Lecture 1

DJM

January 9, 2018

Syllabus

Course info

Instructor:
Daniel McDonald
Office: Ballantine Hall 669
Website: http://mypage.iu.edu/~dajmcdon
Slack: @dajmcdon
Email: dajmcdon@indiana.edu

Office hours:
Me: Tuesday 1-2, Wednesday 2:30-3:30
Michael: Friday 10-11 (BH 643)

Course webpage:
WWW: https://stats-432sp2018.github.com/
Github: https://github.com/stats-432sp2018
Slack: https://stats-432sp2018.slack.com/

Lectures:
TR 9:30 - 10:45, BH 149

Textbook:
Required: *Advanced Data Analysis from an Elementary Point of View*
Required: *Introduction to Statistical Learning*

Prerequisite:
STAT-S 431 or equivalent or permission of the instructor.

Course objective

This is a course in advanced data analysis. Based on the theory of linear models covered in S431, this course will focus on applying many types of data analysis methods to interesting datasets. The focus will be dealing with and describing data rather than on particular methods per se.

The course combines analysis with methodology and computational aspects. It treats both the "art" of understanding unfamiliar data and the "science" of analyzing that data in terms of statistical properties. The focus will be on practical aspects of methodology and intuition to help students develop tools for selecting appropriate methods and approaches to problems in their own lives.

I expect that the material should be appropriate and interesting to students coming from either statistics or informatics/computer science. I will make an effort to provide necessary background so that lectures are accessible to both populations.

We will put special emphasis on learning to use certain tools common to companies which actually *do* data science. This includes Slack, GitHub, Rstudio, and Rmarkdown. As such, we will require the use of these technologies.

Lectures

Class time will consist of a combination of lecture, discussion, questions and answers, and problem solving, with a focus on problem solving. You are strongly encouraged to bring a laptop to class.

Textbook

We will use two books. Both are free online. The first is still in progress and subject to change, so you should download it somewhat frequently.

Course communication

This class will use Slack for class communication. Slack is a Team messaging app which is frequently adopted by companies and research groups. We will use it for announcements, questions, homework communication, etc. You are required to use it.

Since homework and the project are team-based, you need a way to communicate with your team. Slack is that way. You can create a special channel for your team. You can direct message individuals. You can message me or the TA. You can post pictures of cats. The sky is the limit. By using slack, we will avoid sending lots of email back and forth.

Slack has apps for iPhone or Android, Mac or Windows. Or you can use the web.

~~If you send me email instead, I may ignore it.~~

Communication rules

- All content-related (non-personal) questions should be asked in Slack. Use the `general` channel for homework, lecture, or other questions. For personal issues, direct message me (@dajmcdon) or the TA.
- Before posting a new question please make sure to check if your question has already been answered. Just search.
- It may be more efficient to answer your question "in-person" so make good use of office hours (2.5 hours per week).
- Emails will almost certainly be ignored.
- I generally reply to messages during normal business hours (M-F). My typical response time is 24 hours. Please don't message me on Slack, wait an hour without response, email me, email me again, etc.
- Ignoring these rules will result in decreased participation points.

Grading

10 In-class exercises (5 points each)
10 Reading responses (5 points each)
6 Homeworks (25 points each)
1 Course project (PC 1/PC 2/PC 3/Presentation 15/35/75/25)
2 Take-home exams (150 points each)
Participation (50 points)

In all cases, a fixed number of points may be **earned** for each exercise. Points are not deducted for poor performance in this class. Points are awarded for excellent performance.

In-class exercises

- We will regularly have short programming or theoretical exercises during class time.
- At the end of class, you will push your results to Github for grading.
- Complete submissions will receive full credit.
- Partial submissions will receive 2 points.
- There will be at least 10 of these during the semester.
- Any submissions you make in excess of 10 will be extra credit.

Reading responses

- Each chapter will have a short coding exercise which you should submit before we cover the chapter.
- I will post the exercise on Github, you clone it and upload your changes.
- These will generally be due before class begins on **Tuesday** each week.
- Complete submissions will receive full credit.
- Partial submissions will receive 2 points.
- There will be at least 10 of these during the semester.
- Any submissions you make in excess of 10 will be extra credit.

