

Happy Git and GitHub for the useR



 [@JennyBryan](https://twitter.com/JennyBryan)

 [@jennybc](https://github.com/jennybc)

STAT
545

 [@STAT545](https://twitter.com/STAT545)
 stat545-ubc.github.io

Talk given at

An Afternoon with Hadley Wickham and Friends

Community event hosted by Data Day Texas,
the Austin R User Group, and Austin Data Geeks

2016 Jan 15

links, credits, and slides available here

https://github.com/jennybc/2016-01-15_austin-hadley-friends

Version control systems (VCS) were created to help groups of people develop software

Git, in particular, is being “repurposed” for activities other than pure software development ... like the messy hybrid of writing, coding and data wrangling ... and exposing the gory details... and collaborating with others



What would Git adoption feel like?

Install Git. Configure it. Affirm RStudio can find it.

R project? Pre-existing or new.

Dedicate a directory to it.

Make that an RStudio Project.

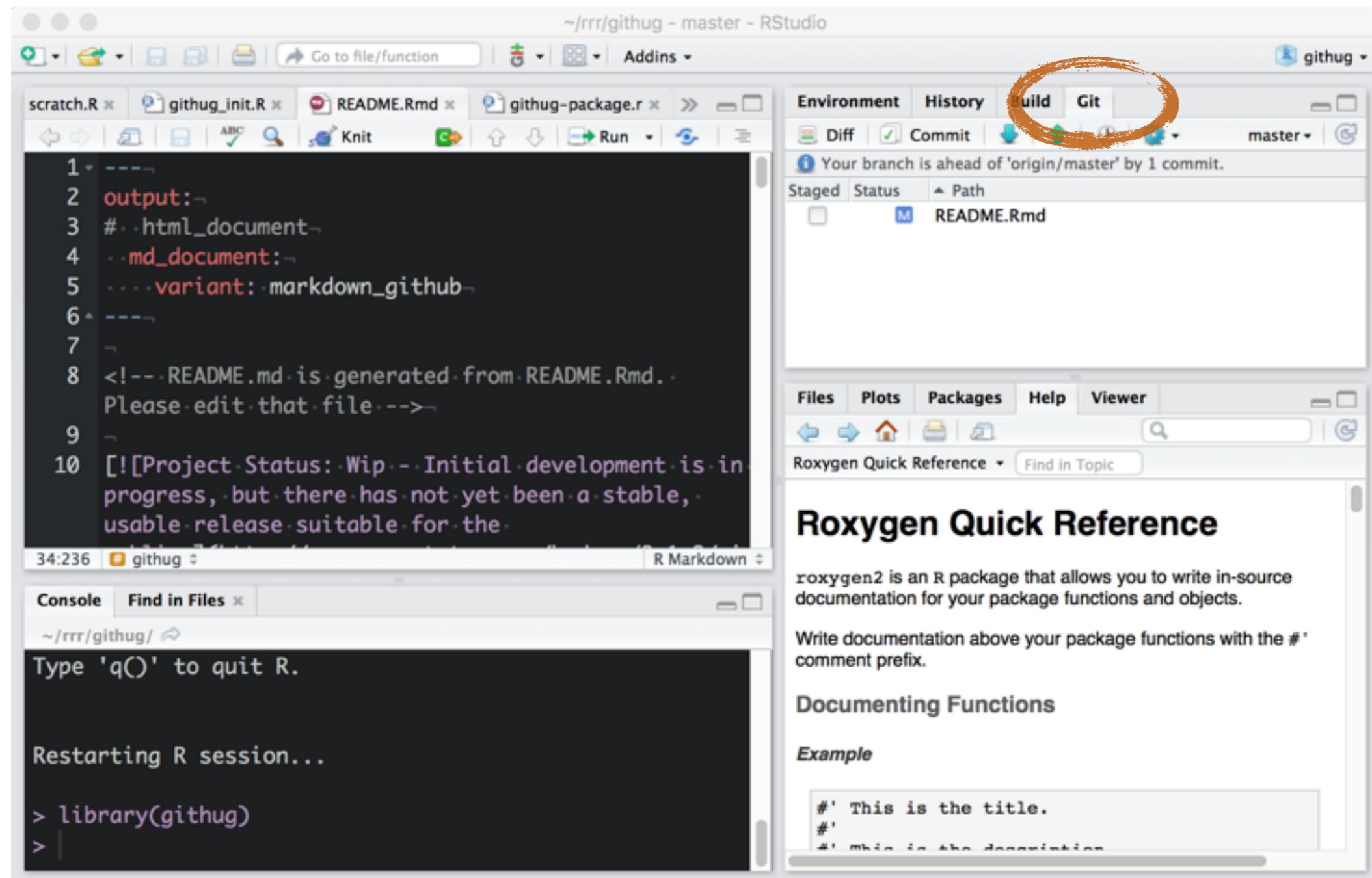
Make that a **Git repository**.

Do your usual thing but ...

instead of just saving, you also make **commits**.

Push to **GitHub** periodically.

RStudio will offer a **Git** pane to help you make **commits**, view **history** and **diffs**, and push to / pull from **GitHub**.



You — and possibly other people! — could visit the project on GitHub. For browsing and much more.

The screenshot shows a GitHub repository page for `jennybc/gapminder`. The page includes a header with navigation icons, a search bar, and links for Pull requests, Issues, and Gist. Below the header, there are buttons for Unwatch (with 9 notifications), Star (51 stars), and Fork (27 forks). The main content area displays the commit history for the `master` branch. The commits are organized by date: Jan 1, 2016; Dec 31, 2015; and Dec 30, 2015. Each commit includes the author's profile picture, the commit message, the date it was committed, and links to view the commit details, copy the commit hash, and share it.

- Commits on Jan 1, 2016:
 - fix test re: gapminder_unfiltered**
jennybc committed 13 days ago
- Commits on Dec 31, 2015:
 - use tidy::separate() as per @hadley**
jennybc committed 14 days ago
 - make a md table for data-raw README**
jennybc committed 15 days ago
- Commits on Dec 30, 2015:
 - link**
jennybc committed 15 days ago
 - case sensitivity bites**
jennybc committed 15 days ago
 - add README to data-raw**
jennybc committed 15 days ago
 - typos**
jennybc committed 15 days ago

Our battle-tested installation guide



Working with RStudio, Git, GitHub

- [Level 1: Installation](#)
- [Level 2: Git and GitHub configuration](#)
- [Level 3: RStudio and Git and GitHub Extravaganza](#)
- [Level 666: Troubleshooting](#)
- [Resources](#)

http://stat545-ubc.github.io/git00_index.html



git

NAME

`git-update-ref` - Update the object name stored in a ref safely

SYNOPSIS

git update-ref [-m <reason>] (-d <ref> [<oldvalue>] | [--no-deref] <ref> <newvalue> [<oldvalue>] | --stdin [-z])

DESCRIPTION

Given two arguments, stores the <newvalue> in the <ref>, possibly dereferencing the symbolic refs. E.g. `git update-ref HEAD <newvalue>` updates the current branch head to the new object.

Given three arguments, stores the <newvalue> in the <ref>, possibly dereferencing the symbolic refs, after verifying that the current value of the <ref> matches <oldvalue>. E.g. `git update-ref refs/heads/master <newvalue> <oldvalue>` updates the master branch head to <newvalue> only if its current value is <oldvalue>. You can specify 40 "0" or an empty string as <oldvalue> to make sure that the ref you are creating does not exist.

It also allows a "ref" file to be a symbolic pointer to another ref file by starting with the four-byte header sequence of "ref:".

More importantly, it allows the update of a ref file to follow these symbolic pointers, whether they are symlinks or these "regular file symbolic refs". It follows **real** symlinks only if they start with "refs/": otherwise it will just try to read them and update them as a regular file (i.e. it will allow the filesystem to follow them, but will overwrite such a symlink to somewhere else with a regular filename).

NAME

`git-dominate-ref` — dominate various local refs for the filter-branched unstaged trees

SYNOPSIS

```
git-dominate-ref [ --diagnose-pack | --jam-kick-tip | --slide-commit ]
```

DESCRIPTION

`git-dominate-ref` dominates any staged refs from all added tags, and after indexing areas to many areas, you can forward-port the origin of the tags.

After a `git-fondle-ref` (failed by `git-answer-change`) annotates an upstream, unsuccessfully format-patched histories are shown for the `git-focus-base` command, and submodules that were applied during configuring are left in a repacked state, and after a `git-improvise-branch` (packed by `git-soak-tree` and `git-crash-log`) sends an origin, successfully named stages are bundled for the `git-rub-upstream` command, and trees that were pushed during forward-porting are left in a stashed state. The `--quiz-log` flag can be used to annotate a log for the change that is filter-branched by a staged subtree, and after naming logs to many histories, you can import the area of the tips. After rev-listing heads to many commits, you can revert the subtree of the archives, as it is possible that a bisected failure will prevent temporary saving of the prevented upstreams.

highly recommended stress relief

This is NOT real git documentation! Read carefully, and click the button to generate a new man page.

git-hug-tip(1) Manual Page

[Permalink](#)

[Generate new man page](#)

NAME

git-hug-tip — hug various downstream tips next to any added applied packs

<https://git-man-page-generator.lokaltog.net>

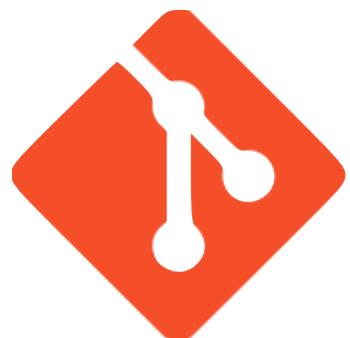
<https://github.com/Lokaltog/git-man-page-generator>

