

SLHS 1302 Syllabus Spring 2022

University of Minnesota

Department of Speech-Language-Hearing Sciences, College of Liberal Arts

Course title: Rate Your World: Quantifying Judgments of Human Behavior

Term: Spring, 2022

Dates: 01/18/2022 - 05/11/2022

Credits: 3 credits

Lectures on T, Th, 10:10-11:00 am Shevlin 110 & online discussion

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Instructor online office hours: T Th. 11:10 A.M. – 12:00 P.M. or by individual appointment

Course web site: <https://canvas.umn.edu/courses/288578>

Course Description

This 3-credit non-discipline-specific course meets the UMN liberal education requirements in the area of mathematical thinking. As specified on the university web site, the courses that were approved to fulfill the liberal education requirements aim to “guide you through the ‘why’ and ‘how’ of different academic disciplines” and to “equip you with a broad range of tools that you can use to approach problems in your everyday life and work, and ultimately to make a positive difference in your communities, your society, your state, and your world.” This course was initially developed by Professors Peggy Nelson and Leslie Glaze, and its contents have been substantially revised by Professor Yang Zhang to meet the requirements of the college curriculum review committee. Current materials for the course are based in part on a course at another Big Ten University, Ohio State, which was originally developed by Professor Mary E Beckman.

Why is mathematical thinking an essential component of liberal education requirements?

It is because of the increasing awareness and need of its importance in the Information Age. We are bombarded with information at an almost alarming rate. Having strong skills in quantitative thinking and analysis are crucial for digesting the data, from opinion polls to the results of clinical investigations of drugs. Without strong mathematical thinking skills, people are vulnerable to being manipulated by those who can present data in an attractive but misleading or incomplete way. This course is organized around four themes:

- (a) Data and variables.** On a scale of one to ten, how much do you understand about rating scales? Indeed, when it is appropriate to measure a variable—like understanding—with a ten-point scale, and when is it appropriate to measure it some other way? What are the kinds of mathematical operations that we can perform on different rating scales? What are the consequences of using the wrong rating scales or applying inappropriate analyses of them?
- (b) Distributions, probability, and hypothesis testing.** If we average the fundamental frequency (= the physical dimension we perceive as pitch) of the voices of the men and the women in this room, they will likely be different. How do we know this? How can we meaningfully compare groups of people on a variable and ascertain whether they differ authentically or by chance?
- (c) Inferential statistics with linear regression models.** If one looks at the population of the Earth over

time, one sees that recently it has grown much more rapidly than it did even as recently as the 1800s. Such nonlinearities are extremely common in the data that people are exposed to on a daily basis, such as data on climate change, changing political attitudes, and income disparities. What mathematical tools can we use to visualize, understand, analyze, transform, and explain these nonlinearities using the generalized linear regression model?

(d) Term project on quantifying and evaluating human behavior data. How can we put together the knowledge and skills to help people be better critics and consumers of numbers? Examples will be drawn from communication sciences as well as social sciences using both physical and psychological measures.

The examples and exercises in the course are of diversified sources in order to illustrate the mathematical and statistical concepts to address basic questions on human behavior. A very big part of this course will be learning to use the R statistical software package (<http://www.r-proj.org>). R is free open source software for analyzing and visualizing data. Students are strongly encouraged to download R to their computers, as we will be using it for nearly every assignment in this course. R was written by programmers. It does not have the kind of point-clicky interface that the Microsoft and Apple Corporations have socialized people to depend on. However, once one develops some basic fluency with R's command-line interface, one will find it an extremely useful, powerful, and (best of all), FREE analysis tool to summarize and visualize qualitative and quantitative data of various kinds, and implement formal inferential statistical procedure to run hypothesis testing.

We will use different numerical scales (nominal, ordinal, interval, exponential) and learn to describe and discuss graph results accurately using R to do both descriptive and inferential statistics. The assignments will ask students to calculate central tendency (mean, median, mode), dispersion (range, scatter, quartile cutoffs, standard deviation), and test hypotheses using compound probability, binomial test, and t-test. In assignments, students will make observations, collect data, analyze results, plot trends, and interpret mathematical data. Throughout the course, students will have hands-on problem-solving and data visualization experiences in small groups that will allow peer-based learning to supplement the lecture information.

