



# PSY 626: Bayesian Statistics for Psychological Science

Fall 2020

Days/times: Tuesday, Thursday / 10:30 am - 11:45 am

Location: Online

## Update

- August 25: I changed the link to the WebEx meeting, below. This might work better.
- August 25: A link to the recording of today's lecture is now available, below.
- August 27: The TA set up some instructions for [installing software](#) we will (eventually) use on a Scholar cluster. It also includes some tips for other systems. If you have problems, please contact [mkon@purdue.edu](mailto:mkon@purdue.edu).
- September 1: ITP may still be setting up student access to the Scholar cluster. If you do not get it to work by Thursday, let me know and I will reach out to them.
- September 9: Homework 1 is available, below.
- September 22: Despite the problems we had this morning with WebEx, we will try to use it again on Thursday. Skype will be our backup plan.
- October 12: I forgot to put a *time* for submitting homework 2. Send it to Maria by midnight on Friday, October 16.
- October 28: Each student will prepare and present a "final project" for PSY 626. Using a data set, you will run a Bayesian analysis (exactly how is up to you). Ideally, you have your own data set to use for this investigation, but if you need a data set, I can provide one for you. Although the end of the semester is several weeks away, it seems prudent to start scheduling the student presentations. I plan to have two presentations each class period. Please sign up for a day at a [Google doc](#) by putting your name next to the date you are willing to present in the Speaker 1 or Speaker 2 column.
- November 5: In response to a question after lecture, I mentioned a statistics focused blog hosted by Andrew Gelman. It is [Statistical Modeling, Causal Inference, and Social Science](#). It discusses a variety of statistical-related topics. Gelman is a prominent Bayesian. Many of the discussions are quite interesting.

## Instructor:

<i>Name</i>	<i>Office</i>	<i>Email</i>	<i>Phone</i>	<i>Office hours</i>
<a href="#">Greg Francis</a>	PSYCH 3186	<a href="mailto:gfrancis@purdue.edu">gfrancis@purdue.edu</a>	494-6934	MWF 2:30 - 3:30 pm

**Office hours:** Virtual office hours will be held 2:30-3:30 pm (US Eastern time) [via WebEx](#). If WebEx asks for a meeting ID, use: gfrancis.

## Materials (lectures, readings, datasets, code):

- [PPT slides for Lecture 1, Francis \(2019\)](#).

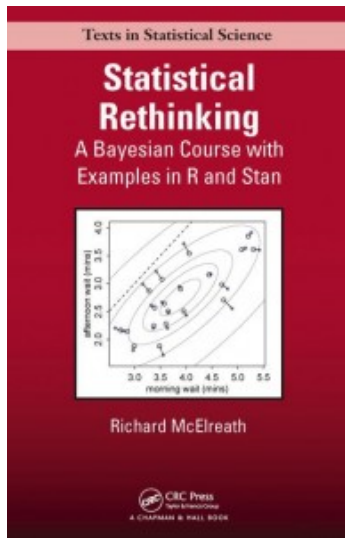
- [PPT slides for Lecture 2](#), [Francis \(2012\)](#).
- [PPT slides for Lecture 3](#), [Francis \(2014\)](#).
- [PPT slides for Lecture 4](#).
- [PPT slides for Lecture 5](#), [Shrinkage.R](#), [ShrinkagePrediction.R](#).
- [PPT slides for Lecture 6](#), [VisualSearch.csv](#), [VisualSearch.R](#).
- [PPT slides for Lecture 7](#), [VisualSearch2.R](#), [VisualSearch3.R](#).
- [PPT slides for Lecture 8](#), [VisualSearch4.R](#).
- [PPT slides for Lecture 9](#), [SmilesLeniency.csv](#), [SmilesLeniency1.R](#).
- [PPT slides for Lecture 10](#), [WeaponPrime.csv](#), [WeaponPrime1.R](#), [FacialFeedback.csv](#), [FacialFeedback.R](#).
- [PPT slides for Lecture 11](#), [DecisionMaking.csv](#), [DecisionMaking.R](#), [ZennerCards.csv](#), [Zenner1.R](#).
- [PPT slides for Lecture 12](#), [VisualSearch.csv](#), [VisualSearch5.R](#), [VisualSearch5c.R](#), [VisualSearch5e.R](#), [VisualSearch5f.R](#).
- [PPT slides for Lecture 13](#), [FacialFeedback.csv](#), [FacialFeedback2.R](#), [ZennerCards.csv](#), [Zenner3.R](#).
- [PPT slides for Lecture 14](#), [SmilesLeniency.csv](#), [SmilesLeniency2.R](#), [ADHDTreatment.csv](#), [ADHDTreatment1.R](#).
- [PPT slides for Lecture 15](#).
- [PPT slides for Lecture 16](#).
- [PPT slides for Lecture 17](#).
- [PPT slides for Lecture 18](#), [OneSubject.csv](#), [SternbergSearch0.R](#), [SternbergSearch1.R](#), [SternbergSearch.csv](#), [SternbergSearch2.R](#), [SternbergSearch2b.R](#), [SternbergSearch3.R](#).
- [PPT slides for Lecture 19](#).
- [PPT slides for Lecture 20](#), [MoonIllusion.zip \(data and analysis files\)](#).
- [PPT slides for Lecture 21](#), [PhysiciansWeight.csv](#), [PhysiciansWeight1.R](#).

