ST 301 (AKI) LECTURE #29

1 The Curious Case of Benjamin Button (2008, US)?

Review in reversed order.

- Ch 12: Regression analysis
  We want to see relation between x and y. Especially, we assume linear relation. Model:
  \[ Y_i = \beta_0 + \beta_1 x_i + e_i, \quad i = 1, \cdots, n, \]
  where \( e_i \sim N(0, \sigma^2) \).
  Unknown parameters: \( \beta_0, \beta_1, \sigma \).
  \( x_i \) is fixed, \( e_i \) is random. Hence \( Y_i \) is random. You only observe \((x_i, Y_i)\), NOT \( e_i \).

- Ch 11: Analyzing Count Data
  You have discrete output.
  Eg 1) 2 × 2 case
  Based on this, can you conclude
  C1) Commercial A is better than Commercial B?

- Ch 10, 9, 8: Inference about mean (One sample or two samples)
  Look at p441 summary. That is all you need. All procedures are pretty similar.

- Ch 7, 6: Normal distribution and Central Limit Theorem
  \( X_1, X_2, \cdots, X_n \sim \text{unknown AND } n \geq 30. \)
  Then,
  \[ \frac{\sum_{i=1}^n X_i}{n} = \bar{X} \sim N(\mu, \frac{\sigma}{\sqrt{n}}), \]
  or, equivalently,
  \[ \frac{\bar{X} - \mu}{\frac{\sigma}{\sqrt{n}}} = \frac{\sqrt{n}(\bar{X} - \mu)}{\sigma} \sim N(0, 1). \]
  This is an amazing result. It says "Even if you don’t know individual \( X_i \)'s distribution, you can predict future, i.e., \( \bar{X} \) behavior! It becomes Normal distribution. Remember, the online game result we watched together?

- Ch 4, 5: Random Variable and Probability distribution
  We need basic math for statistics. Want to win in Vegas? Just practice, practice, practice (In movie "21", Ben studied very hard!)
\[ P(A \cup B) = P(A) + P(B) - P(A \cap B). \]

- **Independent Events**: If A and B are independent, if
  \[ P(A \cap B) = P(A)P(B) \]
or equivalently,
  \[ P(A|B) = P(A) \]

- **Linear Transformation of \( E(X) \) and \( Var(X) \) (Useful rules)**
  \[ E(aX + b) = aE(X) + b \]
  \[ Var(aX + b) = a^2 \text{Var}(X) \]
  \[ E(aX + bY) = aE(X) + bE(Y) \]
  \[ Var(aX + bY) = a^2 \text{Var}(X) + b^2 \text{Var}(Y) \]
  when X and Y are independent.

- The following X is called a **Binomial Random Variable** and its distribution is called **Binomial distribution**
  \[ n = \# \text{ of Bernoulli trials} \]
  \[ p = \text{probability of Success} \]
  \[ X = \# \text{ of Success} \]

2 **Final Exam Info**

- Final Dec 21 (Tue) 2:45-4:45pm
- Room=AGR HALL 125.
- Multiple Choice
- Bring student ID, 3 cheating papers, pencil, hand calculator.
- Range: Mid1+Mid2+Ch10, 11, 12. Heavier weight on Ch10,11,12.
- ?? questions. About 60% from HWs. 40% from lecture notes.
- I will email you how your rebate points work by Dec 20 (M).
- Final (letter) grade is relative scale. See the Syllabus. I will post everyone’s total score and relative position in learnuw. (Maybe use your last 4 digit of student ID?)

Please check all of your scores (past bonus problem, today’s evaluation point, HWs, discussions etc) EXCEPT the final exam in learnuw. If there is an error, let me know by email by Dec 17 2010 (Fri) 11:59pm! After that point, I will not modify it.