# PSYCH 790 : Fall 2020

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Online: MW 4:00-5:45. Join me in Zoom!
OH: M 3-4 W 3-4 & by appt. Location TBA

GTA: Johanna Lyn Ramirez <j000r275@ku.edu> OH: M & R 10AM (Zoom link available in blackboard announcement)

KU BlackBoard: http://courseware.ku.edu. Has copies of some reading assignments, old tests.

Course Webpage http://pj.freefaculty.org/stat

1. Lectures & Guides, topically organized: http://pj.freefaculty.org/guides.

   **CAUTION:** I'll be updating the lectures as we go through the semester, usually the night before class.

   My lectures are in a Git repository that you could track. If you are a Git user, ask me for an address and I'll fix you up.

2. R support page. http://pj.freefaculty.org/R. That also has WorkingExamples.

3. LaTeX document Preparation. http://pj.freefaculty.org/latex.

## Textbooks

At the bookstore:

Cohen, Jacob, Cohen, Patricia, West, Stephen G. West and Leona S. Aiken. 2003. *Applied Multiple Regression/Correlation Analysis for the Behavioral Sciences*, 3ed

In Blackboard folder "Course_Documents/Readings" you'll find chapters

Johnson, Paul. *Stuff Worth Knowing*. Newest edition always available in the KU Blackboard system.

**Prerequisites:** One semester of statistics and/or research design. Algebra is vital and will be used regularly.

### Grades

Tests: Midterm Exam: 2 x 25%

Final Exam: 30%

Homework Exercises: 20%

### Please Use the Blackboard Forum! Don't Ask For Help In Private Emails.

We have a "forum". Ask questions there. Michael or PJ will answer.

If you are asking an R question, include

1. Output from R command "sessionInfo()".

2. R code to reproduce the problem you are seeing.

## Computer Tips

1. Keep your exercises projects organized into separate folders. BE HIERARCHICAL.

   psyc790/

   assign_1

   assign_2

   pj-lectures

   **Keep It Separated** so that, all of the data and code stays together. To exchange same information to others, you can simply "zip" and send a folder.

2. Never put blank spaces in file names or directory names. Also don't use symbols like ! * & or [ ]

## Conduct

Students are expected to comply with University codes, policies, laws, and guidelines. Information on academic misconduct is available at the following address: http://www.studenthandbook.ku.edu/codes.shtml#Academic%20Misconduct. The work that students submit must be their own work. We recognize the fact that people do study together and exchange ideas, but, at the end of the day, each student is responsible for doing her/his own work.

## Preserving Flexibility

This syllabus is not a binding contract. Dates may be adjusted, material may be altered. All changes will be announced in class.

## Schedule of Readings

1. Aug 24. Welcome, Howdy, Install your software and get going.

   (a) Install R. That's pretty easy on all platforms. I have installation guides for Windows and Mac. You also need a good Editor. The easiest install is "RStudio", but that's so horribly restrictive I hate to encourage it. I still think Emacs is the best.

   (b) Think about document preparation. Are you stuck with MS Word? Want to try LaTeX or Markdown? Sometimes you have trouble and my only response is "Yes, you are using a bad program." I have guides (http://pj.freefaculty.org/latex) and an R package stationery that will help to make sense of some of this.

   **Lecture:**

   **stat/Regression/Overview** http://pj.freefaculty.org/guides/stat/Regression/Overview/Regression-Ove
   pdf

2. Aug 26: R Workshop day 1

   **Read:** Read something about R! In Blackboard, look for "R Introductory Guides" by Lumley, Paradis, and Owen. There are plenty of books and other websites as well.

   **Lecture:** R overview. guides/Rcourse/summeR_workshop

3. Aug 31: R Workshop day 2

   **Read:** Run some of my examples in R/WorkingExamples. Make sure your results match my html files.

**Read:** Try to install the packages "rockchalk", "kutils", and "stationery" installed. Look at the vignettes

**Lecture:**

(a) Project setup: As I recall, my summeR-2-1-workflow lecture was dull, so we'll probably substitute this one I prepared for graduate student orientation:
Keeping a Project Together