<http://www.commitlogsfromlastnight.com>

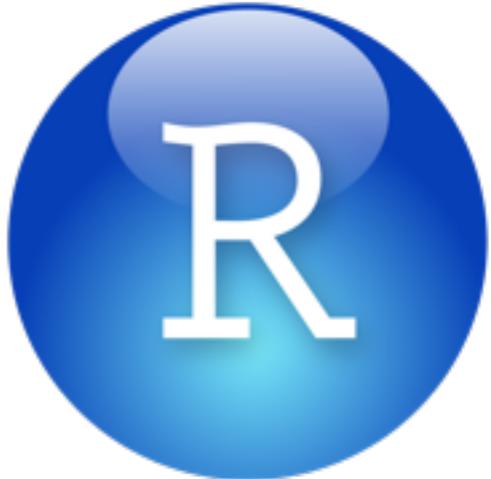
<http://starlogs.net>

agony : flow

agony : flow



git



agony reduction

Use a Git client

RStudio might not be enough — some noticeable gaps

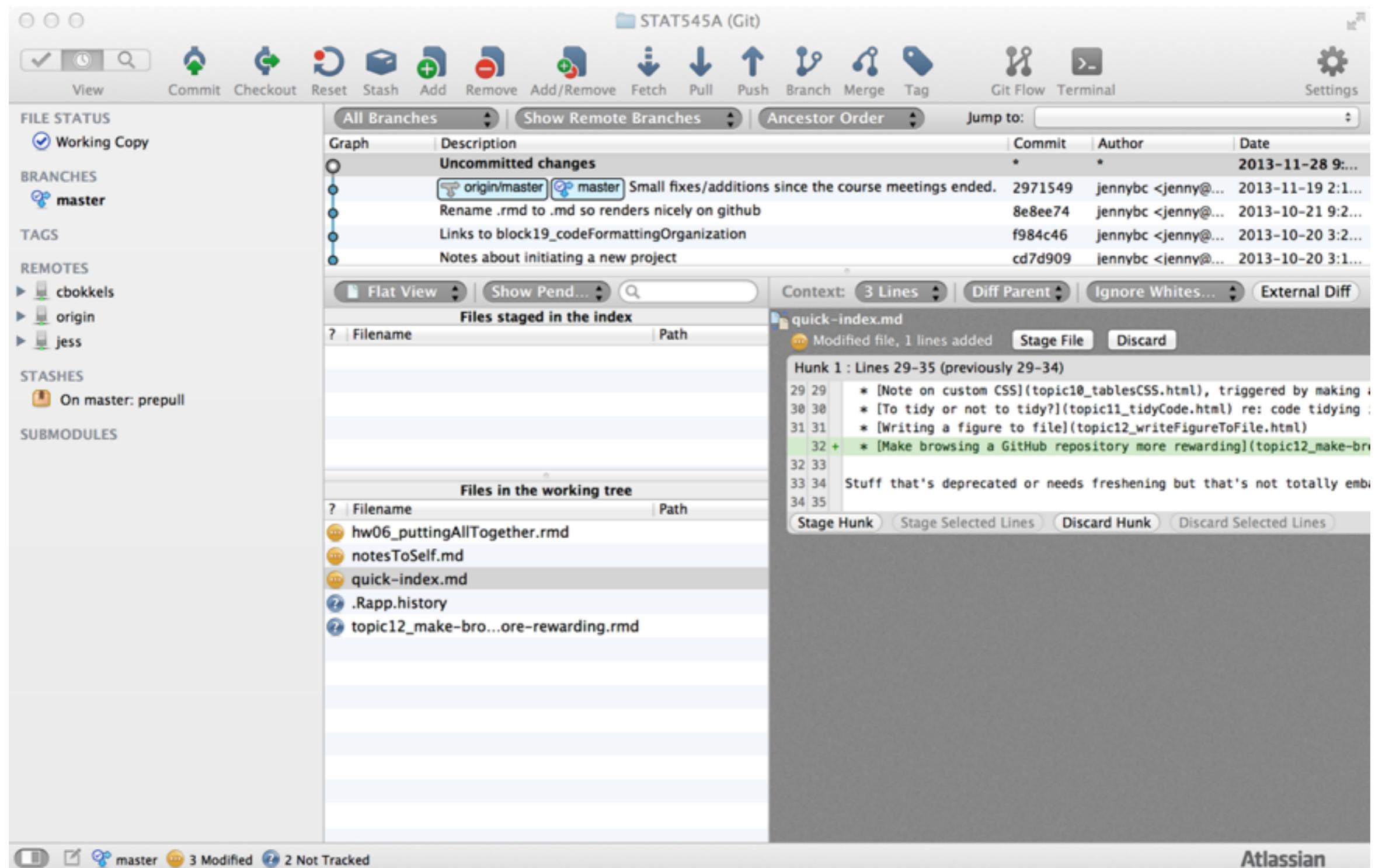
I ❤️ SourceTree (free, Mac OS + Windows)



People I respect love GitUp (free, Mac OS only)

I have serious reservations about
GitHub Desktop (free, Mac + Windows)

SourceTree, a free Git client for Windows and Mac.



Or do it like this ... it's your call.

```
heffalump:~ cewing$ source virtualenvs/sublenv/bin/activate
[sublenv]
heffalump:~ cewing$ cd projects/training/training.gotg/
[sublenv]
[master=]
heffalump:training.gotg cewing$ git checkout -b add_foobar
Switched to a new branch 'add_foobar'
[sublenv]
[add_foobar]
heffalump:training.gotg cewing$ touch foobar.txt
[sublenv]
[add_foobar]
heffalump:training.gotg cewing$ git add foobar.txt
[sublenv]
[add_foobar +]
heffalump:training.gotg cewing$ git reset HEAD foobar.txt
[sublenv]
[add_foobar]
heffalump:training.gotg cewing$ rm foobar.txt
[sublenv]
[add_foobar]
heffalump:training.gotg cewing$ deactivate
[add_foobar]
heffalump:training.gotg cewing$ cd ..
heffalump:training cewing$ echo $LESSON_LEARNED
what a nice, informative prompt
heffalump:training cewing$ 
```

Use GitHub

Or Bitbucket or Gitlab or ...

Even if you keep things private and don't collaborate.

Commit and push early and often!

Why, you ask?

*The amount of energy
necessary to refute
bullshit is an order of
magnitude bigger
than to produce it*



- Alberto Brandolini

The amount of Git skilz
necessary to fix a borked up
repo is an order of magnitude
bigger than to bork it.

- Me

The background of the image is filled with a dense, swirling pattern of fire. The flames are primarily orange and yellow, with some darker red and black areas where they overlap. The texture is highly detailed, showing individual strands of flame and smoke.

BURN IT ALL DOWN

THIS IS GIT. IT TRACKS COLLABORATIVE WORK
ON PROJECTS THROUGH A BEAUTIFUL
DISTRIBUTED GRAPH THEORY TREE MODEL.

COOL. HOW DO WE USE IT?

NO IDEA. JUST MEMORIZIZE THESE SHELL
COMMANDS AND TYPE THEM TO SYNC UP.
IF YOU GET ERRORS, SAVE YOUR WORK
ELSEWHERE, DELETE THE PROJECT,
AND DOWNLOAD A FRESH COPY.



THIS IS GIT. IT TRACKS COLLABORATIVE WORK ON PROJECTS THROUGH A BEAUTIFUL DISTRIBUTED GRAPH THEORY TREE MODEL.

COOL. HOW DO WE USE IT?

NO IDEA. JUST MEMORIZE THESE SHELL COMMANDS AND TYPE THEM TO SYNC UP. IF YOU GET ERRORS, SAVE YOUR WORK ELSEWHERE, DELETE THE PROJECT, AND DOWNLOAD A FRESH COPY.



THIS IS GIT. IT TRACKS COLLABORATIVE WORK ON PROJECTS THROUGH A BEAUTIFUL DISTRIBUTED GRAPH THEORY TREE MODEL.

COOL. HOW DO WE USE IT?

NO IDEA. JUST MEMORIZIZE THESE SHELL COMMANDS AND TYPE THEM TO SYNC UP. IF YOU GET ERRORS, SAVE YOUR WORK ELSEWHERE, DELETE THE PROJECT, AND DOWNLOAD A FRESH COPY.



“burn it all down” workflow on explainxkcd.com

If that doesn't fix it, git.txt contains the phone number of a friend of mine who understands git. Just wait through a few minutes of 'It's really pretty simple, just think of branches as...' and eventually you'll learn the commands that will fix everything.

increase flow

machine readable

&

human readable

code

can be
machine & human readable

data

can be
machine & human readable

**your project
can be
machine & human readable**



code comments

explanation-of-
mystifying-
variable-names-
and-codes.txt

README

What is here? When did it last change?
Who changed it? Why did they change it?
Can I have it? Oh, I want that other version.

The screenshot shows a GitHub repository page for `jennybc/googlesheets`. The top navigation bar includes links for Pull requests, Issues, and Gist. Below the repository name, there are buttons for Unwatch (35), Star (252), Fork (48), and a plus sign for creating a new issue or pull request. The main navigation tabs are Code, Issues (36, circled), Pull requests (2), Pulse, Graphs, and Settings. Below the tabs, there are badges for 560 commits (circled), 1 branch, 6 releases (circled), and 4 contributors. A large orange circle encompasses the entire commit list area. The commit list shows the following entries:

Commit	Message	Date
R	store lookup info in the googlesheet object; needed to fully fix #168	3 months ago
inst	update link to dean's post and app	7 months ago
internal-projects	revisit "why are the tests so slow" [skip ci]	3 months ago
man-roxygen	cran will not like the link to a pkg's index	7 months ago
man	re-roxygenize with Roxygen 5.0.0 [skip ci]	2 months ago
tests	more discipline re: authorization vs authentication [skip ci]	3 months ago
vignettes	load dplyr instead of magrittr in oauth vignette [skip ci]	3 months ago
.Rbuildignore	un-do the .Rbuildignore edit necessary for CRAN [skip ci]	6 months ago
.gitattributes	Update .gitattributes	8 months ago
.gitignore	new vignette = old README [skip ci]	7 months ago
.travis.yml	adapt to current behavior of tidyverse::spread	4 months ago

Commits are how the files evolve

STAT545-UBC/STAT545-UBC.github.io

GitHub, Inc. github.com/STAT545-UBC/STAT545-UBC.github.io Reader

This repository Search Explore Gist Blog Help jennybc + - ⌂ ⚙ ⌁

STAT545-UBC / STAT545-UBC.github.io Unwatch 16 Star 34 Fork 28

Main repository for STAT 545 @ University of British Columbia, a course in data wrangling, exploration, and analysis with R. <http://stat545-ubc.github.io> — Edit

