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Data Analysis & Management
Fall 2022

Thursday 6-8:40pm
CLJ 572

I. Course Information

Instructor Information

Instructor: Dr. Jason Silver

Email: jason.r.silver@rutgers.edu

Office: CLJ 579D

Office Hours: Tuesdays 1pm – 2pm; Thursdays 4pm – 5pm; or by appointment (Zoom)

Online Materials

The course page can be found on [Canvas](#).

All virtual meetings (including virtual office hours and class sessions, if needed) will take place at the following Zoom link:

<https://rutgers.zoom.us/j/926111?pwd=SEs2OGRGY1RBNTNPRzJIN2ZETmRNUT09>

Course Overview

An introduction to methods for analyzing quantitative criminal justice data. Emphasis is placed on understanding data in relation to key methodological concepts, including units of analysis, variables, measurement, and associations. It will teach strategies for presenting data patterns graphically, describing distributions and relationships through summary statistics, and drawing conclusions about sampled populations using inferential statistical methods, including statistical models. In doing so, it will teach methods for assessing univariate, bivariate, and multivariate patterns and relationships.

Course Learning Objectives

1. Define the main characteristics of research designs.
2. Distinguish the levels of measurements and types of variables.
3. Choose, apply, and correctly interpret summary measures.
4. Visualize distributions of continuous and categorical variables.
5. Calculate and interpret measures of association.
6. Explain the principles of statistical inference.
7. Test hypotheses using bivariate analytic techniques.
8. Conduct basic statistical analyses by hand and using computer software.

Required Readings

- *OnlineStatBook* (free online textbook)
 - <https://onlinestatbook.com/>
- Other online materials, to be posted to Canvas
- *Stat Spotting: A Field Guide to Identifying Dubious Data* (2013) by Joel Best
 - PDFs posted to Canvas
 - Searchable book available through Rutgers Library

You do NOT need to purchase any books for this course.

Course Structure

Course material will be delivered via lectures with in-class activities. Knowledge of course material will be assessed through in-class participation activities and applied data analysis assignments. Readings will be assigned each week. All assignments are due at 11:59pm on the specified date.

Optional practice problem sets will also be available on Canvas each week. These will not be graded but may provide an additional opportunity to practice the material outside of class.

II. Course Schedule

Date	Required Readings (OSB = OnlineStatBook)	Assignments Due
Week 1: Introduction 9/8		Course Survey Due <u>Tuesday, 9/13</u>
Week 2 Data Analysis Basics 9/15	<ul style="list-style-type: none">• What are statistics? (<i>OSB Introduction, A</i>)• Importance of statistics (<i>OSB Introduction, B</i>)• https://courses.lumenlearning.com/boundless-statistics/chapter/populations-and-samples/• https://conjointly.com/kb/unit-of-analysis/• Variables (<i>OSB Introduction, F</i>)• Levels of measurement (<i>OSB Introduction, H1</i>)• Summation notation (<i>OSB Introduction, J</i>)• <i>Stat-Spotting Part 1 (A-B)</i>	

