Stat 133: Concepts in Computing with Data

Stat 133 by Gaston Sanchez

Github Repository

github.com/ucb-stat133/stat133-fall-2017

About Stat 133

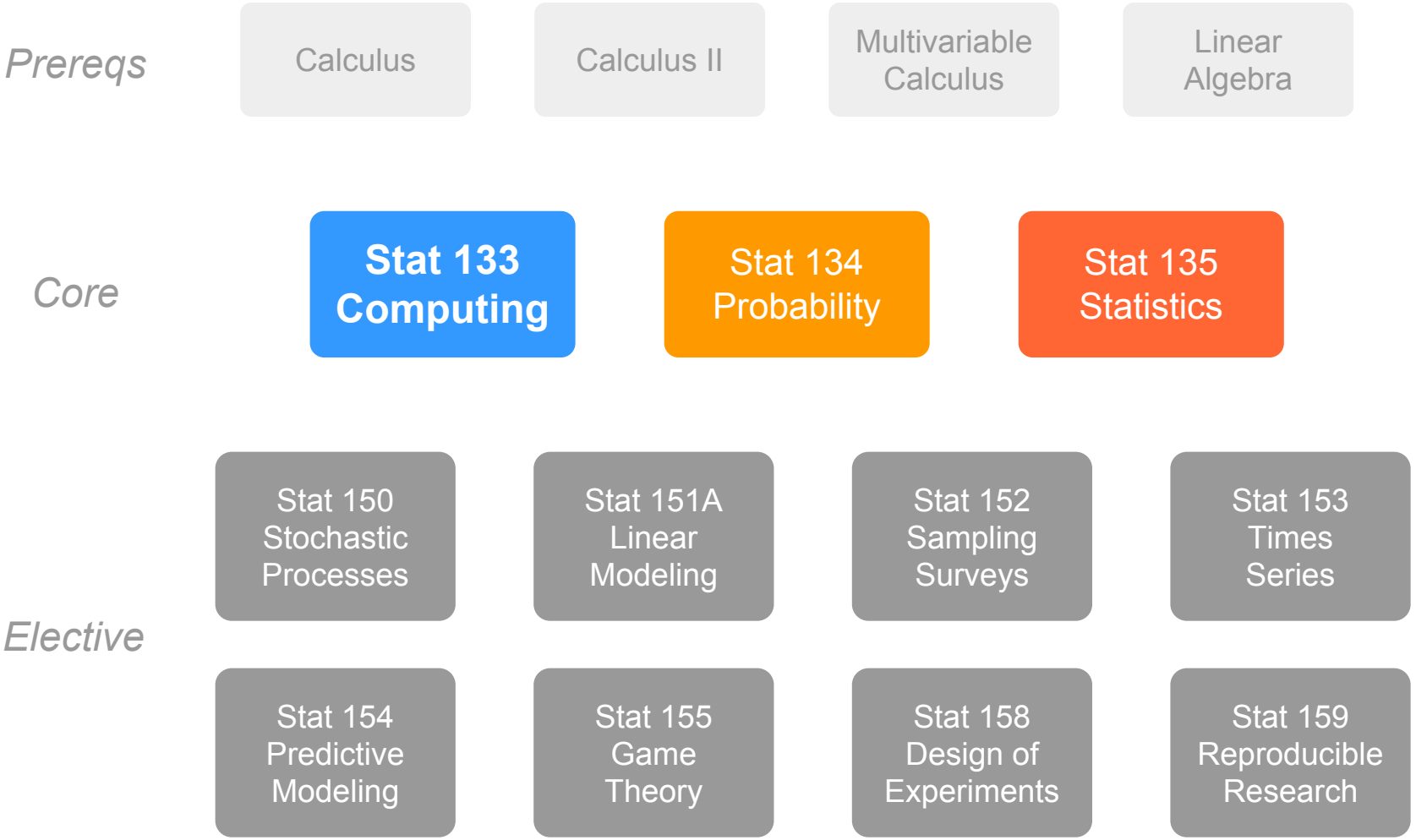
Course Catalog Description *(a bit outdated)*

"An introduction to computationally intensive applied statistics. Topics will include organization and use of databases, visualization and graphics, statistical learning and data mining, model validation procedures, and the presentation of results."

