Faculty of Health
Department of Psychology
PSYC 2021 M: STATISTICAL METHODS I
2022 Winter

Instructor and T.A. Information

Instructor	**Cathy (Xijuan) Zhang**
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Office Hour	TBA

TA	**TBA**
Email	TBA
Office Hour	TBA

Course Prerequisite(s): Course prerequisites are strictly enforced

- HH/PSYC 1010 6.00 (Introduction to Psychology), with a minimum grade of C when used as a prerequisite.

Course Credit Exclusions

Please refer to York Courses Website for a listing of any course credit exclusions.

Course website: eClass

All course materials will be available on the course eClass site.

Course Description

This course is usually the first course in statistics that most psychology (and other) majors take in university. This class will introduce you to the basic principles underlying statistical analyses in psychology and other social sciences areas. It will also prepare you for future statistics classes which will focus on more advanced techniques. More specifically, this course will introduce you to the type of variables utilized in psychology, two-variable correlation, and comparing two independent or paired-sample means. Null hypothesis significance testing will be introduced, however the focus will be on understanding relationships among variables. Data analysis using statistical software will be carried out with the open-source software R (www.r-project.org).

Program Learning Outcomes

Upon completion of this course, students should be able to:

1. Compute descriptive statistics and inferential statistics.
2. Interpret and report the results of descriptive statistics and inferential statistics.
3. Distinguish between the role of descriptive statistics and inferential statistics.
4. Run simple analyses using the computer programming language *R.*

Topics Covered

- Defining Key Statistical Terms
- Frequency Distributions

- Central Tendency
- Variability
- z-scores/Normal Distribution
- Probability
- Sampling Distribution
- Confidence Intervals
- Power
- Effect Size
- Hypothesis Testing
- Pearson's Correlation
- Chi-square: Goodness of Fit
- Chi-square: Test of Independence
- One-sample *t*-test
- Introduce independent and dependent designs

**Effect size is included as part of all inferential statistics covered in this course.*

Course Notes and Textbooks

Required lecture notes will be posted on eClass.

Required textbook: Navarro (2018): Learning statistics with R: A tutorial for psychology students and other beginners.

- It is an open source textbook that can be downloaded using the link https://open.umn.edu/opentextbooks/textbooks/559

Required youtube videos are at the end of the syllabus.

Recommended youtube videos will also be posted on eClass.

Additional Recommended textbook: Illowsky & Daen (2013): Introductory Statistics.

- Also an open source textbook that can be downloaded using the link https://openstax.org/details/books/introductory-statistics?Book%20details

Course Requirements and Assessment:

Final grades will be comprised of marks earned on:

1) Exams (Midterm: 25%; Final Exam: 35a%)
Midterm (October 18, 2021):
Final Exam (TBA): All course materials will be covered with more emphasis on the second half of the course.

2) Assignments (4 x 10%)
There will be four assignments for the course that will require you to analyze data (including using R) and short answer questions. You will be given the assignments one week before they are due.
Assignment Due Dates:

Assignment #1: Feb 4, 2022
Assignment #2: Feb 18, 2022
Assignment #3: March 25, 2022
Assignment #4: April 8, 2022
You will be deducted 10% (of the 15% allotted to each assignment; i.e., 1.5% of your final grade) for each day (not including weekends) that your assignment is late.

3) Bonus (2%)
You can earn up to 2% bonus if you write the assignments using LaTex on Overleaf.

- 0.5% for each assignment
- Tutorial website: https://www.overleaf.com/learn/latex/Learn_LaTeX_in_30_minutes

Grading as per Senate Policy
The grading scheme for the course conforms to the 9-point grading system used in undergraduate programs at York (e.g., A+ = 9, A = 8, B+ = 7, C+ = 5, etc.). Assignments and tests* will bear either a letter grade designation or a corresponding number grade (e.g. A+ = 90 to 100, A = 80 to 89, B+ = 75 to 79, etc.)
For a full description of York grading system see the York University Undergraduate Calendar -

Grading Scheme for 2021-22

Missed Tests/Midterm Exams/Late Assignment
If you cannot handin the assignment on time, please let me know as soon as possible. I can give a three-day extension without penalty. After the three-day extension, you will lose 10% of the assignment grade for each late day until the release of the answer. Once the answer key is released, you will not be able to submit the assignment for grades.
If you miss the midterm, then the final exam will count 60% of your grade.

