CWRU DSCI351-451: Week06a Foundations of Inference

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Contents

6.1.1.1 Reading, Homeworks, Projects, SemProjects

- Readings:
  - R4DS 7-8 Wrangle: Tibbles and readr for today
  - R4DS 9-16 More tidyverse Wrangling and then Programming for Thursday
- Homeworks
  -
- Data Science Projects:
  - Proj. 1 Due
- 451 SemProjects:
  -
- Friday Comm. Hour
  -

6.1.1.2 Textbooks

- Peng: R Programming for Data Science
- Peng: Exploratory Data Analysis with R
- Open Intro Stats, v3
- Wickham: R for Data Science
- Hastie: Intro to Statistical Learning with R

Day:Date	Foundation	Practicum	Reading	Due
w1a:Tu:8/28/18	ODS Tool Chain	R, Rstudio, Git		
w1b:Th:8/30/18	Setup ODS Tool Chain	Bash, Git, Twitter	PRP4-33	HW1
w2a:Tu:9/4/18	What is Data Science	OIS:Intro2R	PRP35-64	**HW1 Due**
w2b:Th:9/6/18	Data Analytic Style, Git	451SempProj, Git	PRP65-93, OI1-1.9	HW2
w3a:Tu:9/11/18*	Struct. of Data Analysis	ISLR:Intro2R, Loops	PRP94-116, OIS3	**HW2 Due**
w3b:Th:9/13/18*	OIS3 Intro to Data	GapMinder, Dplyr, Magrittr		
w4a:Tu:9/18/18	OIS3, Intro2Data part 2, Data	EDA: PET Degr.	EDA1-31	Proj1
w4b:Th:9/20/18	Hypothesis Testing	GGPlot2 Tutorial	EDA32-58	HW3
w5a:Tu:9/25/18	Distributions	SemProj RepOut1	R4DS1-3	**HW3 Due**
w5b:Th:9/27/18	Wickham DSCI in Tidyverse	SemProj RepOut1	R4DS4-6	**SemProj1,**
w6a:Tu:10/2/18	OIS Found. of Inference	Inference	R4DS7-8	**Proj1 Due**
w6b:Th:10/4/18		Midterm Review	R4DS9-16 Wrangle	
w7a:Tu:10/9/18*	Summ. Stats & Vis.	Data Wrangling		
w7b:Th:10/11/18*	**MIDTERM EXAM**			HW4
w8a:Tu:10/16/18	Numerical Inference	Tidy Check Explore	OIS4	**HW4 Due**
w8b:Th:10/18/18	Algorithms, Models	Pairwise Corr. Plots	OIS5.1-4	Proj 2, HW5
Tu:10/23	**CWRU FALL BREAK**		R4DS17-21 Program	
w9b:Th:10/25/18	Categorical Infer	Predictive Analytics	OIS6.1,2	
w10a:Tu:10/30/18	SemProj	SemProj	OIS7	**SemProj2 HW5 Du**
w10b:Th:11/1/18	Lin. Regr.	Lin. Regr.	OIS8	**Proj.2 due**
w11a:Tu:11/6/18	Inf. for Regression	Curse of Dim.	OIS8	Proj 3
w11b:Th:11/8/18	Model Accuracy	Training Testing	ISLR3	HW6
w12a:Tu:11/13/18	Multiple Regr.	Mul. Regr. & Pred.	ISLR4	**HW6 due**
w12b:Th:11/15/18	Classification		ISLR6	
w13a:Tu:11/20/18	Classification	Clustering	ISLR5	**Proj 3 due**
Th:11/22/18	**THANKSGIVING**			Proj 4
w14a:Tu:11/27/18	Big Data	Hadoop		
w14b:Th:11/29/18	InfoSec	VerisDB		**SemProj3**
w15a:Tu:12/4/18	SemProj ReportOut3			
w15b:Th:12/6/18	SemProj ReportOut3			**Proj4**
	FINAL EXAM	**Monday12/17, 12:00-3:00pm**	Olin 313	**SemProj4 due**

Figure 1: DSCI351-451 Syllabus

6.1.1.3 Syllabus

Open Intro Stats, v3

6.1.1.4 Major Points for Distributions

- Normal distribution is the basis of statistical expectations
- Geometric and Binomial Distributions are a form of expectations
- For two different way of posing questions
- Geometric: # of trials until success
- Binomial: P(given # of successes in given # of trials)

6.1.1.4.1 Normal expectations

- pnorm, gives us the expected probability of a given observed sample value
- for a given normal distribution

6.1.1.4.2 Skewness

- normal distribution is symmetrical
- if you have skewness (real data is "never" normal)
- check if a variable transformation can reduce skewness
- if so, then you statitstical analysis will be better

6.1.1.4.3 Convenient measures for normal distributions

- normalize the mean and standard deviation
- using Z scores, so that you can cross-compare sample and population results
- and check your normal expectations against your data
- and
- All of these normal distribution concepts
- Are the foundation of statistical analysis
- And of defining statistical significance
- You'll be using them in HWs, Projs. and SemProjs.

6.1.1.5 Next we'll see the following

6.1.1.5.1 Central Limit Theorem

- -> With Standard Errors (SE)
- -> and Confidence Intervals

6.1.1.5.2 Hypothesis Testing

- -> test statistic
- -> p values

6.1.1.5.3 Trials and Errors

- -> Type I errors
- -> Type II errors

6.1.1.6 Cee-lo a good, no house advantage game

- Cee-lo Dice Game
- Cee-lo Probabilities
- Rules and probabilities in readings cee-lo.txt
- Inference (Predicting the Future)

6.1.1.7 Cee-lo dice game

6.1.1.7.1 Cee-lo without a bank (winner take all)

In this version of the game,

- each round involves two or more players of equal status.

A bet amount is agreed upon and

- each player puts that amount in the pile or pot.

Each player then has to roll all three dice at once and

- must continue until a recognized combination is rolled.

Whichever player rolls the best combination

- wins the entire pot, and a new round begins.

In cases where two or more players tie for the best combination,

- they must have a shoot out to determine a single winner.

6.1.1.7.2 The combinations in Cee-lo

The combinations are similar to those described above, and can be ranked from best to worst as:

- 4-5-6
  - The highest possible roll. If you roll 4-5-6, you automatically win.
- Trips
  - Rolling three of the same number is known as rolling "trips".
  - Higher trips beat lower trips,
  - so 4-4-4 is better than * 3-3-3.
  - Any trips beats any established point.
- Point
  - Rolling a pair, and another number,
  - establishes the singleton as a "point".
  - A higher point beats a lower point,
  - so 2-2-6 is better than 5-5-2.
- 1-2-3
  - The lowest possible roll.
  - If you roll 1-2-3, you automatically lose.
- Any other roll is a meaningless combination and
  - must be rerolled until one of the above combinations occurs.

6.1.1.7.3 Probabilities[edit]

- With three six-sided dice there are 6 × 6 × 6 or 216 possible permutations.
  - 4-5-6: 6/216 = 2.777777778% (Automatic Win)
  - Trips: 6/216 = 2.777777778%
  - Point: 90/216 = 41.66666667%
  - 1-2-3: 6/216 = 2.777777778% (Automatic Loss)
  - Meaningless permutations: 108/216 = 50%

6.1.1.7.4 Rolling the Dice on a Warm Night

- Human mystical thinking
- And beware the bank

6.1.1.8 Links

Checkout the R documentation Project

- R Doc Project