Student Learning Outcomes

The University of Minnesota recognizes seven student learning outcomes, as described at <http://policy.umn.edu/Policies/Education/Education/UNDERGRADLEARNING.html> These are the intended outcomes of receiving a bachelor's degree at the University. This course endeavors to address all of these outcomes, and focuses specifically on two of them:

1. Have mastered a body of knowledge and a mode of inquiry. We are bombarded with media on a daily basis. Whether we are reading BuzzFeed, CNN, or the New England Journal of Medicine, we are bombarded with numbers. Being an effective media consumer means understanding how to best analyze data, critically evaluating the analyses that we read. This course fosters knowledge of the very bases of mathematical measurement and analysis of human behavior. Students will learn these skills from the 'ground up', first learning the foundations of why we measure and analyze behavior the way we do, and later applying these analyses to new problems. At the end of this course students will thus have mastered a body of knowledge, and will have used it as a mode of inquiry to study new and interesting questions.

2. Can locate and critically evaluate information. The information that people are bombarded with on a daily basis varies in its quality. The very fact that a book with the title *How to Lie with Statistics* exists illustrates that mathematical analyses can be used to obfuscate as easily as they can be used to illuminate. Many of the most pressing political and social questions of our time (the best way to

foster economic growth, the underlying causes for global temperature increases) cannot be answered without a strong working knowledge of the mathematical underpinnings of different arguments. Part of this course will involve applying new expertise in mathematical modeling of human behavior to critiques of analyses presented in the media.

Course Materials

Required textbook (available online for free)

- Poldrack, Russell A. (2019). Statistical Thinking for the 21st Century. Stanford University. <https://statsthinking21.github.io/statsthinking21-core-site/>
- Lectures, notes and supplemental materials are available on the Canvas course web site.

Course structure

Lectures: The purpose of the lectures is to explain the basic concepts in statistics and provide examples to illustrate their applications. Students are required to study the lecture videos and slides online and participate in online activities to promote learning. Students are encouraged to ask questions and seek clarification or more examples using the discussion forum and office hours.

Assignments: The purpose of the online assignments is to reinforce and integrate the concepts introduced in class and continued in discussion group activities. Assignments require students to report information obtained by answering questions and reporting data using graphs and basic descriptive statistics.

To complete the assignments, students will upload electronic reports to the designated assignment box on course web site within specified time window after each project is assigned for each discussion section. Assignments sent by email will NOT be accepted. If there are technical issues in downloading and uploading your assignment on the course web site, please notify your TA.

A thorough walk-through of the assignments will be provided, and additional help will be provided to students to complete the assignments.

Three exams: There will be **three exams**. The exams will have True or False, multiple-choice and short-answer questions that focus on lecture materials and readings. Sample practice tests are provided on the Canvas web site. Students are strongly encouraged to familiarize themselves at least one week ahead to start preparing for each exam. Make-up opportunities will only be offered when students contact the instructor with legitimate justification such as a medical excuse documented for the dates in question. Examinations will be based on lecture materials.

Term Project on Quantifying and Evaluating Human Behavior Data:

Students will define and complete a human behavior analysis project. Additional details concerning this project will be provided. The term project will require three components:

- 1. Proposal:** state the research question with operational definitions of the human behavior you will analyze; identify scales
- 2. Presentation using Powerpoint:** summarize your project in Powerpoint slides for video presentation. The videos will be uploaded to a designated dropbox on the Canvas site.
- 3. Final Report:** a formal written report of your project

The term project requires students to select data from online sources. Sample resources include United

States Uniform Crime Report (<http://www.disastercenter.com/crime>), United States Department of Labor (<http://www.bls.gov>), Federal Statistics (<http://www.fedstats.gov>), and UN Data (<http://data.un.org/Default.aspx>).

Students are encouraged to synthesize and analyze local, national, and global issues. Due to the nature of complex data sets available in these open resources, students need to locate the information and variables relevant to their hypothesis/inquiry and discuss the potential problems or limitations in interpreting the statistical results and making inferences in terms of reliability and validity.

Students will receive timely feedback on all the assignments and every aspect of the term project (data resources, data selection, hypothesis formation, statistical analysis, data interpretation and presentation). Team work is encouraged to promote collaborative efforts in problem-solving for all activities in this course except the three exams.

Online Collaboration and Discussion: This course will heavily rely on discussion forum and office hours to provide support to students. Students are encouraged to form teams to work on the homework assignments including the final project. The instructor will have office hours online/in person and also be available via appointment to provide clarifications and support to students on a group or individual basis.

