b>Midterm 2, Thursday in class</b></li> </ul>                     |
| 11 | Nov 5-9      | <ul style="list-style-type: none"> <li>• Topics: Tests of Proportions, Covariance &amp; Correlation</li> <li>• Chapters: 22, 23, 4</li> <li>• Due: Homework Ch 22 &amp; 23, Sunday at midnight</li> <li>• Due: <b>R assignment 4, Thursday in class</b></li> </ul>             |
| 12 | Nov 12-16    | <ul style="list-style-type: none"> <li>• Topics: Intro to Regression, <b>R Project</b></li> <li>• Chapters: 4, 5</li> <li>• Due: Homework Ch 4 &amp; 5, Sunday at midnight</li> </ul>                                                                                          |
|    | Nov 19-23    | <ul style="list-style-type: none"> <li>• <b>Thanksgiving break, no class.</b></li> </ul>                                                                                                                                                                                       |
| 13 | Nov 26-30    | <ul style="list-style-type: none"> <li>• Topics: Least Squares, <math>\chi^2</math>-distribution</li> <li>• Chapters: 6, 25</li> <li>• Due: Homework Ch 6 &amp; 25, Sunday at midnight</li> <li>• Due: <b>R Project, Thursday in class</b></li> </ul>                          |
| 14 | Dec 3-7      | <ul style="list-style-type: none"> <li>• Topics: Conditions, Estimation, and Hypothesis Testing in Regression</li> <li>• Chapters: 26</li> <li>• Due: Homework Ch 26, Sunday at midnight</li> </ul>                                                                            |
| 15 | Dec 10-13    | <ul style="list-style-type: none"> <li>• Topics: Categorical &amp; Interaction Models, ANOVA, Causal Inference</li> <li>• Chapters: 27, 29</li> <li>• Homework Ch 27 &amp; 29, Sunday at midnight</li> <li>• Due: <b>R assignment 5, Thursday in class</b></li> </ul>          |
|    | Dec 17       | <ul style="list-style-type: none"> <li>• <b>Final Exam: Mon, Dec 17 1:30pm – 4:00pm</b></li> </ul>                                                                                                                                                                             |