Stat 133

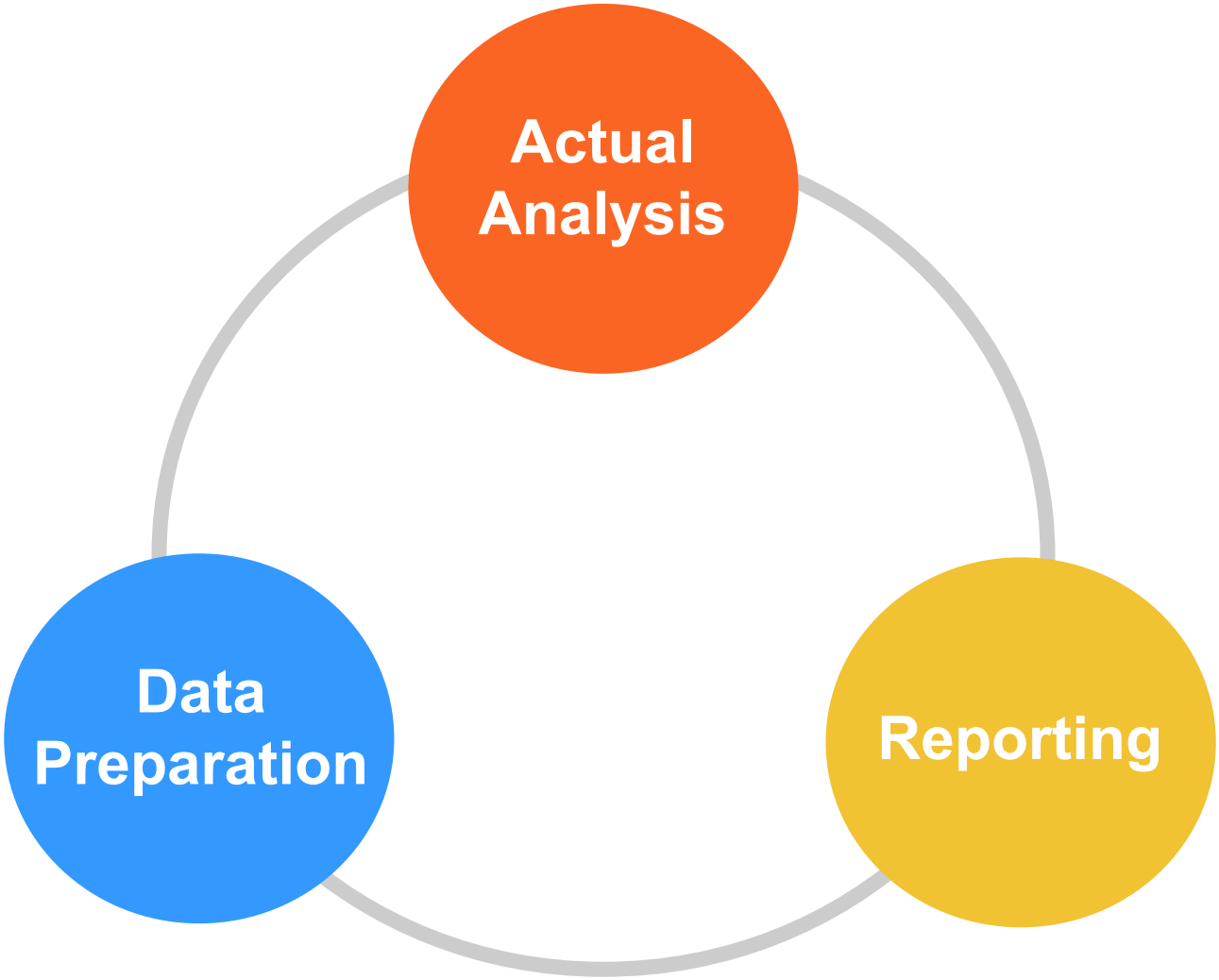
Core Course for Statistics Major

Stats Major

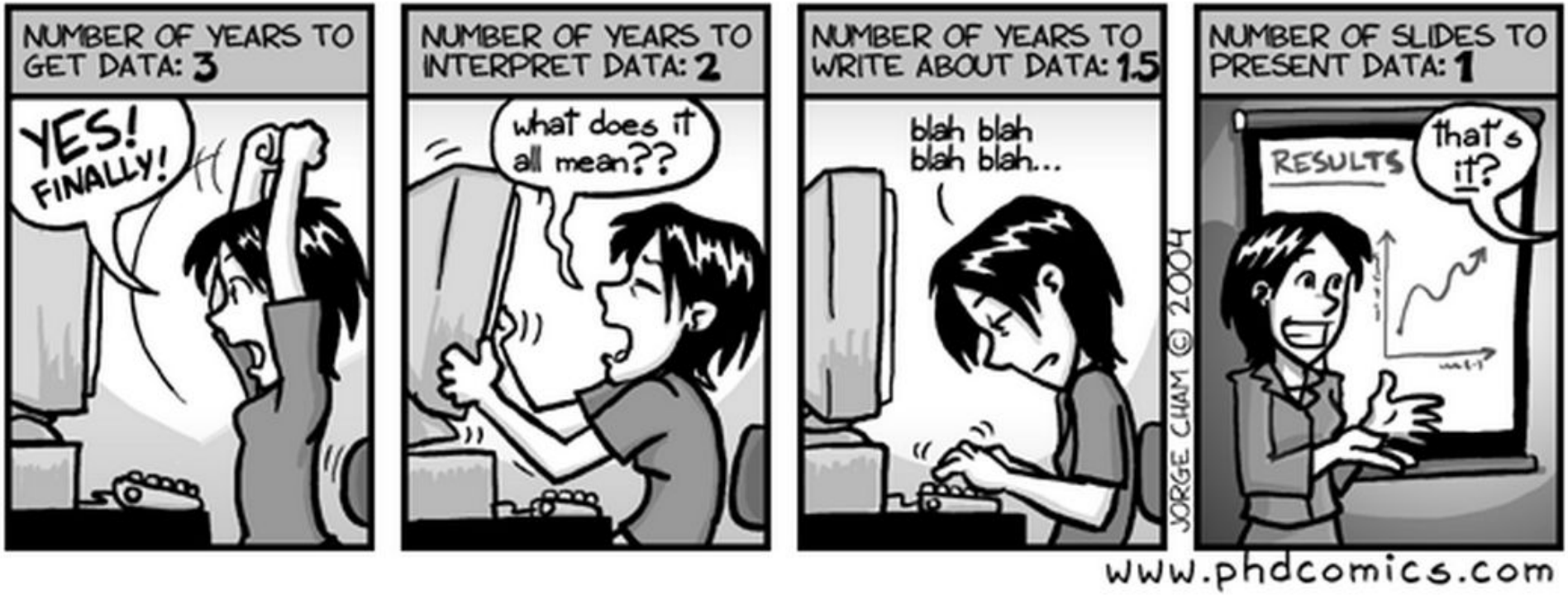

Prereqs
Calculus
Calculus II
Multivariable Calculus
Linear Algebra
Core
Stat 133 Computing
Stat 134 Probability
Stat 135 Statistics
Elective
Stat 150 Stochastic Processes
Stat 151A Linear Modeling
Stat 152 Sampling Surveys
Stat 153 Times Series
Stat 154 Predictive Modeling
Stat 155 Game Theory
Stat 158 Design of Experiments
Stat 159 Reproducible Research

Data Analysis Cycle (DAC)

My vision of the Data Analysis Cycle



DATA: BY THE NUMBERS



http://www.phdcomics.com/comics/archive.php?comicid=462


NUMBER OF YEARS TO GET DATA: 3
YES! FINALLY!


NUMBER OF YEARS TO INTERPRET DATA: 2
what does it all mean??


NUMBER OF YEARS TO WRITE ABOUT DATA: 1.5
blah blah blah blah...


NUMBER OF SLIDES TO PRESENT DATA: 1
RESULTS
that's it?

Sad but true...

Sad But True

Data

Analysis

Report

Communication

Traditionally, this is where most teaching focuses on

Sad But True

(ALMOST) NO ONE TEACHES THIS!