(b) Data import Rcourse/summeR_workshop/summeR-2/summeR-2-2-import, inspect

(c) Time permitting: Dates in data Date and Time Information in R

4. Sept. 2: R Workshop day 3

**Read:** Practice!

**Lecture:**

(a) Recoding Rcourse/summeR_workshop/summeR-2/summeR-2-3-recoding

(b) Regression with R summeR-2/summeR-2-4-analysis

5. Sept. 7 Describing One Variable (primarily numeric variables)

**Read:** Verzani, Ch. 1 & 2

**Priorities:** histogram, kernel density, mean, median, mode, standard deviation, variance, scaling

**Lecture:** /stat/Descriptive/CentralTendencyAndDispersion http://pj.freefaculty.org/guides/stat/Descriptive/CentralTendencyAndDispersion/CentralTendencyAndDispersion.pdf

6. Sept. 9. R Workshop: Exploring statistical distributions

**Read:**

(a) Paul E. Johnson, "Distribution Overview: Probability by the Seat of the Pants," http://pj.freefaculty.org/guides/stat/Distributions/DistributionOverview/DistributionReview.pdf *An essay I have created just for this purpose!* Same as last chapter in *Stuff Worth Knowing.*

(b) Browse through this: *Regress+ Compendium of Statistical Distributions* I put a copy on the Blackboard http://www.causascientia.org/math_stat/Dists/Compendium.pdf

**Lecture:** /Rcourse/rRandomVariables
http://pj.freefaculty.org/guides/Rcourse/rRandomVariables/rRandomVariables.pdf

7. Sept. 14 Describing Two Variables

**Read:** 1) Verzani, Ch. 3
2) Fox, Chapter 3.2, 3.3

**Priorities:** scatterplot, barplot, boxplot, correlation

**Lecture:** /stat/Descriptive/ScatterBoxBarPlots http://pj.freefaculty.org/guides/stat/Descriptive/ScatterBoxBarPlots

8. Sept 16. Central Limit Theorem and Sampling Distributions

**Read:** Bowen & Weisberg, *An Introduction to Data Analysis*, Ch. 10 "Statistical Inference" (available in the Blackboard)

**Lecture:** stat/Inferential/CentralLimitTheorem http://pj.freefaculty.org/guides/stat/Inferential/CentralLimitTheorem/CLT-lecture1.pdf

9. Sept 21. Confidence Intervals

**Read:** Verzani, Ch. 7

**Lecture:** stat/Inferential/ConfIntervals

http://pj.freefaculty.org/guides/stat/Inferential/ConfIntervals/ConfIntervals-lecture.pdf

10. Sept 23. Hypothesis Testing

    **Read:** Verzani, Ch. 8

    **Lecture:** stat/Inferential/HypoTesting

    http://pj.freefaculty.org/guides/stat/Inferential/HypoTesting/SignifTests-lecture.pdf

11. Sept 28. Regression: One Input Variable

    **Read:**

    (a) Cohen, Chapter 2.
    (b) Verzani, Ch. 3.4, and Ch. 10;
    (c) Woolridge, *Introductory Econometrics*, Chapter 2. This is a VERY EXCELLENT regression introduction.

    **Lecture:** stat/Regression/ElementaryOLS

    http://pj.freefaculty.org/guides/stat/Regression/ElementaryOLS/Regression-1-lecture.pdf

12. Sept 30. Regression: Hypo testing: t tests, F test, Confidence Intervals

    **Read:**

    **Lecture:** stat/Regression/ElementaryOLS http://pj.freefaculty.org/guides/stat/Regression/ElementaryOLS/Regression-2-lecture.pdf

13. Oct 5 More Worked Examples

    **Lecture:** In this folder, I so far have 3 full worked examples of elementary regression /stat/Regression/ElementaryOLS
    Look for files named Regression-Example-1, and so forth.

14. Oct 7 Content Catchup, Test 1 distributed (due in 5 days).

15. Oct 12 Regression: Multiple Inputs

    **Read:** 1) Verzani, Ch. 11
    2) Wooldridge, Introductory Econometrics, Ch 3 (Blackboard).
    3) Fox, Ch 5.2-end, Ch 6.2-end

    **Lecture:** stat/Regression/MultipleRegression http://pj.freefaculty.org/guides/stat/Regression/MultipleRegression/Regression-MultipleInputs-lecture-1.pdf

16. Oct 14 Regression Assumptions and Plots For Checking Them

    **Read:** Cohen, Ch. 4

    **Lecture:** stat/Regression/MultipleRegression http://pj.freefaculty.org/guides/stat/Regression/MultipleRegression/Regression-MultipleInputs-lecture-3.pdf

