

# STATS 412

Third Class Note

*In Son Zeng*

*17 September, 2018*

## My Office Hour:

My office hours are on **16:30 - 18:00 Tuesday** and **13:30 - 15:00 Friday**, at **USB 2165**. You may check the campus map to get to my office.

## Remainder for Assignment 1 and 2

**Give Reasoning Homework 1:** In homework 1, I notice many of you did not provide reason(s) to justify answers. To clarify, Question 1 and 2 explicitly mention “You need to explain”, so you must give reasoning to receive full credit for your answer. Similarly, Question 5 asks you to “tell whether”, in this case you also need to state the reason to support your answer to receive full points. For the rest of the problems, you are strongly encourage to provide great reasonings, since it is a great exercise to practice how to use writing to effectively deliver ideas.

**Give Reasoning Homework 2:** There are a variety of questions which require reasoning in homework 2 as well. It is required to give reason on Question 1 and Question 8. Please read the questions thoroughly again before submission.

**General Concepts:** There are a couple of concepts I would like you to pay attention to before the homework deadline:

- Median and Quartiles
- Boxplot construction: What are the elements displayed in the boxplot? You may find it helpful to check the textbook in chapter 1.
- Histogram height: What does the height of histogram represent?

## Key points during lecture:

**Expectation, Variance and Standard Deviation:** To recap, for discrete random variable  $X$ , the expectation, variance and standard deviation are given by:

$$E(X) = \mu_x = \sum_x x \cdot P(X = x)$$

$$Var(X) = \sigma_x^2 = \sum_x (x - \mu_x)^2 \cdot P(X = x) = E(X^2) - [E(X)]^2 = \sum_x x^2 \cdot P(X = x) - \left( \sum_x x \cdot P(X = x) \right)^2$$

$$SD(X) = \sqrt{Var(X)} = \sigma_x$$

The expectation for discrete distribution could be derived from summing up all the products of “possible value of  $X$  times the corresponding probability”. Reminder: don’t try to round the expectation to integer.

After obtaining the expectation, there are two major ways to compute the variance: (1) to sum over the products of “possible value of  $[X - E(X)]^2$  times the corresponding probability” or (2) sum over the products of “possible value of  $X^2$  times the corresponding probability” and subtract the result by the square of the expectation.

Finally, to obtain the standard deviation, we can take the positive square root of variance. Reminder: standard deviation must be positive.

## Last Comment:

Please inform me to fix the typos and grammatical mistakes if they exist. It is a great practice of writing and I appreciate your help!