ECE 302: Probabilistic Methods in Electrical and Computer Engineering
Spring 2024
Instructor: Prof. Stanley H. Chan

PURDUE
U N I V E R S I T Y

Oh My Question!

Spring 2024
(Last Update: January 4, 2024)

Oh My Question! is a new experiential learning we (Prof Stanley Chan and his teaching team) design and implement for Spring 2024. The motivation is to improve the learning of students (i.e., you!!) by encouraging you to think about probability and random processes in daily life. Our goal is to fight against comments such as:

- *This course is boring.*
- *It's just another math course.*
- *It has nothing to do with my work.*
- *The professor teaches things I don't care about.*
- *The exam is not the same as the homework (Err, well, shouldn't the exam be different from homework?)*
- *I have no clue about what the heck this class is.*
- *I just want to pass.*

To overcome these realistic comments, we are going to try something new and fun. We want YOU to get involved in the TEACHING process. Huh? Teaching? Aren't we supposed to learn from what the professor teaches? Nope, we are sorry. Your professor wants *you* to teach your fellow classmates probability.
The one-sentence summary of Oh My Question is simple:

> Create problems, prepare solutions, and present your answers to your peers.

What to do? You will form a team. Your team needs to come up with questions, *good* questions. Good questions are questions that you will find it interesting and stimulating. To make things a bit more clearer, here are the criteria for a good question:

- It should cover the lecture materials we specify, e.g., Chapter 3-4 of the textbook.
- It should involve a scenario, e.g., Kent goes to Zoo and he sees three elephants.
- It needs to be solved by paper and pencil, i.e, you need to have equations.
- It should have a trick that requires thinking (i.e, cannot be trivial)
- It needs to be accompanied with a Python program that can verify your answer.
- It cannot be a proof.
- The answer does not need to be a number; it can be a symbol.

So, basically, when you present your work, you need to show everyone:

- Question
- Analytic solution
- Python verification

> **Example 1**. In a classroom of 100 students, what is the probability that there are at least two people with the same birthday? (This is from Prof Chan's book Chapter 1)

> **Example 2**. The resolution of an imaging system is limited by the smallest circle it can resolve from diffraction. Suppose the diffraction pattern is modeled as a Gaussian. We put two Gaussians one at location -1, and one at location +1. What is the smallest standard deviation of the Gaussian such that the two Gaussians will start to appear as one?

There will be plenty of examples throughout this semester's homework. You will quickly get an idea of what we are looking for.

Team:

- **Team size**: Students should form teams of 3-4 people. You are free to form your own teams. The minimum number of people in a team is 3, and the maximum number of people in a team is 4. We will create a Google spreadsheet for you to sign up during the first two weeks of the semester.

- **Team UTA**: Each team will be assigned to a UTA. There are limited number of slots for each UTA. So please sign up early. First come first serve.

    – M 5-7pm UTA 1, Room TBD
    – Tu 5-7pm UTA 2, Room TBD
    – W 6-8pm UTA 3, Room TBD
    – Th 6-8pm UTA 4, Room TBD
    – F 5-7pm UTA 5, Room TBD

- **Team ID**: Each team will be assigned a team number, e.g., M01 or Tu04, or Th02. Please remember your team number.

- **Team grades**: All members of a team will receive identical scores. Moreover, your team shares the same penalty if we catch you plagiarised, e.g., copying from a book or generating question from ChatGPT.

How is it graded? The grade will consist of two parts:

Base points. (Up to 10% of the course, for each of the two Oh My Question!) Every team needs to **orally** present your problem and answers to UTA. Your UTA will give up to 5%. Finalized version needs to be written and submitted through gradescope. The Head TA, GTAs, and UTAs will then assign the remaining 5% points.

Presentation Day. (Up to 5 bonus points for Midterms.) The Head TA, GTAs and UTAs will meet and select 10 short-list questions. Short-listed teams will present in class and will receive votes from the class. Votes will be translated to bonus points for the mid-terms. Highest voting team will receive 5 points in mid-term, second highest will receive 4.5 points in mid-term, etc.
The peer evaluation is based on how many popular votes you can get. The tip here is not to make things too hard and too easy. If it's too hard so that no one understands it, you will not get any votes. Make it interesting.

Why should you participate? Well, this is part of the course, so you have no choice, haha! But something is more interesting. Besides offering you the bonus points for the midterms, we will randomly select (and modify) questions for your midterm exams. So, if you actively participate in this game, you will have first-hand knowledge about what will be asked in the midterm exams.