Add/Drop Deadlines
For a list of all important dates please refer to: https://registrar.yorku.ca/enrol/dates/fw21

Last date to add a course without permission of instructor	Jan 23
Last date to add a course with permission of instructor	Feb 7
Last date to drop course without receiving a grade	March 18
Course Withdrawal Period (withdraw from course and receive a "W" on transcript – see Add and Drop Deadline Information below)	March 19 – April 10

Add and Drop Deadline Information
There are deadlines for adding and dropping courses, both academic and financial. Since, for the most part, the dates are **different**, be sure to read the information carefully so that you understand the differences between the sessional dates below and the Refund Tables.

You are strongly advised to pay close attention to the "Last date to enrol without permission of course instructor" deadlines. These deadlines represent the last date students have unrestricted access to the registration and enrolment system.
After that date, you must contact the professor/department offering the course to arrange permission.
You can drop courses using the registration and enrolment system up until the last date to drop a course without receiving a grade (drop deadline).
You may withdraw from a course using the registration and enrolment system after the drop deadline until the last day of class for the term associated with the course. When you withdraw from a course, the course remains on your transcript without a grade and is notated as 'W'. The withdrawal will not affect your grade point average or count towards the credits required for your degree.

Electronic Device Policy
This course will be delivered in an online format and therefore electronic devices (e.g., tablets, laptops) are permitted during class time for course-related purposes. It is expected that you would complete tests/exams in a manner that does not require consulting an unauthorised source during an examination unless the tests/exams are open-book.

Academic Integrity for Students
York University takes academic integrity very seriously; please familiarize yourself with Information about the Senate Policy on Academic Honesty.
It is recommended that you review Academic Integrity by completing the Academic Integrity Tutorial and Academic Honesty Quiz

Test Banks
The offering for sale of, buying of, and attempting to sell or buy test banks (banks of test questions and/or answers), or any course specific test questions/answers is not permitted in the Faculty of Health. Any student found to be doing this may be considered to have breached the Senate Policy on Academic Honesty. In particular, buying and attempting to sell banks of test questions and/or answers may be considered as “Cheating in an attempt to gain an improper advantage in an academic evaluation” (article 2.1.1 from the Senate Policy) and/or “encouraging, enabling or causing others” (article 2.1.10 from the Senate Policy) to cheat.

Academic Accommodation for Students with Disabilities
While all individuals are expected to satisfy the requirements of their program of study and to aspire to do so at a level of excellence, the university recognizes that persons with disabilities may require reasonable accommodation to enable them to do so. The university encourages students with disabilities to register with Student Accessibility Services (SAS) to discuss their accommodation needs as early as possible in the term to establish the recommended academic accommodations that will be communicated to Course Directors as necessary. Please let me

know as early as possible in the term if you anticipate requiring academic accommodation so that we can discuss how to consider your accommodation needs within the context of this course. https://accessibility.students.yorku.ca/

Excerpt from Senate Policy on Academic Accommodation for Students with Disabilities

1. Pursuant to its commitment to sustaining an inclusive, equitable community in which all members are treated with respect and dignity, and consistent with applicable accessibility legislation, York University shall make reasonable and appropriate accommodations in order to promote the ability of students with disabilities to fulfill the academic requirements of their programs. This policy aims to eliminate systemic barriers to participation in academic activities by students with disabilities.

All students are expected to satisfy the essential learning outcomes of courses. Accommodations shall be consistent with, support and preserve the academic integrity of the curriculum and the academic standards of courses and programs. For further information please refer to: York University Academic Accommodation for Students with Disabilities Policy.

Course Materials Copyright Information

These course materials are designed for use as part of the PSYC 2021C course at York University and are the property of the instructor unless otherwise stated. Third party copyrighted materials (such as book chapters, journal articles, music, videos, etc.) have either been licensed for use in this course or fall under an exception or limitation in Canadian Copyright law. Copying this material for distribution (e.g. uploading material to a commercial third-party website) may lead to a violation of Copyright law. Intellectual Property Rights Statement.