Week 3 Distributions 9/22	<ul style="list-style-type: none"> • Descriptive statistics (<i>OSB Introduction, C</i>) • https://www.mathsisfun.com/data/frequency-distribution.html • Qualitative variables (<i>OSB Graphing Distributions, A</i>) • Line graphs (<i>OSB Graphing Distributions, B7</i>) • Histograms (<i>OSB Graphing Distributions, B2</i>) • https://www.dummies.com/education/math/statistics/how-to-identify-skew-and-symmetry-in-a-statistical-histogram/ • <i>Stat-Spotting, Part 2 (C-D)</i> 	
Week 4 Measures of Central Tendency and Variability 9/29	<ul style="list-style-type: none"> • What is central tendency (<i>OSB Summarizing Distributions, 3</i>) • Measures of central tendency (<i>OSB Summarizing Distributions, 4</i>) • https://statisticsbyjim.com/basics/measures-central-tendency-mean-median-mode/ • Measures of variability (<i>OSB Summarizing Distributions, 13</i>) • <i>Stat-Spotting, Part 2 (E-F)</i> 	Analysis #1 Assigned
Week 5 Probability 10/6	<ul style="list-style-type: none"> • Introduction (<i>OSB Probability, A</i>) • Basic concepts (<i>OSB Probability, B</i>) • https://stattrek.com/probability/probability-distribution • Binomial distribution (<i>OSB Probability, G</i>) • Base rates (<i>OSB Probability, L</i>) • <i>Stat-Spotting, Part 2 (G-H)</i> 	Analysis #1 Due 10/6
Week 6 Normal Distributions 10/13	<ul style="list-style-type: none"> • Introduction (<i>OSB Normal Distributions, A</i>) • History (<i>OSB Normal Distributions, B</i>) • Areas of normal distributions (<i>OSB Normal Distributions, C</i>) • Standard normal distribution (<i>OSB Normal Distributions, E</i>) • <i>Stat-Spotting, Part 2 (I)</i> 	
Week 7 Sampling Distributions 10/20	<ul style="list-style-type: none"> • Inferential statistics (<i>OSB Introduction, D</i>) • Introduction (<i>OSB Sampling Distributions, A</i>) • https://statisticsbyjim.com/basics/sample-statistics-wrong/ • Sampling distribution of the mean (<i>OSB Sampling Distributions, E</i>) 	
Week 8 Confidence Intervals 10/27	<ul style="list-style-type: none"> • Introduction to estimation (<i>OSB Estimation, A</i>) • https://blog.minitab.com/en/statistics-and-quality-data-analysis/what-are-degrees-of-freedom-in-statistics • T Distribution (<i>OSB Estimation, E3</i>) • https://www.simplypsychology.org/confidence-interval.html 	Analysis #2 Assigned
Week 9 Hypothesis Testing 11/3	<ul style="list-style-type: none"> • Introduction (<i>OSB Logic of Hypothesis Testing, A</i>) • Significance testing (<i>OSB Logic of Hypothesis Testing, B</i>) • Interpreting significant results (<i>OSB Logic of Hypothesis Testing, E</i>) • Interpreting non-significant results (<i>OSB Logic of Hypothesis Testing, F</i>) • Steps in hypothesis testing (<i>OSB Logic of Hypothesis Testing, G</i>) • Significance testing and confidence intervals (<i>OSB Logic of Hypothesis Testing, H</i>) • Misconceptions (<i>OSB Logic of Hypothesis Testing, I</i>) 	Analysis #2 Due 11/3
Week 10 Comparing Two Means 11/10	<ul style="list-style-type: none"> • Difference between two means (<i>OSB Tests of Means, C</i>) • Type I and Type II errors (<i>OSB Logic of Hypothesis Testing, C</i>) • One- and two-tailed tests (<i>OSB Logic of Hypothesis Testing, D</i>) 	

Week 11 Comparing Three or More Means 11/17	<ul style="list-style-type: none"> • Pairwise comparisons among means (<i>OSB Tests of Means</i>, E) • Introduction (<i>OSB Analysis of Variance</i>, A) • ANOVA designs (<i>OSB Analysis of Variance</i>, B) • https://www.analyticsvidhya.com/blog/2018/01/anova-analysis-of-variance/ 	Analysis #3 Assigned
Week 12 11/22 Chi Square Tests CLASS MEETS ON TUESDAY (VIRTUAL)	<ul style="list-style-type: none"> • https://www.mathsisfun.com/data/chi-square-test.html • Goodness of Fit (<i>OSB Chi Square</i>, B) 	
Week 13 Correlations 12/1	<ul style="list-style-type: none"> • Introduction to bivariate data (<i>OSB Describing Bivariate Data</i>, A) • Values of the Pearson correlation (<i>OSB Describing Bivariate Data</i>, B) • Properties of Pearson's r (<i>OSB Describing Bivariate Data</i>, D) • Computing Pearson's r (<i>OSB Describing Bivariate Data</i>, E) • https://www.scribbr.com/statistics/pearson-correlation-coefficient/ 	Analysis #3 Due 12/1
Week 14 Regression 12/8	<ul style="list-style-type: none"> • Introduction to simple linear regression (<i>OSB Regression</i>, A) • Inferential statistics for b and r (<i>OSB Regression</i>, E) • Regression toward the mean (<i>OSB Regression</i>, G) • https://www.spss-tutorials.com/multiple-linear-regression/ 	Analysis #4 Assigned
FINALS WEEK 12/16-12/23	NO CLASS: FINALS WEEK	Analysis #4 Due Tuesday, 12/20

III. Course Assessment and Grading

Grades are based on 500 possible points: four applied data analysis assignments (4 x 100 points each = 400 points) and ten in-class participation days (10 x 10 points each = 100 points).