### Class recordings:

- [August 25, 2020](#).
- [August 27, 2020](#).
- [September 1, 2020](#). (The recording starts 5-10 minutes in the lecture; I just forgot to start recording until then.)
- [September 3, 2020](#).
- [September 8, 2020](#).
- [September 10, 2020](#).
- [September 15, 2020](#).
- [September 17, 2020](#).
- [September 22, 2020](#).
- September 24, 2020. (Sorry, the lecture did not get recorded. I thought I had pressed the record button, but apparently, I had not.)
- [September 29, 2020](#).
- [October 1, 2020](#).
- [October 6, 2020](#).
- [October 8, 2020](#).
- [October 13, 2020](#).
- [October 15, 2020](#).
- [October 20, 2020](#).
- [October 22, 2020](#).

- [October 27, 2020.](#)
- [October 29, 2020.](#)
- [November 3, 2020.](#)
- [November 5, 2020.](#)
- [November 10, 2020.](#)
- [November 12, 2020.](#)

### Text:



McElreath, R *Statistical Rethinking: A Bayesian Course with Examples in R and Stan*. Try to get the second edition. Ordering information and code examples are at the book [web site](#).

In case you do not yet have the textbook, Chapters 1 and 2 of the textbook are on-line.

### Lectures:

Lectures will happen online via [via WebEx](#). If WebEx asks for a meeting ID, use: gfrancis. I will record the class meetings and make them available. Try to attend the (online) class if possible, so that we can address questions.

**General plan:** The course will explain why you might want to use Bayesian methods instead of frequentist methods (such as t-tests, ANOVA, or regression). The general plan is to:

1. Explain some problems/difficulties with frequentist methods: Publication bias, optional stopping, questionable research practices.
2. Discuss differences between hypothesis testing and prediction: mean squared error, shrinkage.
3. Discuss methods for prediction: likelihood, AIC, BIC, cross-validation.
4. Explain the basic ideas of Bayesian methods: non-informative priors, informative priors.
5. Provide hands-on examples of applying Bayesian methods: Bayes Factors, hierarchical models.

Throughout, we will be using computer programs to demonstrate the ideas. There will not be any proofs.

**Class home page:** The home page for this course is

<http://www.psych.purdue.edu/~gfrancis/Classes/PSY626/indexF20.html> From this page you can download lecture notes, view the class schedule, view current grades, and connect to the various homework laboratory assignments.

**Homework:** Assignments will be due approximately every two weeks. The intention is to use the homework assignments as a way of practicing the concepts we discuss in class. They will be graded, but only to insure

that students actively participate.

1. Homework 1: [as PDF](#), [as MS Word](#), [ComputePower.R](#),
2. Homework 2: [as PDF](#), [as MS Word](#), [SleepySubjects.csv](#),
3. Homework 3: [as PDF](#), [as MS Word](#), [LookDontType.csv](#),

**Project:** In the last two weeks, students will [present \(document updated 29 October 20202\)](#) a Bayesian (or related) analysis of some of their own data. If you do not happen to have a data set, we will get one for you.

**Assumed background:**

- It would be nice, but not necessary, if you had some previous exposure to calculus.
- Doing any kind of Bayesian analysis requires some programming. We will be using the free [R software](#). Many people like the [R studio](#) program. You do not need to be an expert programmer, but if you have little programming experience, you will have some catching up to do.
- Students should have experience with typical statistical methods (t-test, ANOVA, regression).

**Teaching Assistant:**

<i>Name</i>	<i>Email</i>	<i>Office hours</i>
Maria Kon	<a href="mailto:mkon@purdue.edu">mkon@purdue.edu</a>	MWF 9:30 - 10:30 am ( <a href="#">via Microsoft Teams</a> )

Please contact the TA if you cannot meet during office hours to schedule an alternative time.