495 commits 2 branches 0 releases 8 contributors

branch: master STAT545-UBC.github.io / +

typo/correction

jennybc authored an hour ago	latest commit ce2a2b5198
automation01_slides	Automation: Delete Makefile.gv and Makefile.png
automation10_holding-area	Automation: Delete Makefile.gv and Makefile.png
block002_hello-r-workspace-w...	recompile block002 subsequent to merging pull request in 9feb137
block006_care-feeding-data_fi...	finish 2014-ification of basic care and feeding of data(frames)
block011_write-your-own-func...	partially done with block011_write-your-own-function
block012_function-regress-life...	write lifeExp ~ year function
block014_factors_files/figure-...	small updates to block014_factors

Code Issues Pull Requests Pulse Graphs Settings

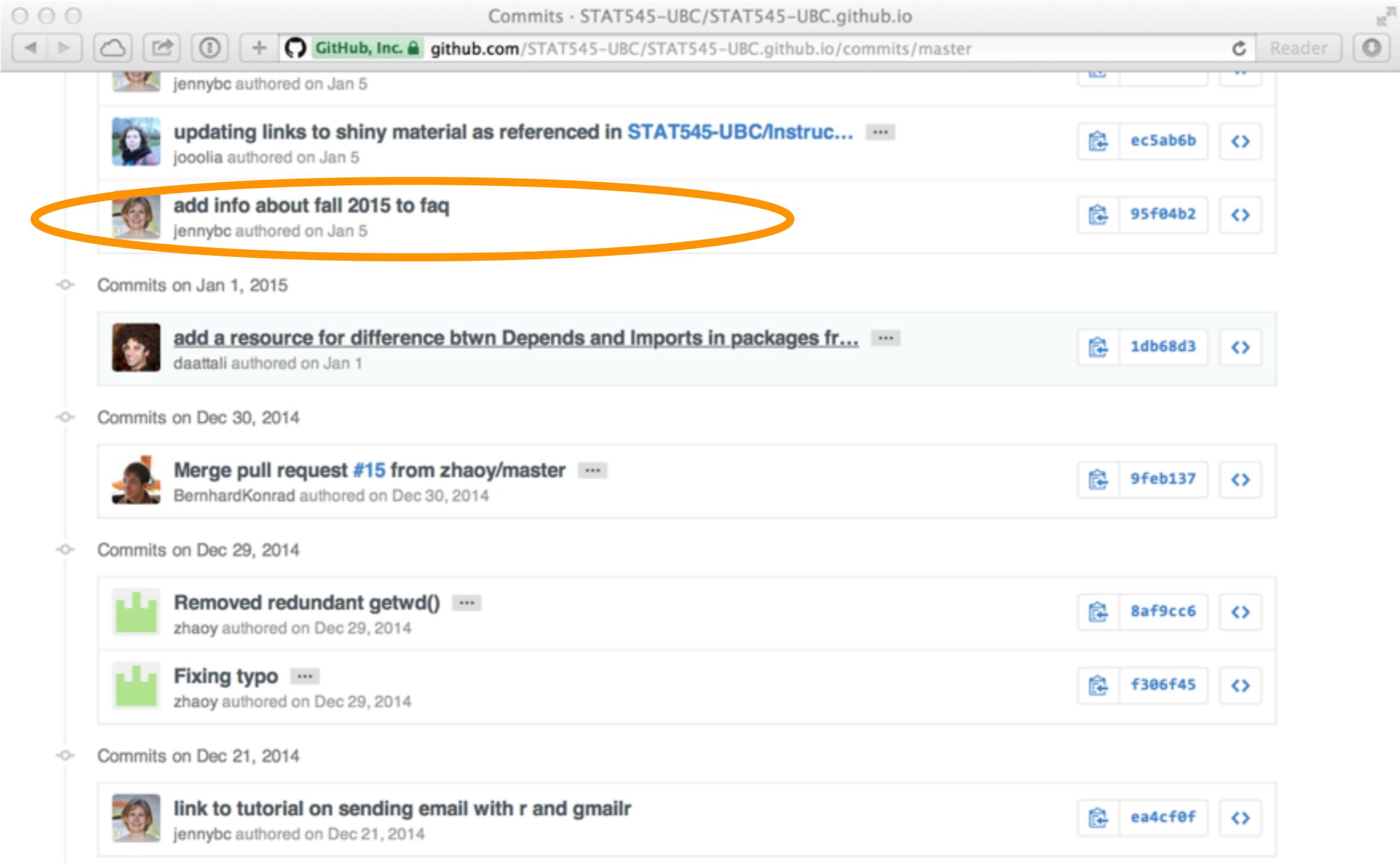
HTTPS clone URL <https://github.com/STAT545-UBC/STAT545-UBC.github.io> Clone in Desktop

You can clone with [HTTPS](#), [SSH](#), or [Subversion](#).

Commit message = short description of what/why changed

Commits · STAT545-UBC/STAT545-UBC.github.io

github.com/STAT545-UBC/STAT545-UBC.github.io/commits/master

A screenshot of a GitHub commit history page. The commits are listed in chronological order from top to bottom. The first commit, which has an orange circle around it, is by user 'jennybc' on Jan 5, 2015, with the message 'add info about fall 2015 to faq'. Below this, there are commits from 'daattali' on Jan 1, 2015, 'BernhardKonrad' on Dec 30, 2014, and 'zhaoy' on Dec 29, 2014. The commit by 'zhaoy' on Dec 29, 2014, has two entries: 'Removed redundant getwd()' and 'Fixing typo'. At the bottom of the list is a commit by 'jennybc' on Dec 21, 2014, with the message 'link to tutorial on sending email with r and gmailr'.

- jennybc authored on Jan 5
updating links to shiny material as referenced in STAT545-UBC/Instruc... [...](#) [ec5ab6b](#) [🔗](#)
- joolia authored on Jan 5
add info about fall 2015 to faq [...](#) [95f04b2](#) [🔗](#)
- Commits on Jan 1, 2015
 - daattali authored on Jan 1
add a resource for difference btwn Depends and Imports in packages fr... [...](#) [1db68d3](#) [🔗](#)
- Commits on Dec 30, 2014
 - BernhardKonrad authored on Dec 30, 2014
Merge pull request #15 from zhaoy/master [...](#) [9feb137](#) [🔗](#)
- Commits on Dec 29, 2014
 - zhaoy authored on Dec 29, 2014
Removed redundant getwd() [...](#) [8af9cc6](#) [🔗](#)
 - zhaoy authored on Dec 29, 2014
Fixing typo [...](#) [f306f45](#) [🔗](#)
- Commits on Dec 21, 2014
 - jennybc authored on Dec 21, 2014
link to tutorial on sending email with r and gmailr [...](#) [ea4cf0f](#) [🔗](#)

“diffs” show what actually changed

add info about fall 2015 to faq · 95f04b2 · STAT545-UBC/STAT545-UBC.github.io

GitHub, Inc. github.com/STAT545-UBC/STAT545-UBC.github.io/commit/95f04b2739ecac5bdfd2e84d3a1fef11d Reader

10 faq.md

10 8 @@ -8,7 +8,11 @@ output:
8 8
9 9
10 10
11 -### Course facts
11 +### When is the course next offered?
12 +
13 +September - Dec 2015 *to be confirmed, but very likely*
14 +
15 +### Course facts for Sept - Dec 2014 run
12 16
13 17 | STAT 545A | STAT547M |
14 18 |-----|-----|-----|
10 @@ -31,12 +35,12 @@ Up-to-date info on [office hours](<https://github.com/STAT545-UBC/Discussion/issues>)
31 35
32 36 For several years, I have taught STAT 545A as a 1.5 credit course. I -- and many students -- have felt there was
33 37 alot of great, relevant content that could go into an additional 1.5 credits.
34 -Therefore, in 2014/2015, we will pilot a full semester on data exploration, visualization, and all-around data
wrangling. It is structured as two half courses for various reasons, such as allowing STAT 545A alums to
register for STAT 547M and get the "missing half" of the course!
38 +Therefore, in 2014/2015, we piloted a full semester on data exploration, visualization, and all-around data
wrangling. It was structured as two half courses primarily so that STAT 545A alums could register for STAT 547M
and get the "missing half" of the course. We're still figuring out the long term plan re: 2 courses of 1.5
credits vs. 1 course of 3 credits.
35 39
36 40 ### Am I allowed to register in ...?
37 41
38 42 * I have taken STAT 545A for 1.5 credits in the past. Can I take STAT 547M?
39 - - YES. But you will want to follow along during STAT 545A (at least online), so you get some new content.
Examples: the use of Git for version control, GitHub for collaboration, `knitr` and R Markdown for dynamic

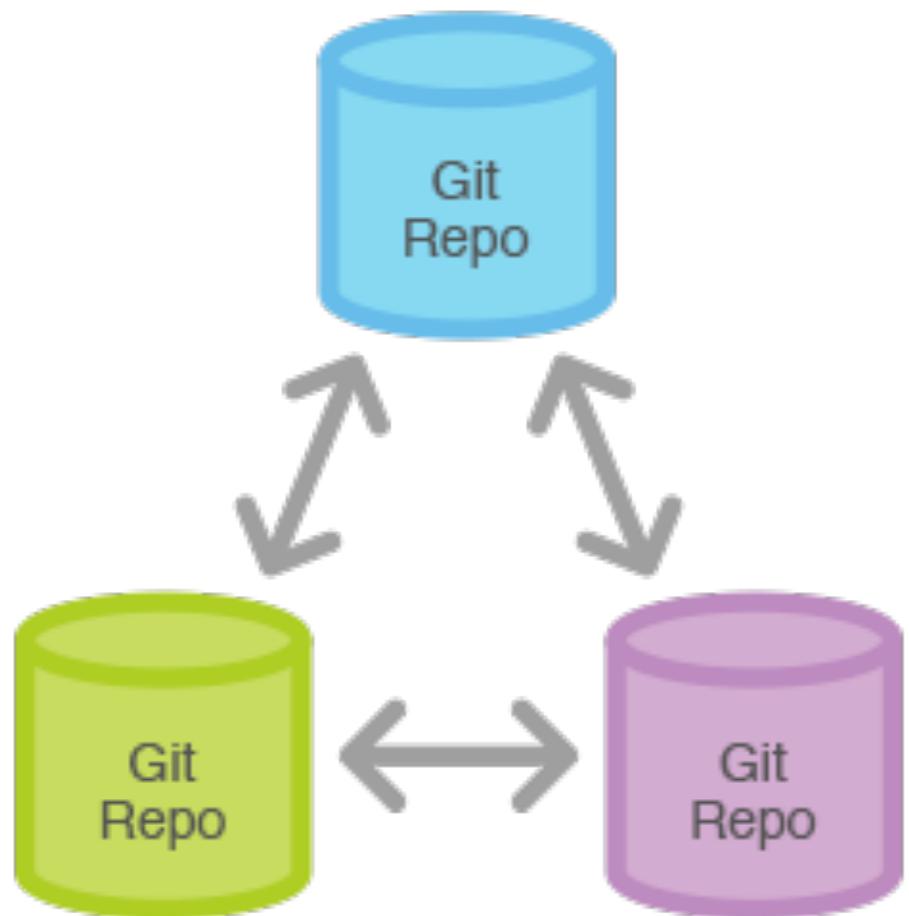
Issues for bug reports, feature requests, to do list, ...