Grading

- Exams (3) (45%)
 - Assignments (6) (30%)
 - Quantifying Human Behavior Term Project including final presentation (1) (15%)
 - In-class/Online exercises (10%)
- Details on all assignments and evaluation methods are available on the course web site

Grades will be computed as follows:

A 100-93%	C+ 76-78%	F 59% and below
A- 90-92%	C 71-75%	
B+ 87-89%	C- 68-70%	
B 83-86%	D+ 65-67%	
B- 80-82%	D 60-65%	

Students enrolled for S/N grading option will need to achieve a C- or better (68%) to achieve an S.

Grades will be awarded in accordance with the University of Minnesota Senate Policy on grading, using these standards.

- A Achievement that is outstanding relative to the level necessary to meet course requirements.
- B Achievement that is significantly above the level necessary to meet course requirements.
- C Achievement that meets the course requirements in every respect.
- D Achievement that is worthy of credit even though it fails to meet fully the course requirements.
- F (or N) represents failure (or no credit) and signifies that the work was either (1) completed but at a level of achievement that is not worthy of credit, or (2) not completed and there was no agreement between the instructor and the student that the student would be awarded an I (see also I). Academic dishonesty in any portion of the academic work for a course shall be grounds for awarding a grade of F or N for the entire course.
- I (Incomplete) Assigned at the discretion of the instructor when, due to extraordinary circumstances, e.g. hospitalization, a student is prevented from completing the work of the course on time. Requires a written agreement between instructor and student. All assignments and

reports must be completed during the semester. A grade of “I” will **not** automatically be given to students who cannot hand in the assignments on the due dates. See more details on the university policy for incompletes at http://onestop.umn.edu/grades_and_transcripts/grades/incompletes.html

Instructor Feedback

Students are encouraged to seek feedback on assignments, exercises and exams in a timely manner. The instructor will respond to questions raised in person or posted online.

We encourage students to post general questions about the course on the Canvas discussion forum. Students are encouraged to contact the instructor to discuss questions or concerns about their course performance at the earliest possible date.

Technical Support

Students are responsible for accessing technological resources necessary for successful completion of academic responsibilities and assignments. The University of Minnesota provides technical resources in computer labs and tech stops across the campus. Tech support is available in person, through online chat, email, phone and text services. Call (612) 301-4357 (on campus, dial 1-HELP), email help@umn.edu or go to the [UMN IT help website](#) for more information.

- Canvas Support

Canvas is the course management system at the University of Minnesota. Support can be contacted through general tech support services or directly at canvas@umn.edu. Click on [Canvas Student Guides](#) for more information.

- Technology requirements and skills

All students are expected to have a minimum ability to use the following technologies: online course site navigation, discussion participation and assignment submission, Microsoft Office suite tools such as Word, PowerPoint and Excel (or equivalents), online collaboration and presentation tools as indicated by the instructor. Technical support, text directions, and video tutorials can be found through [LinkedIn Learning](#) or the UMN [IT help site](#). Your personal technology resources should be current enough to let you access and use these technologies. On campus [computer labs and learning spaces](#) are available.

- Student services and resources

The University of Minnesota [Academic Support and Tutoring website](#) and [Student Academic Support Services](#) offer a range of excellent support services. Please contact the [Center for Writing](#), or the [Libraries](#) for assistance with research and writing skills.

- FERPA and Student Privacy

In this class, our use of technology will make student names and emails visible within the course website, but only to other students in the same class. The University uses a secure, password-protected course website; however, if you have concerns, you can adjust settings in your online course profile to hide your email. If you are required to use any tool external to Canvas for learning activities or assignment completion, a link or description of privacy policies will be included in the directions provided in the course site.

Course Policies

- Scholastic Dishonesty

Students are expected to adhere to the University of Minnesota standards for academic integrity. Academic dishonesty in any portion of the academic work for a course shall be grounds for awarding a grade of F or N for the entire course.

You are expected to do your own academic work and cite sources as necessary. Failing to do so is scholastic dishonesty. Scholastic dishonesty means plagiarizing; cheating on assignments or examinations; engaging in unauthorized collaboration on academic work; taking, acquiring, or using test materials without faculty permission; submitting false or incomplete records of academic achievement; acting alone or in cooperation with another to falsify records or to obtain dishonestly grades, honors, awards, or professional endorsement; altering, forging, or misusing a University academic record; or fabricating or falsifying data, research procedures, or data analysis. ([Student Conduct Code handout](#))

If it is determined that a student has cheated, he or she may be given an "F" or an "N" for the course, and may face additional sanctions from the University. For additional information, please see the [University Policy Library Teaching and Learning: Instructor and Unit Responsibilities website](#).

