

STA 371G Outline

Spring 2014

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Office Hours: Tuesday Thursday 3:30-4:30 PM. You are welcome to come by my office at other times, but to make sure that I will be there then, you may first call my office, send me an email, or talk to me before or after class to make an appointment.

Tuesday, January 14

Topics:

- Introduction
- Probability
- Random variables
- Probability distributions
- Mean, variance and standard deviation of a random variable

Thursday, January 16

Topics:

- Add a constant to a random variable
- Multiply a random variable by a constant
- Conditional, joint and marginal probabilities
- Independent random variables, sum of independent random variables
- Continuous random variables
- Probability density function: area under the curve represents probability
- Standard normal distribution $Z \sim \mathcal{N}(0, 1)$
- Standard normal calculations in Excel: NORMSDIST, or in R: pnorm (type “?pnorm” in R for help).

Reading Assignments:

If you are not familiar with the topics discussed in class, you are recommended to read:

pp. 156-168, 189-195, of Data analysis and decision making, 4th edition

or

pp. 196-206, 225-231 of Data analysis and decision making, 3rd edition

To learn more about these topics, you may further read:

Chapters 2.1, 2.2, 2.4, and 2.5 of OpenIntro Statistics, 2nd edition

Tuesday, January 21

- Normal distribution $X \sim \mathcal{N}(\mu, \sigma^2)$
- Understand the meaning of the standard deviation σ in a normal distribution: $P(\mu - \sigma < X < \mu + \sigma) = ?$ and $P(\mu - 2\sigma < X < \mu + 2\sigma) = ?$
- Normal calculations in Excel:
NORMSDIST, NORMDIST
NORMSINV, NORMINV
or in R:
pnorm, qnorm (type “?pnorm” and “?qnorm” in R for help).
- Plot a normal distribution in Excel and R
- Example: Testing at ZTel, we will make an Excel spreadsheet for calculations

Reading Assignments:

To get familiar with the normal distribution, you are recommended to read:

pp. 211-215, 217-225 of Data analysis and decision making, 4th edition

or

pp. 247-250, 253-260 of Data analysis and decision making, 3rd edition

You may further read:

Chapters 3.1.1, 3.1.2, 3.1.4 and 3.1.5 of OpenIntro Statistics, 2nd edition

Thursday, January 23

- Case study, Texas BBA Salary Statistics
- Conditional, joint and marginal probabilities
- Expectation of a random variable
- If $X \sim \mathcal{N}(\mu, \sigma^2)$, then $P(X < x) = P\left(\frac{X-\mu}{\sigma} < \frac{x-\mu}{\sigma}\right) = P(Z < \frac{x-\mu}{\sigma})$.
- Standardizing a normal random variable $Z = \frac{X-\mu}{\sigma} \sim (0, 1)$
Interpretation: the value of Z is the number of standard deviations that X deviates towards the left (if $Z < 0$) or the right (if $Z > 0$) of the mean.

Tuesday, January 28

Class cancelled due to adverse weather conditions.

Thursday, January 30

- Common problems in Homework 1
- Case study: Texas BBA Statistics
- Binomial distribution $X \sim \text{Binomial}(n, p)$. Examples: the number of “Heads” in 100 coin flips, the number of votes for Republican in 1000 voters
- The normal approximation to the binomial $X \sim \mathcal{N}(np, np(1 - p))$
- Important concepts: Population and Sample
- Sampling distribution of a sample proportion
- Case study: A national poll of 803 adults by Anzalone Liszt Grove Research

Reading Assignments:

Lecture notes 3 and 4 posted in Canvas/files

To learn more about the binomial distribution, its normal approximation, and the sampling distribution of a sample proportion, please read:

pp. 233-239, 403-404 of Data analysis and decision making, 4th edition

or

pp. 268-273, 438-439 of Data analysis and decision making, 3rd edition

For this topic, you may further read:

Chapters 3.4.1, 3.4.2 and 6.1 of OpenIntro Statistics, 2nd edition

Tuesday, February 4

- Population mean, variance, standard deviation
- Sample mean, sample variance, standard error of the sample mean
- Sampling distribution of the sample mean
- Central limit theorem
- t distribution (optional)
- Confidence interval
- Case study, Texas BBA Salary Statistics

Reading Assignments:

To learn more about estimation and sampling distribution, please read:

pp. 352-353, 366-371, 374, 388-395 of Data analysis and decision making, 4th edition
or

pp. 378-379, 393-398, 400-401, 422-430 of Data analysis and decision making, 3rd edition

For this topic, you may further read:

Chapters 4.1, 4.2, 4.4 and 5.3 of OpenIntro Statistics, 2nd edition

Thursday, February 6

- Simple linear regression
- Linear prediction: $Y = b_0 + b_1X$
- Least squares estimation of b_0 and b_1
- Examples: predict house price, baseball runs per game
- Using Excel and R to do the calculation
- Excel add-in: if you are using Mac, please install StatPlus:mac LE (available at <http://www.analystsoft.com/en/products/statplasmacle/>); if you are using windows, please install Analysis ToolPak or Decision Tools Standard 6.1
(available at <http://www.mcombs.utexas.edu/tech/computer-services/coe#DecisionTools>).

Reading Assignments:

Chapters 7.1 and 7.2 of OpenIntro Statistics, 2nd edition

pp. 531-544 of Data analysis and decision making, 4th edition
or

pp. 562-577 of Data analysis and decision making, 3rd edition