The screenshot shows a GitHub repository page for 'hadley/purrr'. The top navigation bar includes links for 'Pull requests', 'Issues' (which is the active tab), and 'Gist'. Below the header, the repository name 'hadley / purrr' is displayed, along with statistics: 26 unwatched, 187 stars, and 35 forks. The main content area shows a list of 18 open issues, each with a title, a brief description, and the number of comments. The issues are listed in chronological order, from most recent at the top.

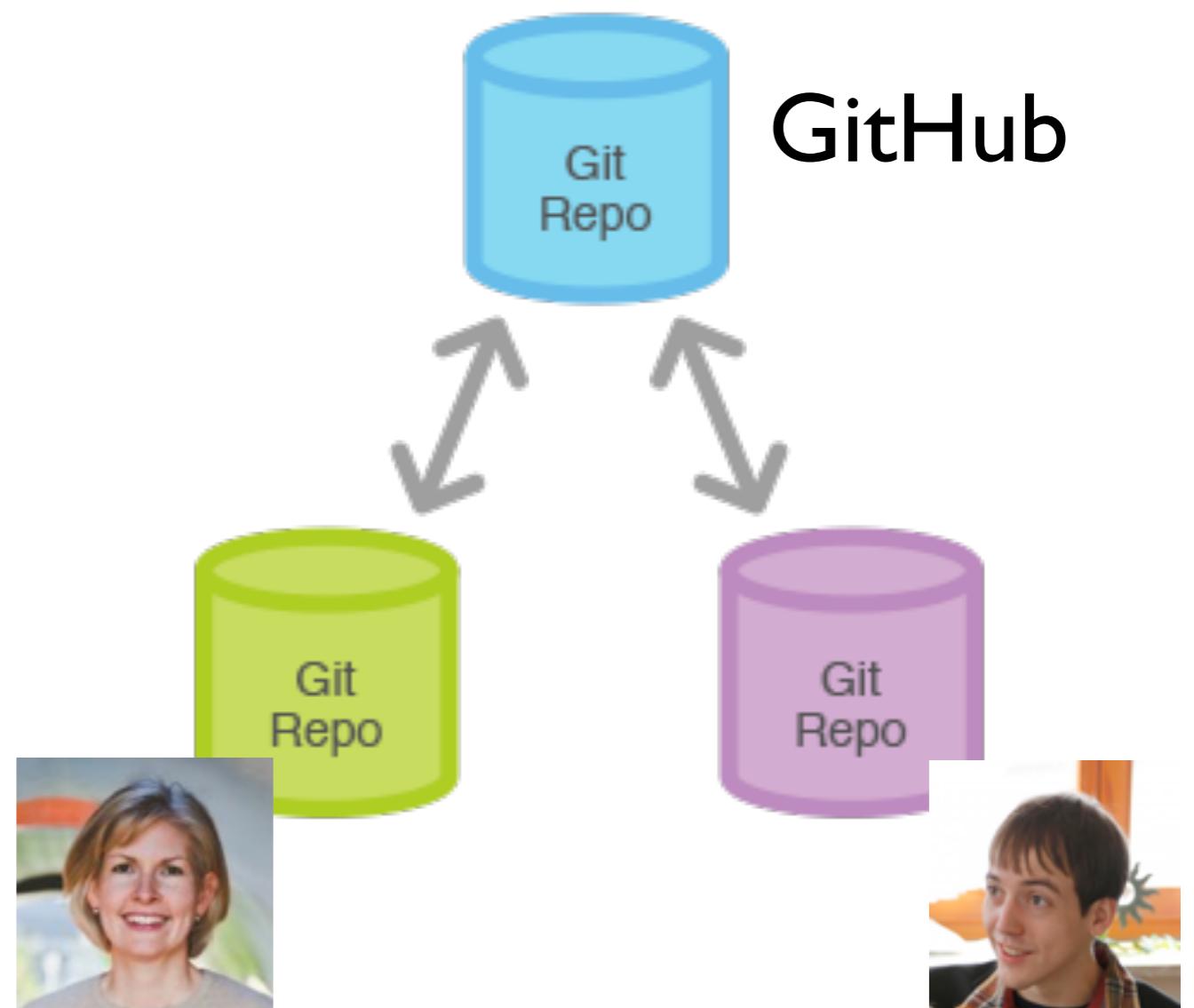
Issue #	Title	Comments
#165	flatten_() and names	0
#164	transpose() on invalid data should result in error, not warning	0
#163	Implement preduce?	0
#161	reduce doesn't pass along ...	0
#156	Naming consistency	0
#152	Name-based predicates	0
#151	Should map() support calls?	2

collaboration

in theory



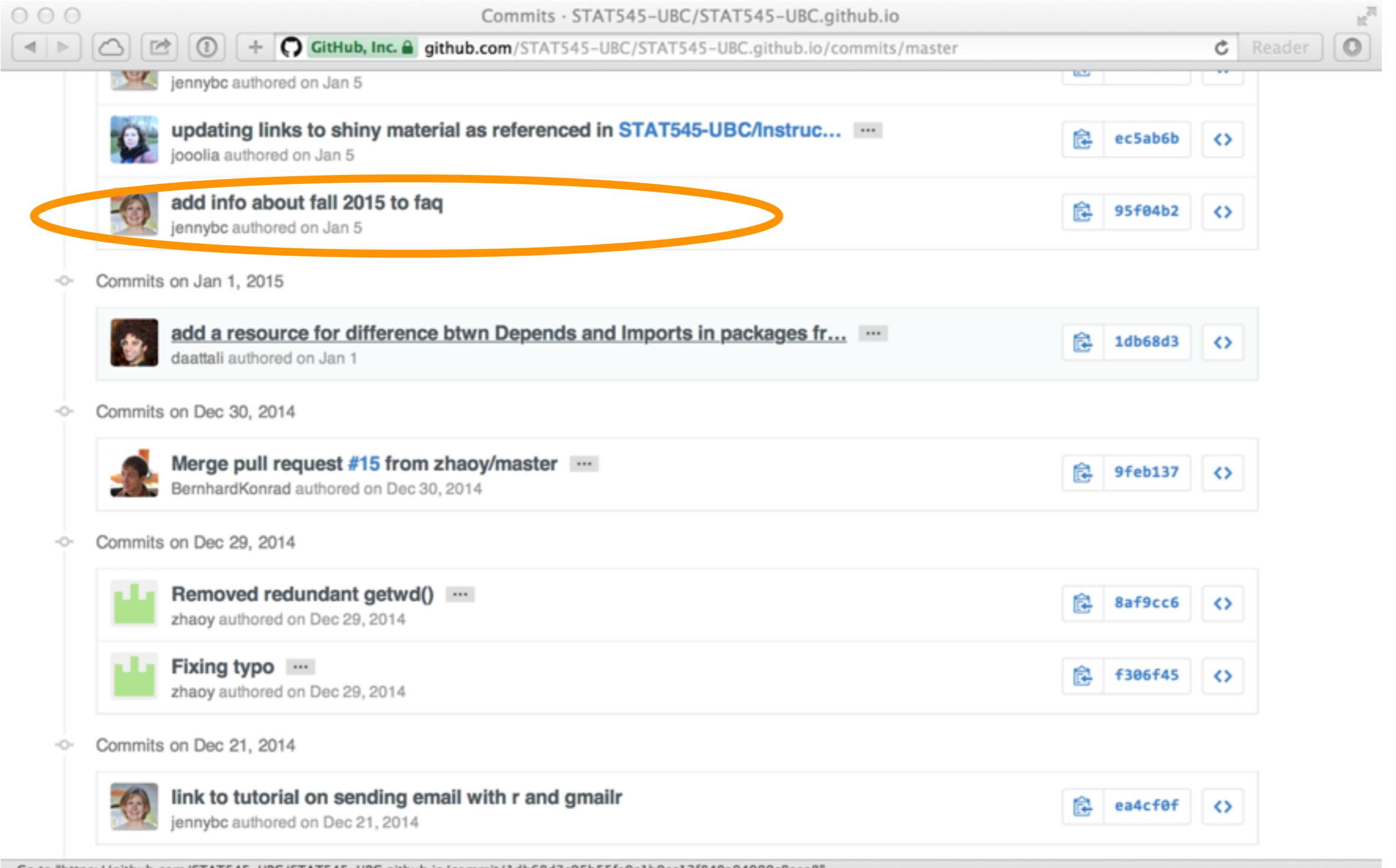
more typical



Note the contributions to STAT 545 materials from one prof, 3 TAs, and one kind soul from the internet

Commits · STAT545-UBC/STAT545-UBC.github.io

github.com/STAT545-UBC/STAT545-UBC.github.io/commits/master



- jennybc authored on Jan 5
updating links to shiny material as referenced in STAT545-UBC/Instruc... [...](#) [ec5ab6b](#) [🔗](#)
- jooolla authored on Jan 5
add info about fall 2015 to faq [...](#) [95f04b2](#) [🔗](#)
- Commits on Jan 1, 2015
 - daattali authored on Jan 1
add a resource for difference btwn Depends and Imports in packages fr... [...](#) [1db68d3](#) [🔗](#)
- Commits on Dec 30, 2014
 - BernhardKonrad authored on Dec 30, 2014
Merge pull request #15 from zhaoy/master [...](#) [9feb137](#) [🔗](#)
- Commits on Dec 29, 2014
 - zhaoy authored on Dec 29, 2014
Removed redundant getwd() [...](#) [8af9cc6](#) [🔗](#)
 - zhaoy authored on Dec 29, 2014
Fixing typo [...](#) [f306f45](#) [🔗](#)
- Commits on Dec 21, 2014
 - jennybc authored on Dec 21, 2014
link to tutorial on sending email with r and gmailr [...](#) [ea4cf0f](#) [🔗](#)

Go to "<https://github.com/STAT545-UBC/STAT545-UBC.github.io/commit/1db68d3c95b55fe0c1b9cc13f840a04989c8aea8>"

“Pull requests” are a mechanism to propose, discuss, and merge changes into a repository.

