



STOR 320 Introduction to Data Science

Lecture 1

Yao Li

Department of Statistics and Operations Research

UNC Chapel Hill

Instructor

- Name: Yao Li
- Email: yaoli@email.unc.edu
- Office hours: Tuesday, Thursday 10:00AM to 11:00AM
- Personal website: <https://liyao880.github.io/yaoli/>
- Course website: <https://liyao880.github.io/stor320/>
- Research interest: adversarial deep learning, large-scale recommender systems, model compression

Get to know your instructor

- Join at **www.kahoot.it**



Instructional Assistant

- Kevin O Connor
 - Email: koconn@live.unc.edu
 - Office Hours: Friday, 1:00 PM to 2:00 PM
- Pavlos Zoubouloglou
 - Email: pavlos@live.unc.edu
 - Office Hours: Monday, 9:00 AM to 10:00 AM
- Sam Booth
 - Email: slbooth@live.unc.edu
 - Office Hours: Wednesday, 2:00 PM to 3:00 PM

Outline

- Administrative details
- What's the course about?
- Introduction to R

Ask Questions in Class

- By default, your microphone will be muted.
- If you have a question, feel free to unmute yourself and ask questions.
- Also, you can type your question in the in-meeting chat window.

Lectures and Labs

- Lectures TTH 11:30 AM - 12:45 PM
- Labs
 - 400 Friday 10:40AM – 11:30AM (FF/Hy)
 - 401 Friday 12:00PM – 12:50PM (Remote only)
 - 402 Friday 1:20PM – 2:10PM (FF/Hy)
- Email Christine (crikeat@email.unc.edu)

Remote Instruction

- This will be a hybrid course:
 - a) lectures will be held live online during the scheduled time and recorded so that you can watch them later;
 - b) lab session 401 will be online and recorded, the other two labs will be held face-to-face in classrooms;
 - c) some of the lectures might be prerecorded if there are connection issues and livestreaming is not possible;
 - d) office hours will be held online but not recorded;
 - e) all assignments will be done remotely.

Questions

- Three ways to ask questions:
 - post questions on Sakai forum;
 - come to the virtual office hours on Zoom;
 - send an email to the instructor or the IAs.

Grading

Labs	40%
Homework	30%
Final Project	30%

A	94 to 100	B	83 to 86.99	C	73 to 76.99	D	60 to 66.99
A-	90 to 93.99	B-	80 to 82.99	C-	70 to 72.99	F	0 to 59.99
B+	87 to 89.99	C+	77 to 79.99	D+	67 to 69.99		

Homework and Labs

- Around 4-6 homework assignments. They will be posted on Sakai and there will be about one week to complete the assignment.
- Each lab assignment will be based on the topics discussed in lecture or related to your final project. Students are responsible to turn in their own labs but are encouraged to work in teams and help each other. A lab instructor will be provided to help students in the completion of the lab and to facilitate group work.

Project

- For the final project, each section of STOR 320 will be divided (ideally) into research groups of size 4 or 5. To ensure fairness, students will be assigned randomly based on lab session.
- The groups will be assigned by August 28, 2020 (Friday) and you can find your group on shared via [google sheet](#).