17. Oct 19. Topic: Multicollinearity

    **Read:** Fox Ch. 13

    **Lecture:** /stat/Regression/Multicollinearity

http://pj.freefaculty.org/guides/stat/Regression/Multicollinearity/Multicollinearity-1-lecture.pdf

18. Oct 21 Regression II: Variable Selection, Variable Importance

    **Read:**

    (a) Cohen, Ch. 5.5

    (b) King, Gary. (1986). "How Not to Lie with Statistics: Avoiding Common Mistakes in Quantitative Political Science." *American Journal of Political Science*, 30(3), 666-687.

    **Lecture:** stat/Regression/MultipleRegression http://pj.freefaculty.org/guides/stat/Regression/MultipleRegression/Regression-MultipleInputs-lecture-2.pdf

    **Lecture:** /stat/Regression/StandardizedBeta http://pj.freefaculty.org/guides/stat/Regression/StandardizedBeta/Standardized-1-lecture.pdf

19. Oct 26 Categorical Predictors. From Model "frame" to "Design matrix"

    **Read:** Cohen, Ch 8

    Most of my lecture is my effort to understand Cohen's terminology

    **Lecture:** /stat/Regression/CategoricalPredictors/lecture-1

    http://pj.freefaculty.org/guides/stat/Regression/CategoricalPredictors/

20. Oct 28 Nonlinear Regression I

    **Read:** Fox, Ch. 12.3, Fox, Ch 17

    **Lecture:** /stat/Regression-Nonlinear/Nonlinear-Overview http://pj.freefaculty.org/guides/stat/Regression-Nonlinear/Nonlinear-Overview/Nonlinear-1-Overview-lecture.pdf

21. Nov 2 Nonlinear Regression, II

    **Read:** Fox, Ch 18

    **Lecture:** /stat/Regression-Nonlinear/Nonparametric-Loess-Splineshttp://pj.freefaculty.org/guides/stat/Regression-Nonlinear/Nonparametric-Loess-Splines/Nonparametric-1-lecture.pdf

22. Nov 4. Outliers and Influence Diagnostics (The Hat Matrix)

    **Read:** 1) Cohen Ch. 10.1-10.5

    2) Fox Ch. 11

    **Lecture:** /stat/Regression/RegressionDiagnostics http://pj.freefaculty.org/guides/stat/Regression/RegressionDiagnostics/RegDiagnostics-1-lecture.pdf

23. Nov 9. Interactions: "mean centering" does not ameliorate multicollinearity. Period.

    **Read:** Cohen, Ch. 7

    **Lecture:** /stat/Regression-Nonlinear/Interaction-Categorical http://pj.freefaculty.org/guides/stat/Regression-Nonlinear/Interaction-Continuous/Interaction-Continuous-1-lecture.pdf

    **Additional Reading:**

    Echambadi, R., & Hess, J. D. (2007). Mean-Centering Does Not Alleviate Collinearity Problems in Moderated Multiple Regression Models. *Marketing Science*, 26(3), 438-445.

    Kromrey, J. D., & Foster-Johnson, L. (1998). Mean Centering in Moderated Multiple Regression: Much Ado about Nothing. *Educational and Psychological Measurement*, 58(1), 42 -67.

24. Nov 11. Interactions: Categorical with Continuous

**Read:** 1) Cohen, 9.3

**Lecture:** /stat/Regression-Nonlinear/Interaction-Categorical

25. Nov 16. Heteroskedasticity

    **Read:** Fox, Ch. 12.2

    **Lecture:** /stat/Regression/Heteroskedasticity-WLS http://pj.freefaculty.org/guides/stat/Regression/Heteroskedasticity-WLS/Heteroskedasticity-WLS-lecture.pdf

    **Note:** I am removing "time series autocorrelation" from this lecture material.

26. Nov 18. Catchup, Midterm Exam 2 distributed (due in 5 days)

27. Nov 23. Logistic Regression

    **Read:** Verzani, Ch. 12; Cohen, 13.1-13.2

    **Lecture:** /stat/Regression-Categorical/LogitProbit https://pj.freefaculty.org/guides/stat/Regression-GLM/LogitProbit/LogitProbit-1-lecture.pdf

28. Dec 7. Final Exam due (following KU final exam schedule, due at 7:30PM)