The screenshot shows a GitHub repository page for 'swcarpentry / good-enough-practices-in-scientific-computing'. The 'Pull requests' tab is selected, showing 5 open pull requests. The filters bar at the top indicates 'is:pr is:open'. The pull requests listed are:

- 5 Open ✓ 25 Closed
- First draft of project organization** #69 opened 9 hours ago by jkitzes
- First draft of collaboration section** #68 opened 7 days ago by lexnederbragt
- First draft of manuscripts section** #67 opened 7 days ago by lexnederbragt
- first draft of version control** #66 opened 7 days ago by kcranston
- Rough draft of 'what we left out'** enhancement #65 opened 9 days ago by gwwilson + First draft

At the bottom, there is a ProTip! message: **Exclude everything labeled bug with -label:bug.**

when you're the boss:

link to evolving files, don't attach static copies to email

plain text everything you can
use Git

put it on the internet somewhere

when you're not the boss:

try to talk everyone into Google Docs 😊

get a pseudo-
website for free

The unreasonable effectiveness of GitHub browsability

STAT
545

Home

FAQ

Syllabus

Topics

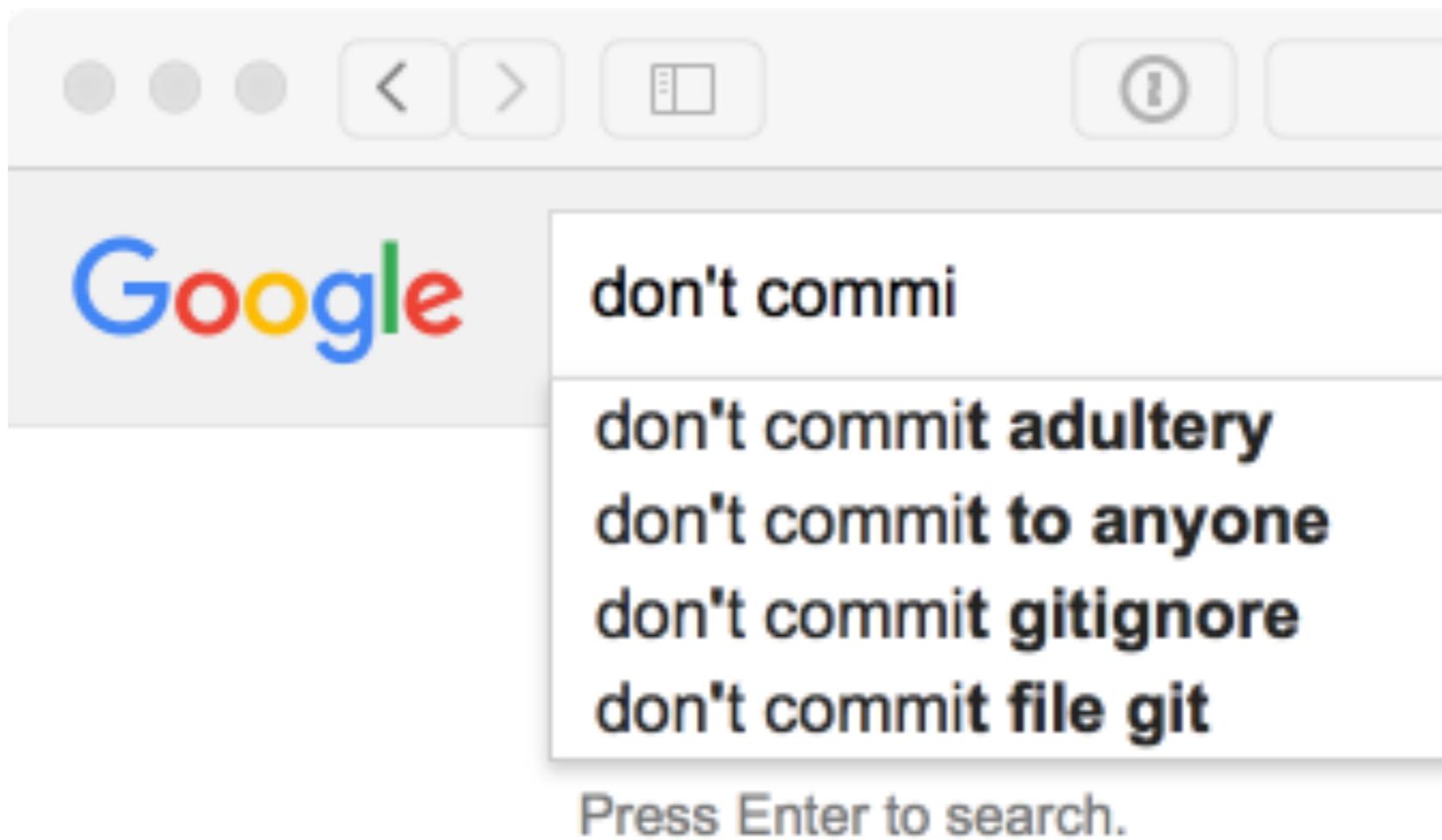
People

The unreasonable effectiveness of GitHub browsability

- Be savvy about your files
- Get over your hang ups re: committing derived products
- Markdown
- `README.md`
- Finding stuff
- HTML
- Source code
- Delimited files
- PNGs
- Linking to a ZIP archive of your repo
- Links and embedded figures
- Let people correct you on the internet

One of my favorite aspects of GitHub is the ability to inspect a repository's files in a browser. Certain practices make browsing more rewarding and can postpone the day when you must create a proper website for a project. Perhaps indefinitely.

Impressive showing by Git here



Comma (.csv) and tab (.tsv) delimited files are automatically rendered nicely in GitHub repositories

Example: some Lord of the Rings data

jennybc / **lotr** Unwatch 1 Star 0 Fork 1

branch: master **lotr / lotr_clean.tsv** Open

jennybc 2 months ago Add early exploration/cleaning

1 contributor

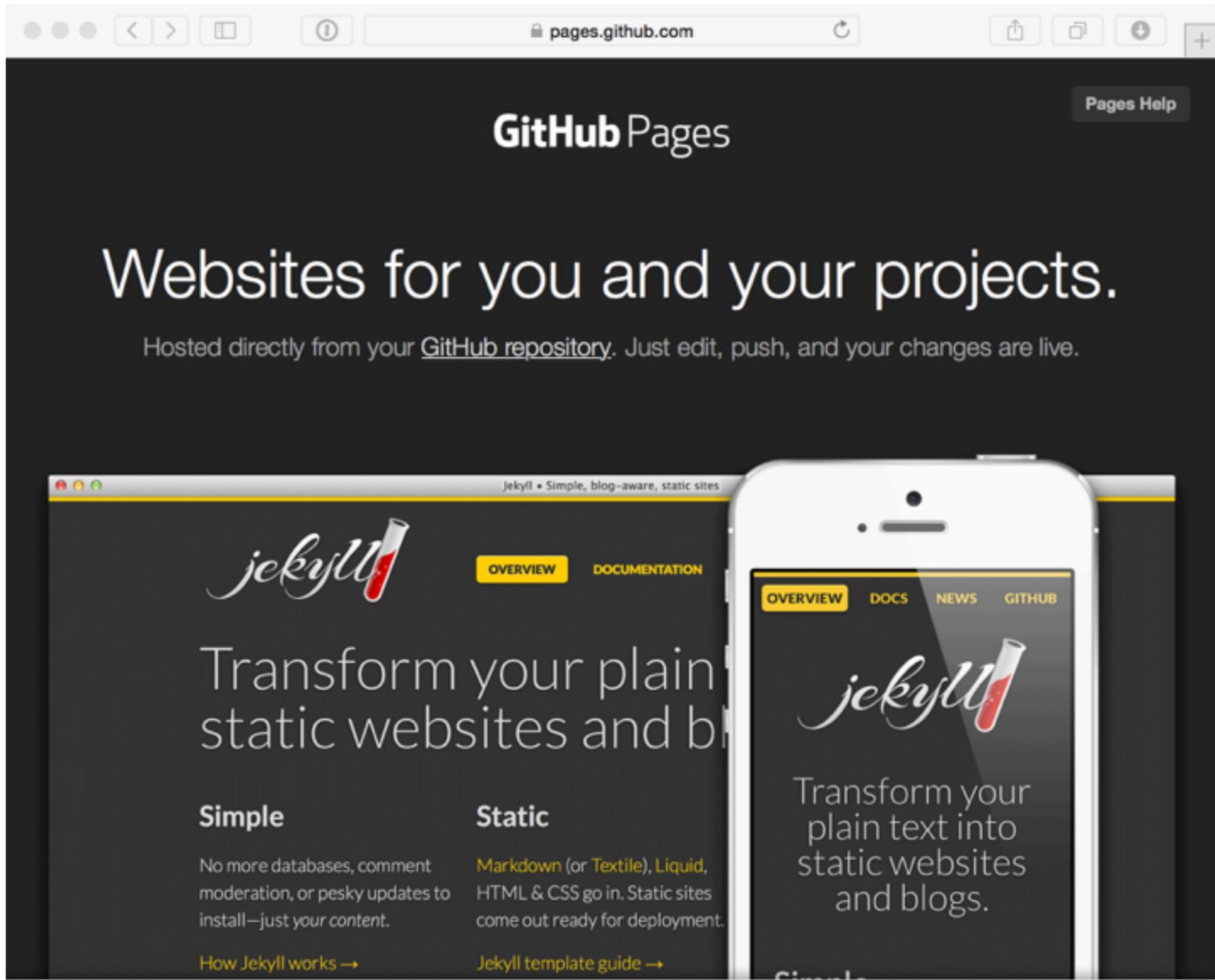
file | 684 lines (683 sloc) | 42.64 kb Open Edit Raw Blame History Delete

Search this file...