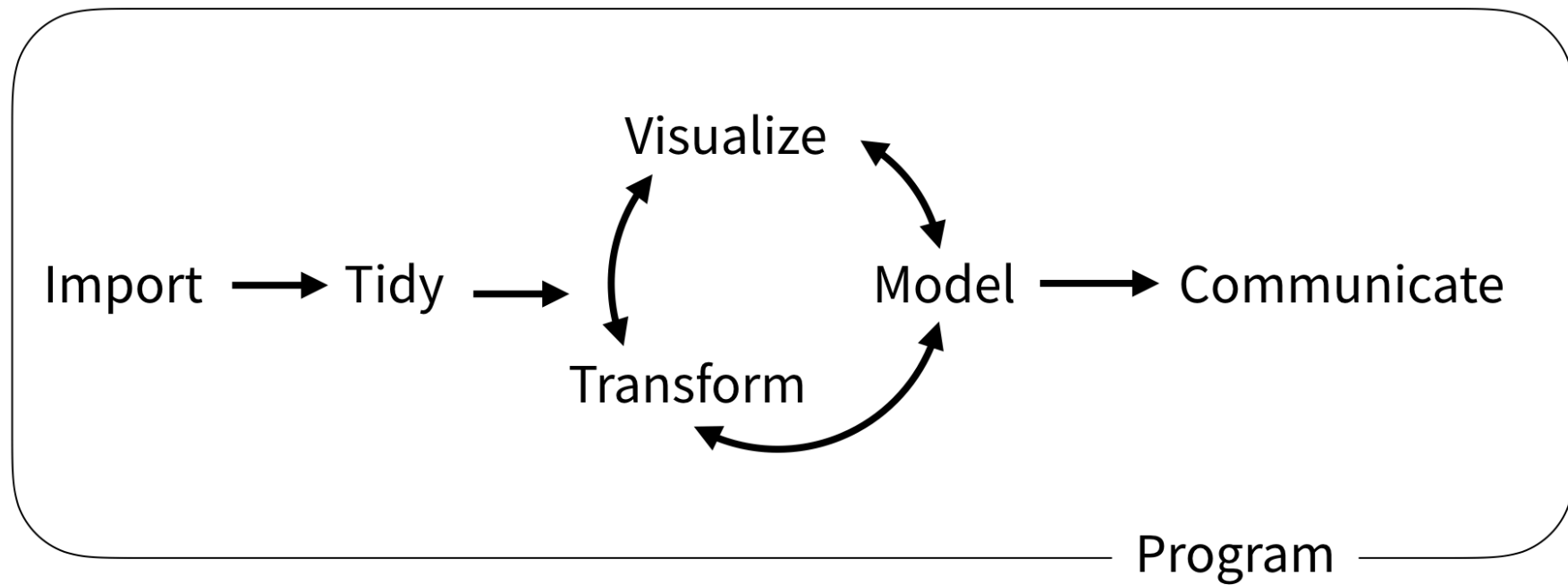
Project

Project proposal	10%
Exploratory data analysis	20%
Final report	40%
Final presentation	30%

Important dates

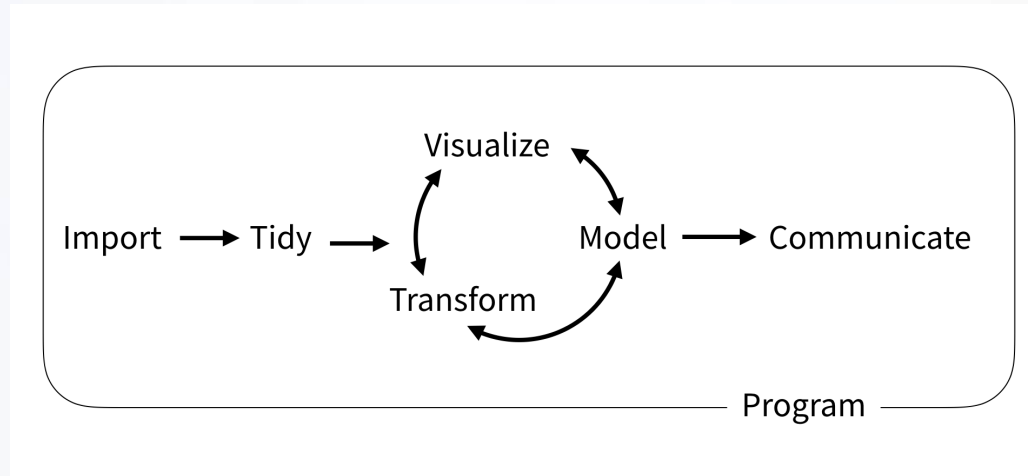
Project proposal	September 15
Exploratory data analysis	October 9
Final report	November 13
Final Presentation	November 12 or November 17

What is data science?