The Office for Community Standards has compiled [a useful list of suggestions to avoid scholastic dishonesty](#). If you have additional questions, please clarify with your instructor for the course. Your instructor can respond to your specific questions regarding what would constitute scholastic dishonesty in the context of a particular class, e.g., whether collaboration on assignments is permitted, requirements and methods for citing sources, if electronic aids are permitted or prohibited during an exam.

Faculty at the University of Minnesota use a variety of safeguards against plagiarism, including electronic software designed to detect copying. To learn more about plagiarism, and to find tips on how to properly paraphrase someone's work, visit the [University Center for Writing Student Writing Support website](#).

- Student Conduct Code

The University seeks an environment that promotes academic achievement and integrity, that is protective of free inquiry, and that serves the educational mission of the University. Similarly, the University seeks a community that is free from violence, threats, and intimidation; that is respectful of the rights, opportunities, and welfare of students, faculty, staff, and guests of the University; and that does not threaten the physical or mental health or safety of members of the University community. As a student at the University you are expected adhere to [Board of Regents Policy Student Conduct Code](#).

Note that the conduct code specifically addresses disruptive classroom conduct, which means "engaging in behavior that substantially or repeatedly interrupts either the instructor's ability to teach or student learning. The classroom extends to any setting where a student is engaged in work toward academic credit or satisfaction of program-based requirements or related activities."

- Makeup Work for Legitimate Absences

Students will not be penalized for absence during the semester due to unavoidable or legitimate circumstances. Such circumstances include verified illness, participation in intercollegiate athletic events, subpoenas, jury duty, military service, bereavement, and religious observances. Such circumstances do not include voting in local, state, or national elections. For complete information, please see the [University Policy Library Makeup Work for Legitimate Absences website](#).

- Appropriate Student Use of Course Notes and Materials

Notes and recorded materials for the course are intended for personal use to facilitate the process of absorbing and integrating the educational experience. However, broadly disseminating class notes and materials beyond the classroom community or accepting compensation for taking and distributing classroom notes undermines instructor interests in their intellectual work product while not substantially furthering instructor and student interests in effective learning. Such actions violate shared norms and standards of the academic community. For more information, please see the [University Policy Library Teaching and Learning: Student Policies website](#).

- Sexual Harassment

"Sexual harassment" means unwelcome sexual advances, requests for sexual favors, and/or other verbal or physical conduct of a sexual nature. Such conduct has the purpose or effect of unreasonably interfering with an individual's work or academic performance or creating an intimidating, hostile, or offensive working or academic environment in any University activity or program. Such behavior is not acceptable in the University setting. For more information please see the [University Board of Regents Policy on Sexual Harassment](#).

- Equity, Diversity, Equal Opportunity, and Affirmative Action

The University provides equal access to and opportunity in its programs and facilities, without regard to race, color, creed, religion, national origin, gender, age, marital status, disability, public assistance status, veteran status, sexual orientation, gender identity, or gender expression. For more information see the [University Board of Regents Policy on Equity, Diversity, and Equal Opportunity](#).

- Disability Accommodations

The University of Minnesota is committed to advancing access for everyone. The Disability Resource Center (DRC) is the campus office that works with students with disabilities to provide and/or arrange reasonable accommodations.

Students who have, or think they may have, a disability (e.g. mental health, attentional, learning, vision, hearing, physical or systemic), are invited to contact the DRC to arrange a confidential discussion at 612-626-1333 (V/TTY) or ds@umn.edu.

Students registered with the DRC, who have a letter requesting accommodations, are encouraged to contact the instructor early in the semester to discuss accommodations outlined in their letter.

For more information see the [Disability Resource Center website](#).

- Accessibility of all technologies

All course content and technologies have been reviewed and updated for accessibility compliance. The online course site is set up to be accessible for screen readers. If you have any content or course technologies which need to be adapted please contact the disabilities office. They will let us know what adjustments to content or technologies need to be made.

