PSTAT 5A: Midterm 2 Topics *Spring 2023: with Ethan P. Marzban*

> ❗ **IMPORTANT NOTES**
>
> - This list is not meant to be comprehensive: just because a topic/concept does not appear below does not mean it isn't fair game for the first Midterm. Conversely, just because something does show up below doesn't mean it is guaranteed to appear on the exam. Your best resource for reviewing are the notes you have (hopefully) been creating each lecture.
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> - Please keep in mind that the exam is technically cumulative. What this means is that the primary focus of the exam will be on material from after the Midterm 1, however you should still remember some of the fundamentals from before Midterm 1 (e.g. the basic notions of probability, the basic syntax of Python, etc.)

Random Variables and Distributions

- State space
- Expected value
- Variance/Standard Deviation
- Discrete vs. continuous random variables

    - Probability Mass Function (PMF)
    - Probability Density Function (PDF)
    - Cumulative Distribution Function (CDF)

- Binomial Distribution
- Uniform Distribution
- Normal Distribution

Inferential Statistics

- Population; population parameter
- Sample statistic; point estimator
- Sampling distribution of a point estimator
- Central Limit Theorem for Proportions

    - Success-Failure Conditions
    - Substitution Approximation

- Sampling distribution of $\overline{X}$

    - Central Limit Theorem for the Sample Mean
    - $t-$distribution with k degrees of freedom

- Confidence Intervals

    - Confidence Level
    - Relationship between the width of a confidence interval and the confidence level
    - Percentiles; reading the $z-$ and $t-$tables

- Hypothesis Testing

    - Null and Alternative Hypotheses
    - Type I and Type II errors
    - Level of significance α
    - Two-sided, lower-tailed, and upper-tailed tests
    - Test statistic
    - Critical value

Programming

- All of the labs in the class so far, with an emphasis on:

    - Visualization using Python
    - Functions (both built-in and user-defined)
        * Default values of arguments
    - Loops
    - QQ-Plots
    - Random number generation, and sampling from a distribution