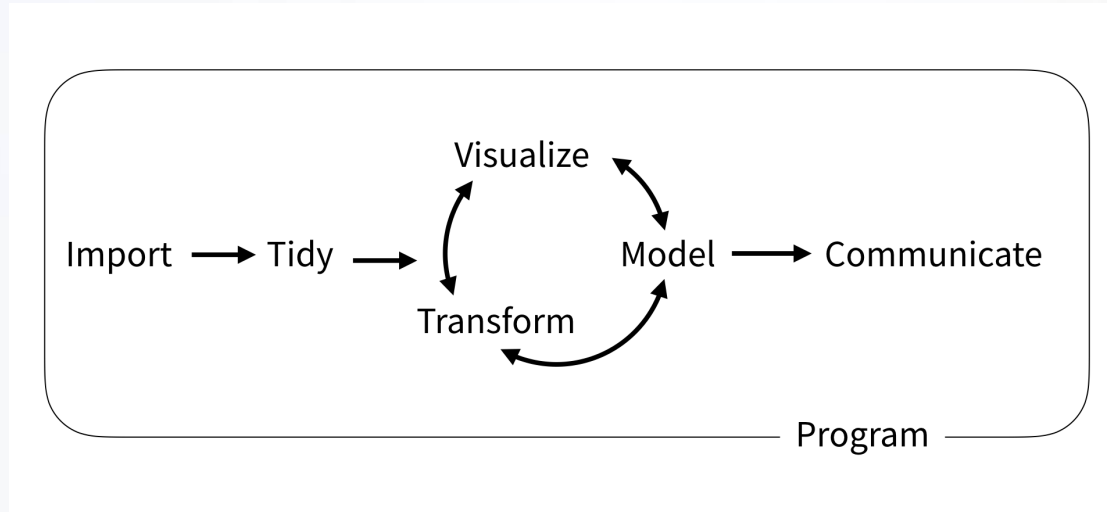
Wickham and Grolemund (2017)

The model of data science



- First we must *import* our data.
- *Tidy* data → consistent structure
- Transformation:
 - narrowing in on observations of interest
 - creating new variables
 - calculating a set of summary statistics

The model of data science



- *Visualization*: show you things that you did not expect or raise new questions about the data.
- Use a *model* to answer your questions
- *Communication*: an absolutely critical part of any data analysis project.
- Surrounding all these tools is programming.

R and RStudio



~/Documents/rmarkdown - gh-pages - RStudio

5-parameters.Rmd x

```
1 ---
2 title: "Visualizing the ocean floor"
3 output: html_document
4 params:
5   data: "hawaii"
6 ---
7
8 ```{r include = FALSE}
9 library(marmap)
10 library(ggplot2)
11 ```
12
13
14 The [marmap](https://cran.r-project.org/web/packages/marmap/index.html) package provides tools and data for visualizing the ocean floor. Here is an example contour plot of marmap's ``r
15 params$data`` dataset.
16
17 ```{r echo = FALSE}
18 data(list = params$data)
19 autoplot(get(params$data))
20 ```
21
22 21:1 (Top Level) R Markdown
```

Environment History Build Git

Files Plots Packages Help Viewer

Visualizing the ocean floor

The `marmap` package provides tools and data for visualizing the ocean floor. Here is an example contour plot of marmap's `aleutians` dataset.

A contour plot of the ocean floor showing the Aleutian Islands. The x-axis is labeled 'x' and ranges from 170 to 210. The y-axis is labeled 'y' and ranges from 50 to 65. The plot shows a series of contour lines representing the depth of the ocean floor, with the Aleutian Islands visible as a series of peaks and valleys.

Console R Markdown x

```
~/Documents/rmarkdown/demos/
> render("5-parameters.Rmd", params = list(data = "aleutians"))
```

Why R?

- Easy to learn and easy to use.
- Very popular and one of the standard languages for statistics, data science, computational biology, finance, industry, etc.
- Free and open-source.
- A lot of high-quality packages.
- New technology and ideas often appear first in R.
- Supported by a vast community that maintains and updates R.
- Runs on basically any platform.

Learning Programming

- Transfer the concepts to other languages
- How you approach a computational task and reason about the computations is similar
- Learning another programming language will be much easier in the future

Statistical Learning

- Linear regression.
- Classification (logistic regression, LDA, K-nearest neighbors).
- Cross-validation and bootstrap.
- Principal component analysis.
- Clustering methods (K-means clustering and hierarchical clustering).
- Recommender systems.
- Neural networks.

Textbooks

- *R for Data Science*. Hadley Wickham. Legally free online, but can be purchased for less than \$40 on Amazon. Additional suggested texts are provided on the website. All texts used in this course are free and downloadable from course website.
- *The elements of statistical learning: data mining, inference, and prediction*. Hastie, Trevor, Robert Tibshirani, and Jerome Friedman.