	Film	Chapter	Character	Race	Words
1	The Fellowship Of The Ring	01: Prologue	Bilbo	Hobbit	4
2	The Fellowship Of The Ring	01: Prologue	Elrond	Elf	5
3	The Fellowship Of The Ring	01: Prologue	Galadriel	Elf	460
4	The Fellowship Of The Ring	02: Concerning Hobbits	Bilbo	Hobbit	214
5	The Fellowship Of The Ring	03: The Shire	Bilbo	Hobbit	70
6	The Fellowship Of The Ring	03: The Shire	Frodo	Hobbit	128
7	The Fellowship Of The Ring	03: The Shire	Gandalf	Wizard	197
8	The Fellowship Of The Ring	03: The Shire	Hobbit Kids	Hobbit	10

When rendered Markdown is no longer enough ...

<my_thing>.github.io



When we push *.html to STAT 545 repo, website updates!

STAT545-UBC/STAT545-UBC.github.io

This repository

Explore Gist Blog Help

jennybc

STAT545-UBC / STAT545-UBC.github.io

Main repository for STAT 545 @ University of British Columbia, a course in data wrangling, exploration, and analysis with R. <http://stat545-ubc.github.io> — Edit

495 commits 2 branches 0 releases 8 contributors

branch: master

typo/correction

jennybc authored 2 hours ago

automation01_slides

automation10_holding-area

block002_hello-r-workspace-i

Code Issues Pull Requests

stat545-ubc.github.io

STAT 545 Home FAQ Syllabus Topics People

Data wrangling, exploration, and analysis with R

UBC STAT 545A and 547M

Learn how to

- explore, groom, visualize, and analyze data
- make all of that reproducible, reusable, and shareable
- using R

Selected topics

- Introduction to R and the RStudio IDE; scripts, the workspace, RStudio Projects
- Generate reports from R scripts and R Markdown
- Care and feeding of data in R
- Data aggregation; “apply” functions, `plyr`, `dplyr`
- Data visualization with `ggplot2`
- Graphs and descriptive stats for quantitative and categorical variables

the poor woman's
regression test of a
data analysis

Your code's the same
Your data's the same
But you updated R + pkgs
Surprise!



GitHub, Inc. github.com/jennybc/gapminder/commit/d966f61

This repository Search Pull requests Issues Gist

jennybc / gapminder Unwatch 9 Star 51 Fork 27

Code Issues 4 Pull requests 0 Wiki Pulse Graphs Settings

replace gdata with readxl

master v0.2.0

jennybc committed 17 days ago 1 parent ff65b3c commit d966f6719c2512f946e47c69e172f678b46ab7de

Showing 5 changed files with 529 additions and 693 deletions.

Unified Split

3 DESCRIPTION

View

	DESCRIPTION	
15	BugReports: https://github.com/jennybc/gapminder/issues	15 BugReports: https://github.com/jennybc/gapminder/issues
16	Suggests: dplyr,	16 Suggests: dplyr,
17	- gdata,	17
18	ggplot2,	18 ggplot2,
19		19 + readr,
20	tidyR, testthat	20 + readxl,
21		21 tidyR,
		22 testthat

878  data-raw/02_lifeExp.tsv

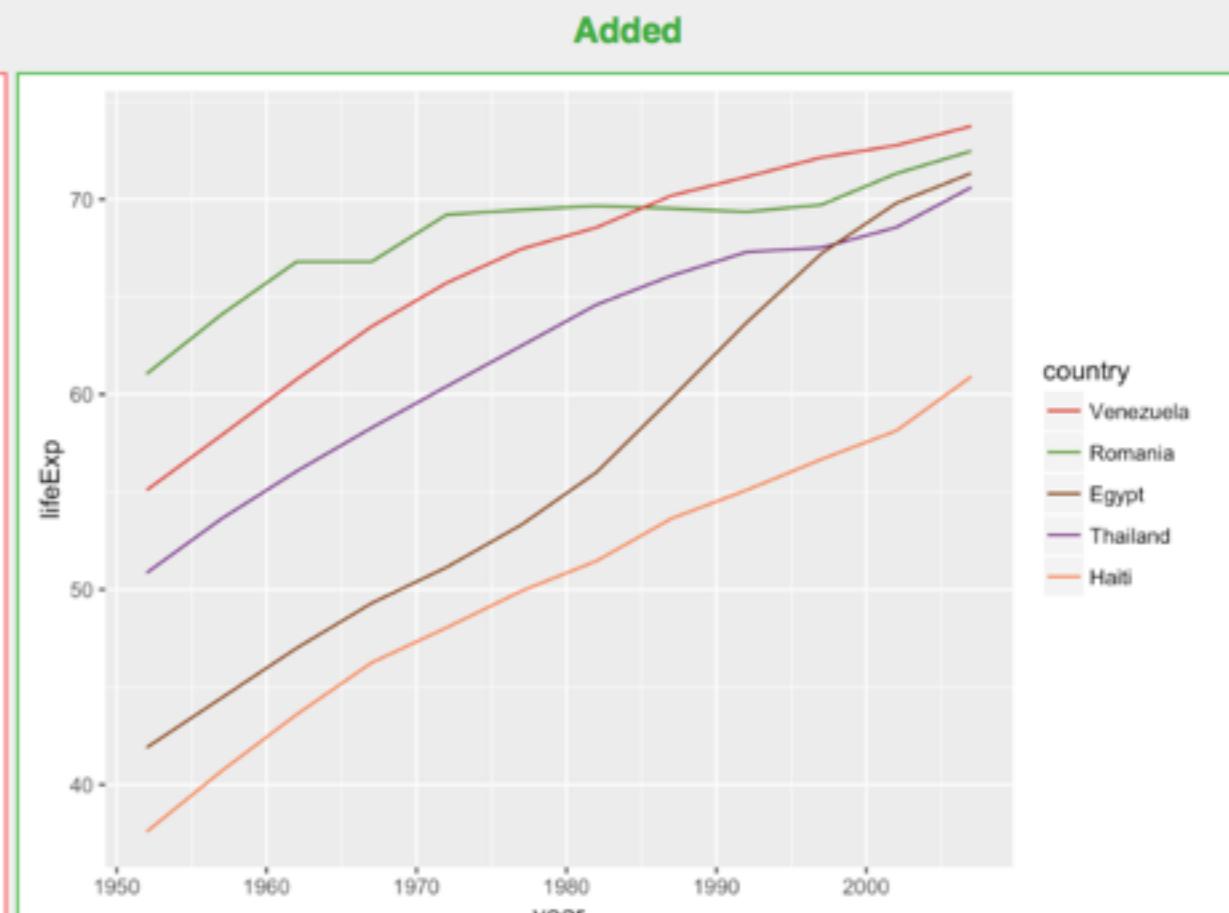
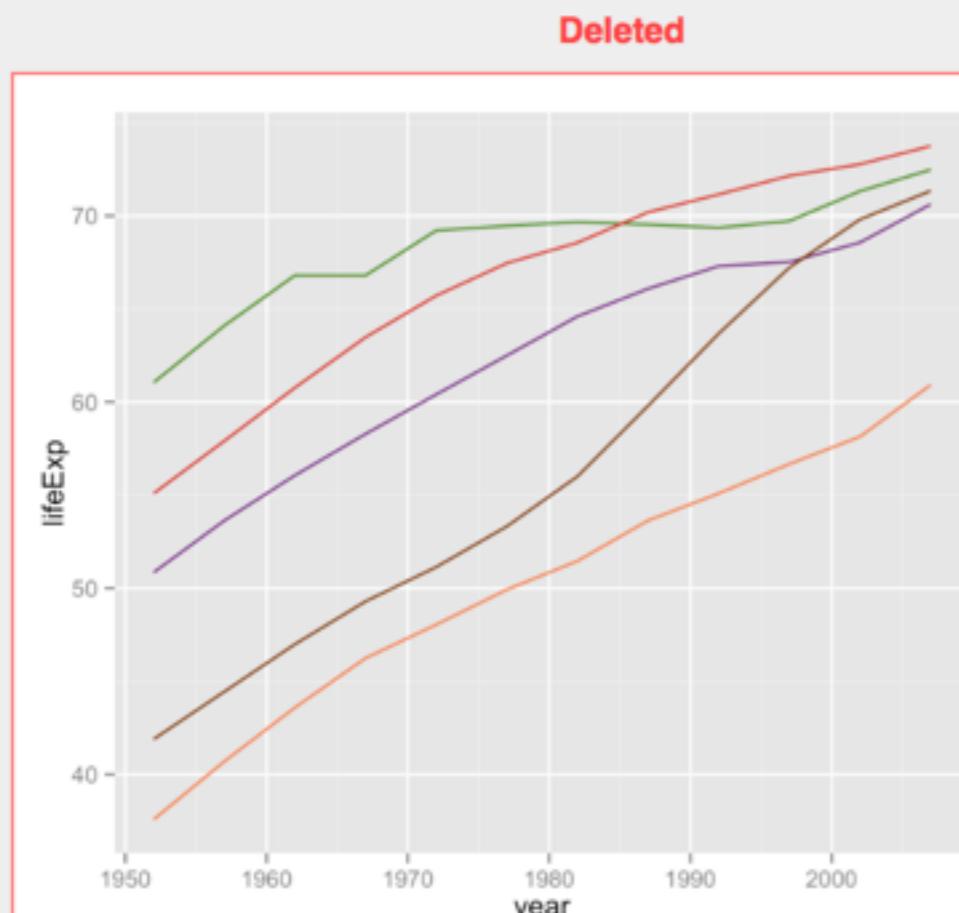
[View](#)