Homeworks

- Homework assignments will be completed in groups which I assign.
- These groups will rotate for each assignment.
- Each team will have their own private repository.
- All assignments will be submitted on Github.
- Homework grades will be awarded based on complete and accurate analyses according to the rubric provided with each assignment.
- Grades will be adjusted up or down based on participation according to the Github commit messages.
- You are expected to consult only with me, the TA, or your assigned group, with the exception of conversations which occur during class meetings or office hours in the presence of me or the TA.
- ~~This means that you and your friend (who is in a different group) may not do the homework together.~~

Project

- You will be required to complete a team project (2-4 people).
- You may choose this group.
- The goal is to analyze a dataset in depth using anything that you have learned.
- The project will have three checkpoints:
  1. PC 1 will be due **Thursday, January 25**,
  2. PC 2 is due **Thursday, March 8**,
  3. PC 3 is due on **Monday, April 30**.
- All are to be uploaded to your repo by 11:59pm on those dates.
- See the project page for detailed requirements.
- The entire class will give brief presentations during the last week of classes.

Exams

- There will be two take home exams.
- Both will be completed ~~entirely~~ individually.
- The midterm will be made available on **Friday, Febuary 16** for submission by **Friday, February 23**.
- The second exam will be available **Friday, April 13** for submission by **Friday, April 20**.
- In both cases, the exam file will be downloaded from your personal repo at 11:59pm on the due date.
- Late submissions will not be accepted.

  If either of these dates pose some type of problem, you must notify me no later than Friday, January 12. After this date, no alternatives will be considered without medical documentation.

Solutions

- Some of the problems that are assigned are similar or identical to those assigned in previous years by me or other instructors for this or other courses.
- Using proofs or code from anywhere other than the textbooks (with attribution), this year's course notes (with attribution), or the course website is not only considered cheating (as described above), it is easily detectable cheating.
- Such behavior is strictly forbidden.

Cheating

- In previous years, I have caught students cheating on the exams.
- I did not enforce any penalty because the action did not help.
- Cheating, in my experience, occurs because students don't understand the material, so the result is usually a failing grade even before I impose any penalty and report the incident to the Dean's office.
- I carefully structure exams to make it so that I can catch these issues.
- I ~~will~~ catch you, and it does not help.
- Do your own work, and use the TA and me as resources.
- If you are struggling, we are here to help.

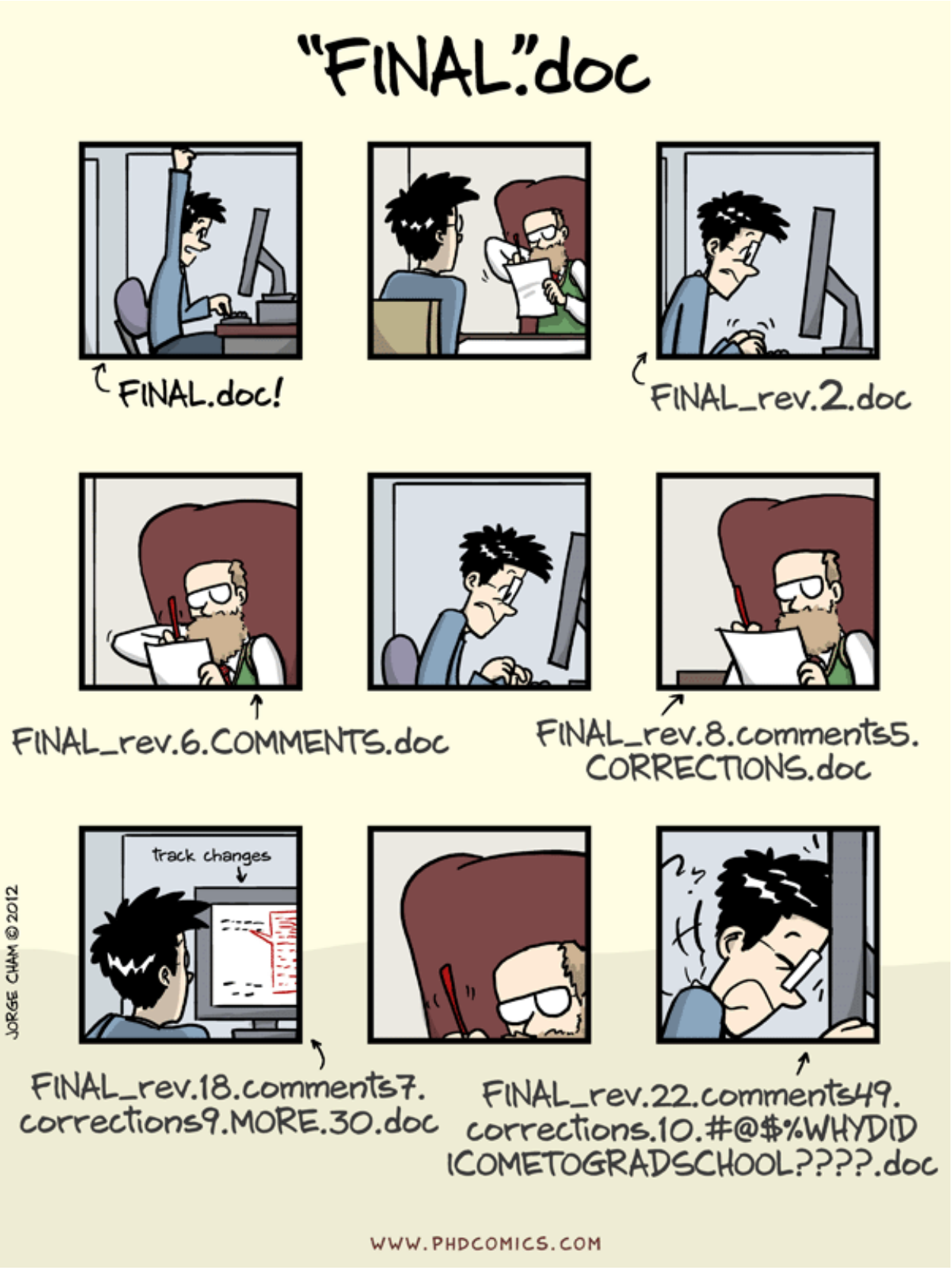
  If I suspect cheating, your case will be forwarded to the Dean's office. No questions asked.