Course Schedule

Day	Topic	Readings/Videos	Notes
Jan 11	Introduction to statistics Review of Basic Algebra	Syllabus Videos: 1) Fractions https://www.youtube.com/watch?v=CA9XLJpQp3c https://www.youtube.com/watch?v=AtBUQH8Tkqc https://www.youtube.com/watch?v=qmfXyR7Z6Lk https://www.youtube.com/watch?v=4lkq3DgvmJo https://www.youtube.com/watch?v=5juto2ze8Lg 2) Ratio/Proportion https://www.youtube.com/watch?v=HpdMJaKaXXc https://www.youtube.com/watch?v=USmit5zUGas 3) Percentage https://www.youtube.com/watch?v=JeVSmq1Nrpw https://www.youtube.com/watch?v=Lvr2YsxG10o https://www.youtube.com/watch?v=5z568fLBQyQ https://www.youtube.com/watch?v=-gB1y-PMWfs 4) Order of Operations https://www.youtube.com/watch?v=dAgfnK528RA https://www.youtube.com/watch?v=ClYdw4d4OmA https://www.youtube.com/watch?v=piIcRV2dx7E 5) Factorial https://www.youtube.com/watch?v=eXcJOgNPYJE 6) Functions: https://www.youtube.com/watch?v=52tpYl2tTqk https://www.youtube.com/watch?v=kvGsIo1TmsM 7) Solve equations https://www.youtube.com/watch?v=l3XzepN03KQ https://www.youtube.com/watch?v=Qyd_v3DGzTM https://www.youtube.com/watch?v=jWpiMu5LNdg https://www.youtube.com/watch?v=f15zA0PhSek https://www.youtube.com/watch?v=iimpwYBiKNg 8) Sigma Notation for Sums https://www.youtube.com/watch?v=lQZY4pD8X6I https://www.youtube.com/watch?v=5jwXThH6fg4 https://www.youtube.com/watch?v=R019a93NrmY https://www.youtube.com/watch?v=luSh3hz_b18	Welcome!
Jan. 18	Introduction to statistics Research design Introduction to *R*	Textbook Readings: • Ch.1 (all) • Ch.2 (2.0-2.6) • Ch.3 (3.0-3.4) Videos: 1) Introduction to Statistics https://www.youtube.com/watch?v=zouPoc49xbk https://www.youtube.com/watch?v=sxQaBpKfDRk 2) Population vs Sample https://www.youtube.com/watch?v=jPPF2xSEyKU https://www.youtube.com/watch?v=VPM84_yfx5Q https://www.youtube.com/watch?v=MXaJ7sa7q-8	

Jan. 25	Descriptive statistics Introduction to *R*	Textbook Readings: • Ch.5 (5.0-5.2 [omit 5.1.6, 5.2.3 and 5.2.6]; 5.4; 5.7 [omit 5.7.6]; 5.9) • Ignore the notations for the standard deviation formula on page 128; please refer to my lecture notes for these equations. • Ch.3 (3.5-3.12) Videos: 1) Central Tendency and Variability https://www.youtube.com/watch?v=B1HEzNTGeZ4 https://www.youtube.com/watch?v=kn83BA7cRNM https://www.youtube.com/watch?v=E4HAYd0QnRc https://www.youtube.com/watch?v=R4yfNi_8Kqw https://www.youtube.com/watch?v=vcbMinm_1Q8 https://www.youtube.com/watch?v=sK0RY-Qkug4 2) *z*-score https://www.youtube.com/watch?v=5S-Zfa-vOXs 3) Correlation https://www.youtube.com/watch?v=-Y-M9aD_ccQ https://www.youtube.com/watch?v=ROpbdO-gRUo	Assignment 1 handed out on Monday
Feb. 1	Probability Introduction to *R*	Textbook Readings: • Ch.9 (9.0-9.3) • Ch.4 (4.0-4.6, 4.12) Videos: 1) Permutation and Combination https://www.youtube.com/watch?v=eoxbgUIYhHo https://www.youtube.com/watch?v=DROZVHObeko https://www.youtube.com/watch?v=iKy-d5_erhI 2) Experiemnt, Sample Space and Event https://www.youtube.com/watch?v=XhVBJSvhPys https://www.youtube.com/watch?v=5oI8-iQqPAI 3) Rules of Probabiilty https://www.youtube.com/watch?v=LS-_ihDKr2M https://www.youtube.com/watch?v=f7agTv9nA5k https://www.youtube.com/watch?v=OyddY7DlV58 3) Conditional Probability and Bayes' Theorem: https://www.youtube.com/watch?v=bgCMjHzXTXs https://www.youtube.com/watch?v=XQoLVl31ZfQ https://www.youtube.com/watch?v=U_85TaXbeIo https://www.youtube.com/watch?v=HZGCoVF3YvM • Warning: the last video is hard. Topics unique to this video may appear on the assignment but not on the exams. 4)Frequentist vs Bayesian https://www.youtube.com/watch?v=GEFxFVESQXc	Assignment 1 due on Friday
Feb. 8	Probability Introduction to *R*	Textbook Readings: • Ch.9 (9.4-9.7) • Ch.4 (4.8-4.11) Videos: 1) Random Variables https://www.youtube.com/watch?v=3v9w79NhsfI https://www.youtube.com/watch?v=vfqPpai_9jI https://www.youtube.com/watch?v=dOr0NKyD31Q https://www.youtube.com/watch?v=j__Kredt7vY	Assignment 2 handed out on Monday