Data

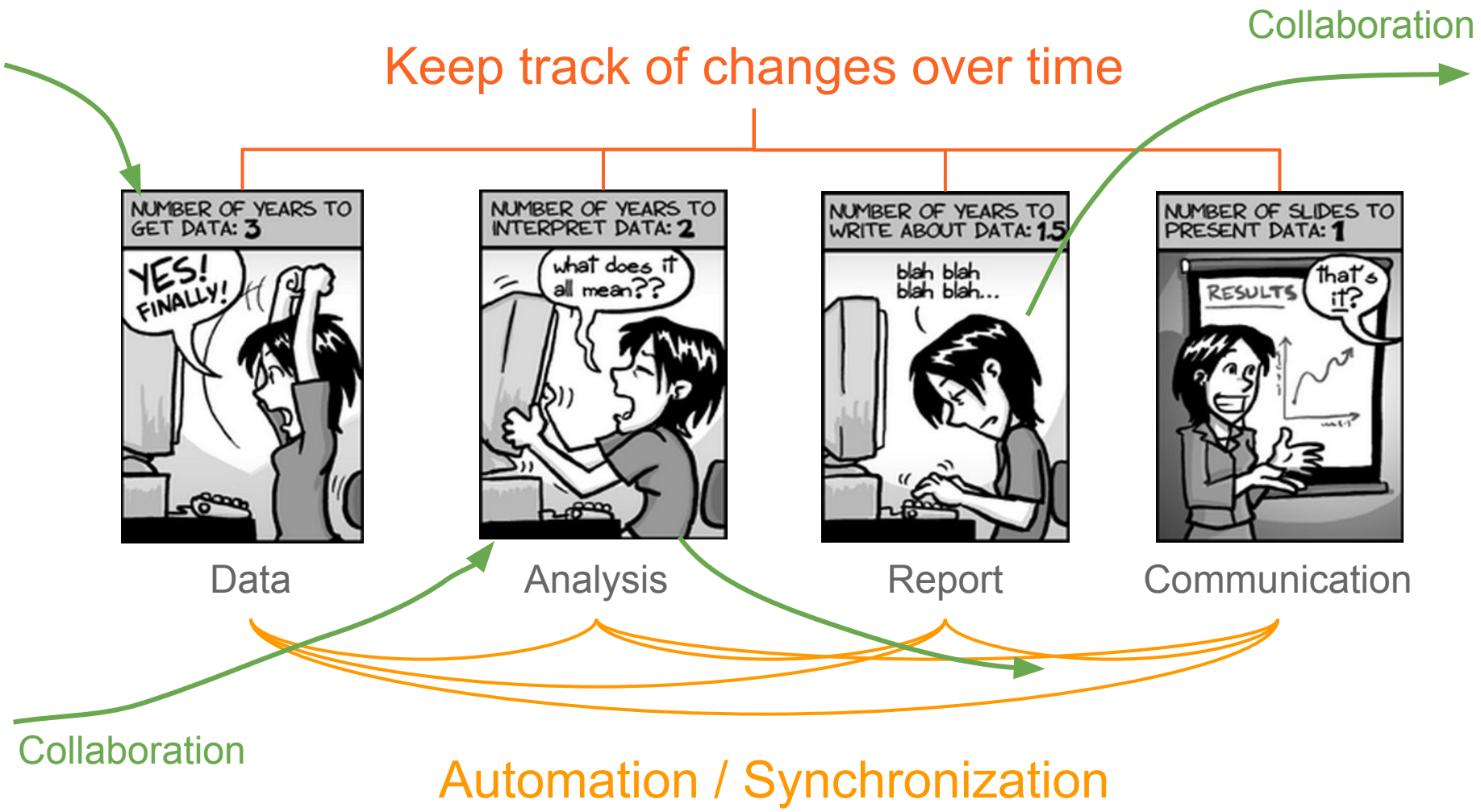
Analysis

Report

Communication

In practice these are where we spend most of our time

Things to keep in mind ...



Course Content

Course cornerstones

Data Manipulation

Data Visualization

Reporting Tools

Programming Concepts

Data Technologies

R
& other tools

AND STATISTICAL CONCEPTS

Data Manipulation

1. Data Tables
2. Data Tidying
3. Selecting and Filtering
4. Reshaping
5. Aggregation & Group by operations
6. Joins and Merges

Data Visualization

1. Visualization basics
2. Colors
3. Statistical graphics
4. Efficient displays
5. Design and Aesthetics considerations
6. Good and bad practices

Programming concepts

1. Programming with an emphasis on data analysis
2. Data types and data structures
3. Control flow structures
4. Variables
5. Functions
6. Regular Expressions

Reporting Tools

1. Markdown syntax
2. LaTeX (mostly equations)
3. Dynamic Documents
4. Shiny Apps
5. Writing reports

Data Technologies

1. Data Tables
2. Unstructured data
3. HTML, XML, etc
4. Web scraping (Web API's)
5. JSON
6. Relational Databases (SQL)

R and other tools

1. R
2. RStudio
3. Command Line (Bash)
4. Version control with Git
5. Hosting with Github
6. etc

Statistical Concepts

1. Basic Numeracy: variability, patterns, comparisons
2. Apply introductory concepts
3. Methods: regression, classification, dimension reduction
4. Missing Data: imputation, treatment
5. Simulation: Monte Carlo, bootstrap, etc

Course Resources

Github Repository

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Some Comments

The R course?

Typically known as the R course

Mea Culpa

R is just the means

The goal is to introduce you to different aspects of the Data Analysis cycle

It just happens that we use R as the main computational tool

Course Format

Lectures: conceptual stuff, demos, case studies, examples, review some code

Labs: practical work using R

Homework: follow the work of labs, plus some challenges

Posts: Give you the opportunity to do some research on specific topic(s)

My Expectations

Don’t expect you to become an expert (that takes a lot of time)

Don’t expect you to become hackers

Instead: give you solid foundations about data analysis

Expose you to different “data technologies”

Ultimate Goals

Understand different types of data (e.g. files, forms, formats)

Know how to access information stored in different formats

Know how to do data manipulation and processing in R

Be better prepared to crunch data

Becoming a data scientist
is a **marathon** not a sprint

Next Week

Install Software

R

RStudio