Github

Acknowledgements

- Much of this lecture is borrowed/stolen from Colin Rundel and Karl Broman

Why version control?



Why version control?

- Simple formal system for tracking all changes to a project
- Time machine for your projects
  - Track blame and/or praise
  - Remove the fear of breaking things
- Learning curve is steep, but when you need it you REALLY need it

  Your closest collaborator is you six months ago, but you don't reply to emails. – *Paul Wilson*

Why Git

- You could use something like Box or Dropbox
- These are poor-man's version control
- Git is much more appropriate
- It works with large groups
- It's very fast
- It's much better at fixing mistakes
- Tech companies use it (so it's in your interest to have some experience)

  This will hurt, but what doesn't kill you, makes you stronger.

Set up

- Open Rstudio
- Go to the "Tools" menu and select "Shell"
- Type

```
git --version
```

- If it's there, you're done, otherwise...

Initial configuration

- Now tell it who your are:

```
$ git config --global user.name "Daniel McDonald"
$ git config --global user.email "dajmcdon@gmail.com"
$ git config --global core.editor nano
```

- `nano` is a light-weight text editor. You probably won't ever use it, but it's good to tell git to use nano. If for some reason git asks you questions about doing things, just remember

  Ctrl + X is quit

(it says this at the bottom of the window)

- This is all that we will do with git in the terminal
- Rstudio has git built in, and so we'll use it through there mostly
- Using the terminal gives access to more complicated issues, which hopefully we won't have to deal with.

Github

- This is a commercial site that interacts with Git (GitLab and Bitbucket do as well)
- You need a free account http://www.github.com/

- Git tracks changes to your files in both places
- Your files live in **repositories** (repos in the lingo)
- You and others share access to repos

When you want to work on a file

- You **pull** the repo onto your local machine
- Make all your changes
- You **commit** your changes with a message, e.g.: "I fixed the horrible bug"
- You **push** your changes back to the repo

The hard way

- You will do this practice, this once, using the terminal or a GUI
- I use GitKraken, but see the reading assignment, below
- If stuff gets messed up later, we can clean it up with the GUI
- It's a little easier than in Rstudio to fix things

The rest

- All the rest of the time, we'll just use Rstudio
- You clone a repo using Rstudio, make your changes, and push using Rstudio

Slack

- We will use another service called Slack for communication
- It is also free
- It is also common in industry
- It's just a way to send me, the TA, or your classmates messages
- This replaces the discussion board, announcements, etc on Canvas
- This way, you can talk to your team, you can talk to me, you can ask the class questions
- There are Android and iOS apps
- I use it in my web browser, so I will not always be there.

In class assignment 1

- Go to https://github.com/STATS-432Sp2018/class-roster
- By noon tomorrow, complete steps 1 and 2
- Read http://happygitwithr.com/index.html
- Bring your laptop on Thursday (see me if you need an alternate solution)