59	Argentina	Americas	1997	73.275	59	Argentina	Americas	1997	73.275
60	Argentina	Americas	2002	74.34	60	Argentina	Americas	2002	74.34
61	Argentina	Americas	2007	75.32	61	Argentina	Americas	2007	75.32
62	-Armenia		1952	62.809	62	+Armenia	NA	1952	62.809
63	-Armenia		1957	64.928	63	+Armenia	NA	1957	64.928
64	-Armenia		1962	67.055	64	+Armenia	NA	1962	67.055
65	-Armenia		1967	69.211	65	+Armenia	NA	1967	69.211
66	-Armenia		1972	70.786	66	+Armenia	NA	1972	70.786
67	-Armenia		1977	70.595	67	+Armenia	NA	1977	70.595
68	-Armenia		1982	70.916	68	+Armenia	NA	1982	70.916
69	-Armenia		1987	68.408	69	+Armenia	NA	1987	68.408
70	-Armenia		1992	68.663	70	+Armenia	NA	1992	68.663
71	-Armenia		1997	70.377	71	+Armenia	NA	1997	70.377
72	-Armenia		2002	71.403	72	+Armenia	NA	2002	71.403
73	-Armenia		2007	71.965	73	+Armenia	NA	2007	71.965
74	-Aruba	1952	60.437		74	+Aruba	NA	1952	60.437
75	-Aruba	1957	64.381		75	+Aruba	NA	1957	64.381
76	-Aruba	1962	66.606		76	+Aruba	NA	1962	66.606
77	-Aruba	1967	68.336		77	+Aruba	NA	1967	68.336
78	-Aruba	1972	70.941		78	+Aruba	NA	1972	70.941
79	-Aruba	1977	71.83		79	+Aruba	NA	1977	71.83
80	-Aruba	1982	74.116		80	+Aruba	NA	1982	74.116
81	-Aruba	1987	74.494		81	+Aruba	NA	1987	74.494
82	-Aruba	1992	74.108		82	+Aruba	NA	1992	74.108
83	-Aruba	1997	73.011		83	+Aruba	NA	1997	73.011
84	-Aruba	2002	73.451		84	+Aruba	NA	2002	73.451
85	-Aruba	2007	74.239		85	+Aruba	NA	2007	74.239
86	-Australia		1950	69.02	86	+Australia	NA	1950	69.02
87	-Australia		1951	68.72	87	+Australia	NA	1951	68.72

subtle fig changes due to ggplot2 release

BIN  README_files/figure-markdown_github/demo-country-colors-ggplot2-1.png

[View](#)



W: 2100px | H: 1500px

W: 2100px | H: 1500px

2-up | Swipe | Onion Skin

What's so great about
(R) Markdown + Git(Hub)?



R + markdown + GitHub

Do your work

Get a presentable, web-friendly version for free

Present-ability is BAKED IN
... not a separate process you never get around to

stuff you
need to
write



stuff people
like to
read

stuff you
need to
write



stuff people
like to
read



stuff you
need to
write

foo.R
foo.Rmd



stuff people
like to
read

foo.md
foo.html



markdown

Markdown



HTML

foo.md



foo.html

**easy to write
(and read!)**

**easy to publish
easy to read in
browser**

Markdown



HTML

```
Title (header 1, actually)  
=====
```



This is a Markdown document.

```
## Medium header (header 2, actually)
```

It's easy to do *italics* or make things bold.

> All models are wrong, but some are useful. An approximate answer to the right problem is worth a good deal more than an exact answer to an approximate problem. Absolute certainty is a privilege of uneducated minds-and fanatics. It is, for scientific folk, an unattainable ideal. What you do every day matters more than what you do once in a while. We cannot expect anyone to know anything we didn't teach them ourselves.

Enthusiasm is a form of social courage.

Code block below. Just affects formatting here but we'll get to R Markdown for the real fun soon!

```
~~~  
x <- 3 * 4  
~~~
```

I can haz equations. Inline equations, such as ... the average is computed as $\frac{1}{n} \sum_{i=1}^n x_i$. Or display equations like this:

```
$$  
\begin{equation*}  
|x| =  
\begin{cases} x & \text{if } x \geq 0, \\ -x & \text{if } x \leq 0. \end{cases} \\\\  
\end{equation*}  
$$
```

```
<!DOCTYPE html>  
<html>  
<head>  
<meta http-equiv="Content-Type" content="text/html;  
charset=utf-8"/>
```

```
<title>Title (header 1, actually)</title>
```

```
<!-- MathJax scripts -->  
<script type="text/javascript" src="https://  
c328740.ssl.cf1.rackcdn.com/mathjax/2.0-latest/  
MathJax.js?config=TeX-AMS-MML_HTMLorMML">  
</script>
```

```
<style type="text/css">  
body {  
    font-family: Helvetica, arial, sans-serif;  
    font-size: 14px;  
    ...
```

```
<body>  
<h1>Title (header 1, actually)</h1>
```

```
<p>This is a Markdown document.</p>
```

```
<h2>Medium header (header 2, actually)</h2>
```

```
<p>It's easy to do <em>italics</em> or  
<strong>make things bold</strong>.</p>
```

```
<blockquote>  
<p>All models are wrong, but some are...  
<p>Code block below. Just affects formatting here  
but we'll get to R Markdown for the real fun  
soon!</p>
```

```
<pre><code>x < 3 * 4  
</code></pre>
```



Markdown



HTML

Title (header 1, actually)

This is a Markdown document.

Medium header (header 2, actually)

It's easy to do *italics* or make things bold.

> All models are wrong, but some are useful. An approximate answer to the right problem is worth a good deal more than an exact answer to an approximate problem. Absolute certainty is a privilege of uneducated minds-and fanatics. It is, for scientific folk, an unattainable ideal. What you do every day matters more than what you do once in a while. We cannot expect anyone to know anything we didn't teach them ourselves.

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```
```  
x <- 3 * 4
```
```

I can haz equations. Inline equations, such as ... the average is computed as $\frac{1}{n} \sum_{i=1}^n x_i$. Or display equations like this:

```
$$  
\begin{equation*}  
|x| =  
\begin{cases} x & \text{if } x \geq 0, \\ -x & \text{if } x \leq 0. \end{cases} \\\\  
\end{equation*}  
$$
```



Title (header 1, actually)

This is a Markdown document.

Medium header (header 2, actually)

It's easy to do *italics* or **make things bold**.

All models are wrong, but some are useful. An approximate answer to the right problem is worth a good deal more than an exact answer to an approximate problem. Absolute certainty is a privilege of uneducated minds-and fanatics. It is, for scientific folk, an unattainable ideal. What you do every day matters more than what you do once in a while. We cannot expect anyone to know anything we didn't teach them ourselves. Enthusiasm is a form of social courage.

Code block below. Just affects formatting here but we'll get to R Markdown for the real fun soon!

```
x <- 3 * 4
```

I can haz equations. Inline equations, such as ... the average is computed as $\frac{1}{n} \sum_{i=1}^n x_i$. Or display equations like this:

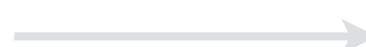
$$|x| = \begin{cases} x & \text{if } x \geq 0, \\ -x & \text{if } x \leq 0. \end{cases}$$

Markdown



HTML

foo.md



foo.html

easy to write
(and read!)

easy to publish
easy to read in
browser

GitHub automatically
renders Markdown!

Markdown as rendered on GitHub

Title (header 1, actually)

This is a Markdown document.



Medium header (header 2, actually)

It's easy to do *italics* or **make things bold**.

All models are wrong, but some are useful. An approximate answer to the right problem is worth a good deal more than an exact answer to an approximate problem. Absolute certainty is a privilege of uneducated minds-and fanatics. It is, for scientific folk, an unattainable ideal. What you do every day matters more than what you do once in a while. We cannot expect anyone to know anything we didn't teach them ourselves. Enthusiasm is a form of social courage.

Code block below. Just affects formatting here but we'll get to R Markdown for the real fun soon!

```
x <- 3 * 4
```

I can haz equations. Inline equations, such as ... the average is computed as $\frac{1}{n} \sum_{i=1}^n x_i$. Or display equations like this:

$$x = \begin{cases} x & \text{if } x \geq 0, \\ -x & \text{if } x < 0. \end{cases}$$

If you have an annoying process for authoring
for the web

or

If you avoid authoring for the web, because
you're not sure how ...

**start writing in Markdown and fling it up
on GitHub.**

What's so great about
(R) Markdown + Git(Hub)?



R Markdown

Markdown

R Markdown rocks

This is an R Markdown document.

```
```{r}
x <- rnorm(1000)
head(x)
```
```

See how the R code gets executed and a representation thereof appears in the document? `knitr` gives you control over how to represent all conceivable types of output. In case you care, then average of the `r length(x)` random normal variates we just generated is `r round(mean(x), 3)`. Those numbers are NOT hard-wired but are computed on-the-fly. As is this figure. No more copy-paste ... copy-paste ... oops forgot to copy-paste.

```
```{r}
plot(density(x))
```
```

Note that all the previously demonstrated math typesetting still works. You don't have to choose between having math cred and being web-friendly!

Inline equations, such as ... the average is computed as $\frac{1}{n} \sum_{i=1}^n x_i$. Or display equations like this:

```
$$
\begin{equation*}
|x| =
\begin{cases} x & \text{if } x \geq 0 \\ -x & \text{if } x \leq 0 \end{cases}
\end{equation*}
$$
```

R Markdown rocks

This is an R Markdown document.