Applied Data Analysis Assignments (4 x 100 points each = 400 points)

The majority (80%) of the points in the course will come from four applied data analysis assignments. In these assignments, you will be asked to perform statistical analyses using software (e.g., Excel, Stata), then to submit a short (~1-2 page) explanation of your results. Applied data analysis assignments may require software available through the Rutgers virtual computer labs (and available in campus computer labs). You will have one week to complete each assignment. The topics covered by each assignment are listed below. Additional details will be provided in class.

Analysis #1: Descriptive Statistics (due October 6th)

Analysis #2: Confidence Intervals (due November 3st)

Analysis #3: Comparing Means (due December 1st)

Analysis #4: Measures of Association (due December 20th during finals week)

Note: **10 points** of **Assignment #1** will come from the Course Survey (**due 9/13**). I use this survey to gather data about the current class for use in statistical examples throughout the semester.

In-Class Participation Activities (10 x 10 points each = 100 points)

The remainder (20%) of the points in the course will come from in-class participation activities. You are required to participate in **ten** class periods over the course of the semester. This means that you can miss **four** class periods without any penalty.

In-class participation activities will differ from week to week, but may include: reading or knowledge checks, practice statistical analyses, analysis of media materials, responses to discussion questions, note sharing, and more. Most classes will include more than activity.

Note that some in-class activities will be graded based on accuracy, while others will count toward your grade based solely on effort and/or completion.

OPTIONAL Weekly Problem Sets (Not Graded)

Weekly problem sets (from past semesters) will be made available on Canvas. These problem sets include a variety of components, including conceptual questions, calculations, and applications of the material. You will be able to see the answers as soon as you submit the problem set.

The problem sets will cover material that you will need to know for the applied data analysis assignments as well as any graded participation activities. If you find yourself struggling in the course, I strongly recommend using the problem sets to practice the material. I am also happy to go over questions on the problem sets during office hours.

Extra Credit

Find a mistake in the lecture materials (2 points per mistake). I am bad at writing and talking at the same time, and I am also bad at proofreading. This means you will occasionally spot mistakes in the course materials. The first person to point out a particular mistake to me, either in class or by email, will receive **2 points of extra credit**.

Note that you can only receive extra credit for mistakes that are relevant to the substantive course material, and I reserve the right to decide whether a mistake warrants extra credit. In other words, you will get extra credit for noticing a formula or conclusion is wrong, but you won't get extra credit for telling me I spelled "Thursday" wrong on the syllabus.

Grading Scale

Grade	Percent Score	Points
A	90% - 100%	448 – 500 points
B+	87% - 89%	433 – 447 points
B	80% - 86%	398 – 432 points
C+	77% - 79%	383 – 397 points
C	70% - 76%	348 – 382 points
D	60% - 69%	298 – 347 points
F	0% - 50%	0 – 297 points

IV. Course Policies

Late or Missing Assignment Policy

Late Work. One assignment can be turned in late without any penalty. Additional late assignments will be penalized by one letter grade (10%) for each day they are late. The penalty will max out at 5 days, meaning that the most you can lose for late work is 50%.

Missed Work. Absences resulting in missed work or exams will be excused for personal or family emergencies. Note that I may ask you to provide documentation. Makeup work or extended deadlines will be provided as needed.

Technology

Please plan on bringing a tablet or laptop to class each day, as some in-class activities will involve accessing the virtual computer lab. If this is not possible for any reason (cost, broken laptop, sharing with friends/family, left it at home, etc.), just let me know and we can figure something out.

Your Rutgers email account is the official form of communication for this class and you should check it regularly. You are responsible for all information about the class sent to that email address. Please **only use your Rutgers email**. My hungry hungry spam filter sometimes eats emails from non-Rutgers email addresses.

As a general rule, I will respond to emails within 24 hours (and usually sooner). If you don't hear from me within that time frame, please assume I didn't receive your first email and try again.

If (when) the class is conducted virtually, lectures will be uploaded in advance and class meeting times will be set aside for review, Q&A, or problem set help.

It is recommended that you visit: <https://runit.rutgers.edu/technology-launch-pad/>

Academic Integrity

As a member of the Rutgers University community you are not to engage in any academic dishonesty. You are responsible for adhering to basic academic standards of honesty and integrity as outlined in the Rutgers University Policy on Academic Integrity for Undergraduate and Graduate Students <http://studentconduct.rutgers.edu/academic-integrity>.