		2) Binomial Distribution https://www.youtube.com/watch?v=nRuQAtajJYk https://www.youtube.com/watch?v=WR0nMTr6uOo https://www.youtube.com/watch?v=8idr1WZ1A7Q • Warning: the last video is hard. Topics unique to this video may appear on the assignment but not on the exams.	
Feb 15	Estimating from a sample	Textbook Readings: • Ch.9 (9.5-9.7) • Ch.10 (10.0-10.3) Videos: 1) Normal Distribution https://www.youtube.com/watch?v=mtbJbDwqWLE https://www.youtube.com/watch?v=iYiOVISWXS4 2) Law of Large Numbers: https://www.youtube.com/watch?v=VpuN8vCQ--M 3) Central Limit Theorem and Sampling Distrbution of the Mean https://www.youtube.com/watch?v=z0Ry_3_qhDw https://www.youtube.com/watch?v=JNm3M9cqWyc https://www.youtube.com/watch?v=NYd6wzYkQIM https://www.youtube.com/watch?v=J1twbrHel3o https://www.youtube.com/watch?v=0ZstEh_8bYc	Assignment 2 due on Friday
Feb. 22	Reading Week		
March.1	**Midterm**		
March. 8	Estimating from a sample Hypothesis testing	Textbook Readings: • Ch.10 (10.4-10.6) • Note: Ignore the formula for sample variance on page 318; ignore the table on page 319 • Ch.11 (11.0-11.3) Videos: 1) Sampling Distributon of Proportion: https://www.youtube.com/watch?v=fuGwbG9_W1c 1) Point Estimation https://www.youtube.com/watch?v=4v41z3HwLaM 2) Interval Estimation and Confidence Interval https://youtu.be/9GtaIHFuEZU https://www.youtube.com/watch?v=yDEvXB6ApWc 3) Types of Hypothesis and *p*-value https://www.youtube.com/watch?v=KS6KEWaoOOE https://www.youtube.com/watch?v=bf3egy7TQ2Q https://www.youtube.com/watch?v=PPD8lER8ju4	
March. 15	Hypothesis testing	Textbook Readings: • Ch.11 (11.4-11.10) • Wikipage on misuse of *p*-values: https://en.wikipedia.org/wiki/Misuse_of_p-values Videos: 1) *p*-hacking https://www.youtube.com/watch?v=0Rnq1NpHdmw https://www.youtube.com/watch?v=Gx0fAjNHb1M	Assignment 3 handed out on Monday

		2) Type I, Type II Error and Power https://www.youtube.com/watch?v=6_Cuz0QqRWc https://www.youtube.com/watch?v=Hdbbx7DIweQ https://www.youtube.com/watch?v=WWagtGT1zH4	
March. 22	Comparing means	Textbook Readings: • Ch.13 (13.0-13.5) Videos: 1) One-Sample z-test and t-test: https://www.youtube.com/watch?v=5ABpqVSx33I https://www.youtube.com/watch?v=HoqzIR8xj4s https://www.youtube.com/watch?v=tsPv-ffN-0M https://www.youtube.com/watch?v=NQWZefn41VY https://www.youtube.com/watch?v=dDsKP7wVpzM 2) Paired-Samples t-test: https://www.youtube.com/watch?v=AGh66ZPpOSQ https://www.youtube.com/watch?v=S-BmFzUTDxQ	Assignment 3 due on Friday
March. 29	Comparing means Categorical data analysis	Textbook Readings: • Ch.13 (13.6-13.8, 13.11) • Ch.12 (12.0-12.6, 12.10) Videos: 1) Chi-Square Distribution: https://www.youtube.com/watch?v=dXB3cUGnaxQ 2) Pearson Chi-Square Test https://www.youtube.com/watch?v=2QeDRsxSF9M https://www.youtube.com/watch?v=hpWdDmgsIRE	Assignment 4 handed out on Monday
April 5	Categorical data analysis History of statistics		Assignment 4 due on Friday