STAT 302 - Introduction to Probability

University of British Columbia - Winter 2021/2022 - Term 2

Disclaimer

Some additional though minor adjustments on course material, evaluations are possible after the term started. A final version on Canvas will be posted and regarded as official.

Course Description

Basic notions of probability, random variables, expectation and conditional expectation, discrete and continuous probability distributions, limit theorems.

Note: STAT 302 is equivalent to MATH 302. Proofs are an important component of the course.

Prerequisites

One of MATH 200, 217, 226, 253 or 254.

Audience

Undergraduates majoring in Mathematics or Statistics, and students from other disciplines seeking an exposition of the basic elements of probability theory and an introduction to probabilistic modelling.

Textbook

A First Course in Probability (10th ed. or +) by Sheldon Ross, Prentice Hall, 2019. Most earlier editions are acceptable.

Instructors

Jiahua Chen
Vivian Meng
Contact information will be available on Canvas including office hours.

IT issues

Register in iclicker cloud in real name: find the link from canvas.

This term we will be using Piazza for class discussion. The system is highly catered to getting you help fast and efficiently from classmates, the TA, and myself. Rather than emailing questions to the teaching staff, I encourage you to post your questions on Piazza. If you have any problems or feedback for the developers, email team@piazza.com.

`https://piazza.com/ubc.ca/winterterm22022/stat302`

Gradescope will be used for assignment hand-in and marking.

Students can join our Gradescope course by clicking on ?Gradescope? from the course navigation in Stat 302 Canvas. Clicking the link will automatically enrol students in our Gradescope course. See also `https://lthub.ubc.ca/guides/gradescope-student-guide/`

Jupyter: This is a tool that allows instructor to prepare lectures with embedded R-codes for demonstration and slides with on-spot error correction functionality. Students will not be required to install this software. If interested, here is many links:
`https://jupyter.org/install`

Server on your on desktop
`https://blog.jupyter.org/jupyterlab-desktop-app-now-available-b8b661b17e9a`

R-kernel (You may use Python at your convenience)
`https://richpauloo.github.io/2018-05-16-Installing-the-R-kernel-in-Jupyter-Lab/`

Computing: R may be used in lectures in this course for demonstration but not essential.
Download and install R: `https://cran.r-project.org/`.
R-Studio: `https://rstudio.com/products/rstudio/download/`
Add-on Packages: R is an extensible system and many people share useful code they have developed as a package via CRAN and github. To install a package from CRAN, for example the plyr package for data aggregation, here is one way to do it in the R console (there are others).

```
install.packages("plyr", dependencies = TRUE)
```

Official manual for R: `https://cran.r-project.org/doc/manuals/r-release/R-intro.pdf`

Do not be intimidated by the volume of this manual. Students can learn from examples given in classes and from each other.

Course Evaluation

- In-class iclicker: Iclicker questions will spread throughout lectures, uniformly but with uncertainty. Higher achievers will earn bonus marks if helpful { (Grade + A)/105 }.
- Mini-Quizzes (10%): There will be10 mini-quizzes. The schedule will be available on Canvas.

- Assignments (20%): There will be 5 hand-in assignments. The TAs will be instructed to not give partial marks when part of your answer is relevant though useless to the overall answer. Partial marks may be granted if your overall answer is marred due to minor typo-like errors. Different parts of the same question will be marked independently. The same error will generally not be punished twice.
- Midterm Exam (20%): There will be one Midterm, which will cover all material discussed in the lectures from Chapter 1 to Chapter 4, inclusive.
- Final Exam (50%): The Final Exam will include all materials covered in the course.

Policy regarding exams and final grade

- Students must write their Midterm Exam during the lecture time slot in which they are registered.
- Students must attain 40% in the final exam to pass the course. If not, the final grade will be the minimum of 40 and the grade computed based on the above scheme.

Syllabus

The syllabus below is a tentative schedule. The topics covered and the order in which they will be presented in this course may change.

1. Definition and rules of probability (Chapter 2).
2. Combinatorial Analysis: permutation and combination (Chapter 1).
3. Conditional probability, conditional independence (Chapter 3).
4. Random variables, distributions, and their expected values and variances. Well-known discrete distributions (Chapter 4).
5. Well-known continuous distributions, functions of random variables (Chapters 5).
6. Bivariate and multivariate probability distribution: Joint, marginal and conditional distributions, multinomial distribution, moment generating functions (Chapters 6)

7. Property of expectations, covariance and correlations, conditional expectations, moment generating functions (Chapter 7).

8. Probability inequalities. Limit theorems: Convergence in probability, convergence in distribution, the Central Limit Theorem (Chapter 8).