Your academic work should be the result of your own individual effort, you should not allow other students to use your work, and you are required to recognize and reference any material that is not your own. Violations of the university's policy will result in appropriate action.

Accommodation and Support Statement

Rutgers University Newark (RU-N) is committed to the creation of an inclusive and safe learning environment for all students and the University as a whole. RU-N has identified the following resources to further the mission of access and support:

- **For Individuals with Disabilities:** The Office of Disability Services (ODS) is responsible for the determination of appropriate accommodations for students who encounter barriers due to disability. Once a student has completed the ODS process (registration, initial appointment, and submitted documentation) and reasonable accommodations are determined to be necessary and appropriate, a Letter of Accommodation (LOA) will be provided. The LOA must be given to each course instructor by the student and followed up with a discussion. This should be done as early in the semester as possible as accommodations are not retroactive. More information can be found at ods.rutgers.edu. Contact ODS at (973)353-5375 or via email at ods@newark.rutgers.edu.
- **For Individuals who are Pregnant:** The Office of Title IX and ADA Compliance is available to assist with any concerns or potential accommodations related to pregnancy. Students may contact the Office of Title IX and ADA Compliance at (973) 353-1906 or via email at TitleIX@newark.rutgers.edu.
- **For Absence Verification:** The Office of the Dean of Students can provide assistance for absences related to religious observance, emergency or unavoidable conflict (illness, personal or family emergency, etc.). Students should refer to University Policy 10.2.7 for information about expectations and responsibilities. The Office of the Dean of Students can be contacted by calling (973) 353-5063 or emailing deanofstudents@newark.rutgers.edu.
- **For Individuals with temporary conditions/injuries:** The Office of the Dean of Students can assist students who are experiencing a temporary condition or injury (broken or sprained limbs, concussions, or recovery from surgery). Students experiencing a temporary condition or injury should submit a request using the following link: <https://temporaryconditions.rutgers.edu>.
- **For English as a Second Language (ESL):** The Program in American Language Studies (PALS) can support students experiencing difficulty in courses due to English as a second language (ESL) and can be reached by emailing PALS@newark.rutgers.edu to discuss potential supports.

- **For Gender or Sex-Based Discrimination or Harassment:** The Office of Title IX and ADA Compliance can assist students who are experiencing any form of gender or sex-based discrimination or harassment, including sexual assault, sexual harassment, relationship violence, or stalking. Students can report an incident to the Office of Title IX and ADA Compliance by calling (973) 353-1906 or emailing TitleIX@newark.rutgers.edu. Incidents may also be reported by using the following link: tinyurl.com/RUNReportingForm. For more information, students should refer to the University's Student Policy Prohibiting Sexual Harassment, Sexual Violence, Relationship Violence, Stalking and Related Misconduct located at <http://compliance.rutgers.edu/title-ix/about-title-ix/title-ix-policies/>.
- **For support related to interpersonal violence:** The Office for Violence Prevention and Victim Assistance can provide any student with confidential support. The office is a **confidential resource** and does *not* have a reporting obligation to report information to the University's Title IX Coordinator. Students can contact the office by calling (973) 353-1918 or emailing run.vpva@rutgers.edu. There is also a confidential text-based line available to students; students can text (973) 339-0734 for support.
- **For Crisis and Concerns:** The Campus Awareness Response and Education (CARE) Team works with students in crisis to develop a support plan to address personal situations that might impact their academic performance. Students, faculty and staff may contact the CARE Team by using the following link: tinyurl.com/RUNCARE or emailing careteam@rutgers.edu.
- **For Stress, Worry, or Concerns about Well-being:** The Counseling Center has confidential therapists available to support students. Students should reach out to the Counseling Center to schedule an appointment: counseling@newark.rutgers.edu or (973) 353-5805. If you are not quite ready to make an appointment with a therapist but are interested in self-help, check out *TAO at Rutgers-Newark* for an easy, web-based approach to self-care and support: <https://tinyurl.com/RUN-TAO>.

For emergencies, call 911 or contact Rutgers University Police Department (RUPD) by calling (973) 353-5111.

Other Useful Links

- Writing: <https://myrun.newark.rutgers.edu/writing-center>
- Health: <https://www.newark.rutgers.edu/health-wellness-students>
- Harassment: <https://sexualharassment.rutgers.edu/>
- Financial need:
- Student Code of Conduct: <http://studentconduct.rutgers.edu/student-conduct-processes/university-code-of-student-conduct/>