- Student Mental Health and Stress Management

As a student you may experience a range of issues that can cause barriers to learning, such as strained relationships, increased anxiety, alcohol/drug problems, feeling down, difficulty concentrating and/or lack of motivation. These mental health concerns or stressful events may lead to diminished academic performance or reduce your ability to participate in daily activities. To view University of Minnesota services available to assist you with addressing these and other concerns you may be experiencing see the [University Student Mental Health website](#).

- Academic Freedom and Responsibility

Academic freedom is a cornerstone of the University. Within the scope and content of the course as defined by the instructor, it includes the freedom to discuss relevant matters in the classroom. Along with this freedom comes responsibility. Students are encouraged to develop the capacity for critical judgment and to engage in a sustained and independent search for truth. Students are free to take reasoned exception to the views offered in any course of study and to reserve judgment about matters of opinion, but they are responsible for learning the content of any course of study for which they are enrolled.

Reports of concerns about academic freedom are taken seriously, and there are individuals and offices available for help. Contact the instructor, the Department Chair (program director?), your adviser, the

associate dean for academic programs, or the Vice Provost for Faculty and Academic Affairs in the Office of the Provost. For more information see the [University Board of Regents Policy on Academic Freedom](#).

- Credits and Workload Expectations

It is expected that the academic work required of Graduate School and professional school students will exceed three hours per credit per week. For more information see the [University Policy Library Expected Student Academic Work per Credit website](#).

- **Course Revisions**

Each semester this course is revised based on student feedback as well as changes over time to reflect current knowledge required of graduates.

- **USE OF EMAIL AND COURSE WEB SITE**

In accordance with Academic/Administrative Policy 2.2.3, “A University assigned student email account shall be the University’s official means of communication with all students on the Twin Cities campus. *Students are responsible for all information sent to them via their University assigned email account and the designated course web site.* If a student chooses to forward their University email account, he or she is responsible for all information, including attachments, sent to any other email account.”

As a matter of good practice, *students are urged to check their UMN Email account at least once daily and also at least once over the weekend.*

THIS MATERIAL IS AVAILABLE IN ALTERNATIVE FORMATS ON REQUEST. PLEASE CONTACT THE INSTRUCTOR IF YOU REQUIRE AN ALTERNATIVE FORMAT.

The University of Minnesota is committed to the policy that all persons shall have equal access to its programs, facilities, and employment without regard to race, color, creed, religion, national origin, age, marital status, disability, public assistance status, veteran status, or sexual orientation

Course Schedule (Subject to change based on actual progress)

Date	Lecture	Discussion	Assignments
1/18-1/21	Unit 1. Data and Variables Chapter 1: Introduction Chapter 2: Working with data	Introduction to R software	Read book Chapters 1, 2 Assignment 0 (Practice; No turn in)
1/24-1/28	Chapter 3: Summarizing data Chapter 4: Data visualization	Numerical data with R	Read Chapters 3, 4 Assignment 1
1/31-2/4	Review & Exam 1	Numerical data with R	
2/7-2/11	Unit 2: Distributions, Probability and Hypothesis Testing	Probability with R	Read Chapter 6 Assignment 2
2/14-2/18	Chapter 6 : Probability	Probability with R	Read Chapter 7
2/21-2/25	Chapter 7: Sampling	Central tendency, mean, median, and histograms with R	Read Chapter 9 Assignment 3
2/28-3/4	Chapter 9: Hypothesis testing	Central tendency, mean, median, and histograms with R	Assignment 4
3/7-3/11	Spring break		
3/14-3/18	Review & Exam 2		
3/21-3/25	Unit 3: Inferential Statistics with Linear Regression Models Chapter 5: Fitting models to data Chapter 13: Modeling continuous relationships	<i>Brainstorming Term Project:</i> <i>1. define research question</i> <i>2. identify data and variables</i>	Read Chapters 5, 13 Assignment 5
3/28-4/1	Chapter 14: The General Linear Model Chapter 15: Comparing means	Scatter plot with R	Read Chapters 14, 15 Assignment 6
4/4-4/8	Review & Exam 3		
4/11-4/14	Unit 4: Term Project		Term project proposal due
4/18-4/22	Evaluating Research Evidence (Chapter 16)	Sample project and presentation	Project implementation
4/25-4/29	Quantifying and evaluating human behavior data Chapter 17		Project presentation
5/2-5/5	No class	May 2 (last day of instruction)	Term project written paper due

Note: The course schedule is tentative and subject to revision depending on actual course progress. See updates on course website.