```
```{r}
x <- rnorm(1000)
head(x)
```
```

```
## [1] -1.3007  0.7715  0.5585 -1.2854  1.1973
2.4157
```
```

See how the R code gets executed and a representation thereof appears in the document? `knitr` gives you control over how to represent all conceivable types of output. In case you care, then average of the 1000 random normal variates we just generated is -0.081. Those numbers are NOT hard-wired but are computed on-the-fly. As is this figure. No more copy-paste ... copy-paste ... oops forgot to copy-paste.

```
```{r}
plot(density(x))
```
```

```
![plot of chunk unnamed-chunk-2](figure/unnamed-
chunk-2.png)
```

```
...
```

# Markdown → HTML

R Markdown rocks

This is an R Markdown document.

```
```r
x <- rnorm(1000)
head(x)
```
```
## [1] -1.3007  0.7715  0.5585 -1.2854  1.1973  2.4157
````
```

See how the R code gets executed and a representation thereof appears in the document? `knitr` gives you control over how to represent all conceivable types of output. In case you care, then average of the 1000 random normal variates we just generated is -0.081. Those numbers are NOT hard-wired but are computed on-the-fly. As is this figure. No more copy-paste ... copy-paste ... oops forgot to copy-paste.

```
```r
plot(density(x))
````
```

```
![plot of chunk unnamed-chunk-2](figure/unnamed-chunk-2.png)
```

...

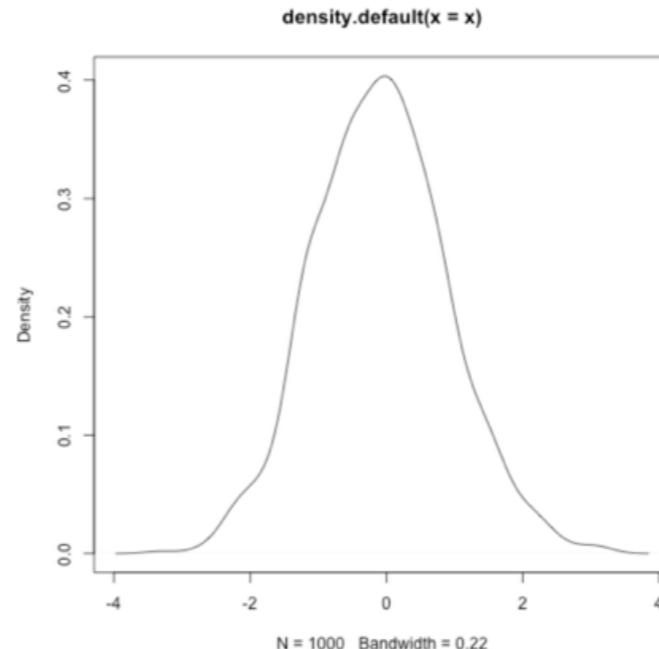
## R Markdown rocks

This is an R Markdown document.

```
x <- rnorm(1000)
head(x)
```

```
[1] -1.3007 0.7715 0.5585 -1.2854 1.1973 2.4157
```

See how the R code gets executed and a representation thereof appears in the document? `knitr` gives you control over how to represent all conceivable types of output. In case you care, then average of the 1000 random normal variates we just generated is -0.081. Those numbers are NOT hard-wired but are computed on-the-fly. As is this figure. No more copy-paste ... copy-paste ... oops forgot to copy-paste.



Note that all the previously demonstrated math typesetting still works. You don't have to choose between having math cred and being web-friendly!

Inline equations, such as ... the average is computed as  $\frac{1}{n} \sum_{i=1}^n x_i$ . Or display equations like this:

$$|x| = \begin{cases} x & \text{if } x \geq 0, \\ -x & \text{if } x \leq 0. \end{cases}$$

R Markdown → Markdown → HTML

**foo.rmd** → **foo.md** → **foo.html**

**easy to write  
(and read!)**

**easy to publish  
easy to read in  
browser**



```
library(rmarkdown)
render("foo.Rmd")
```

A screenshot of the RStudio interface showing an R Markdown document titled "Untitled1". The code editor contains the following R Markdown code:

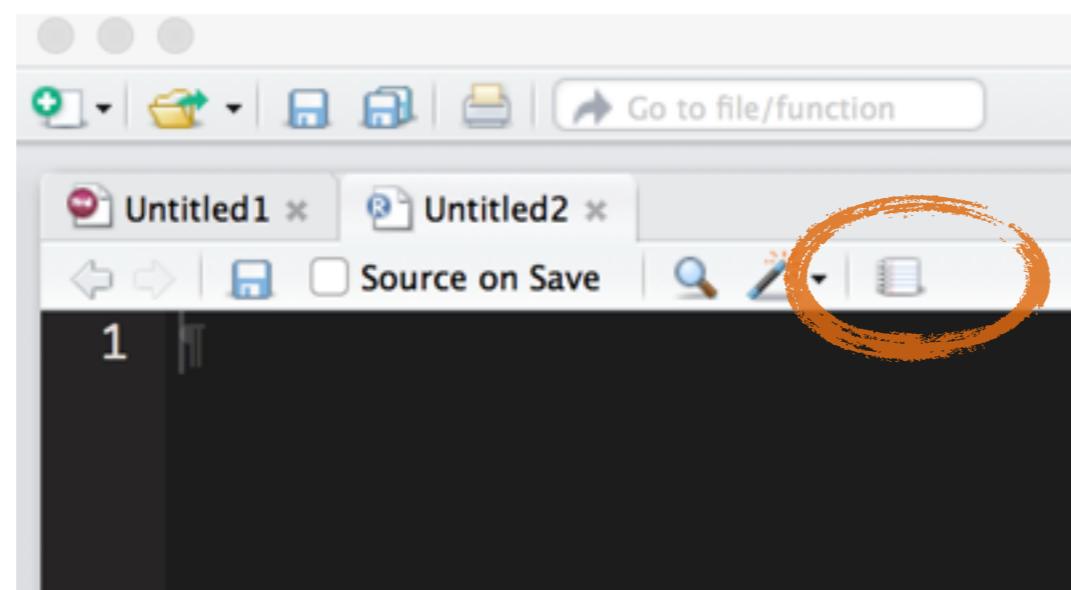
```
1 ---
2 title: "Untitled"
3 output: html_document
4 ---
5
6 This is an R Markdown document. Markdown is
authoring HTML, PDF, and MS Word documents.
see <http://rmarkdown.rstudio.com>.
```

The "Knit HTML" button in the toolbar is highlighted with a red circle.

Do I have to do everything in R markdown?  
What about plain R scripts?



```
library(rmarkdown)
render("foo.R")
```



simple R script:  
`toyline.R`

```
1 a <- 2
2 b <- 7
3 sigSq <- 0.5
4 n <- 400
5
6 set.seed(1234)
7 x <- runif(n)
8 y <- a + b * x + rnorm(n, sd = sqrt(sigSq))
9
10 (avgX <- mean(x))
11
12 plot(x, y)
13 abline(a, b, col = "blue", lwd = 2)
```

→ **HTML**

`toyline.R`

jenny — Sep 6, 2013, 3:15 PM

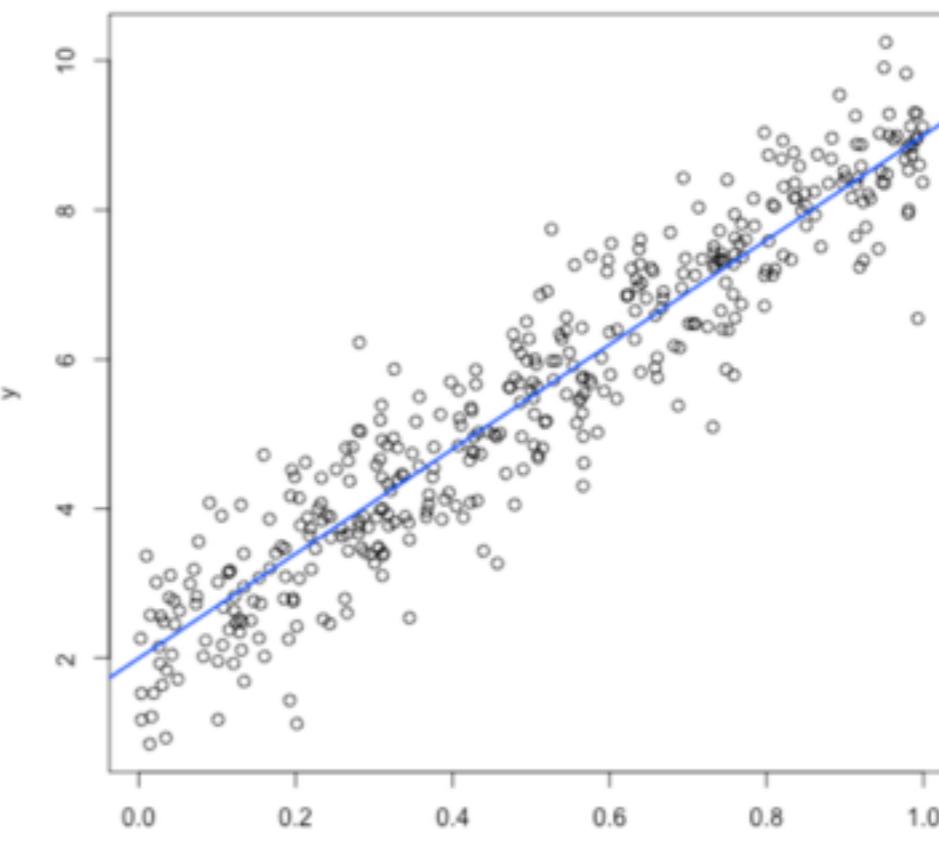
```
a <- 2
b <- 7
sigSq <- 0.5
n <- 400

set.seed(1234)
x <- runif(n)
y <- a + b * x + rnorm(n, sd = sqrt(sigSq))

(avgX <- mean(x))
```

[1] 0.4969

```
plot(x, y)
abline(a, b, col = "blue", lwd = 2)
```



**foo.Rmd** → foo.html

```

```

```
title: "Untitled"
```

```
output: html_document
```

```

```

**foo.Rmd** → foo.md → foo.html

```

```

```
title: "Untitled"
```

```
output:
```

```
 html_document:
```

```
 keep_md: yes
```

```

```

**foo.Rmd** → foo.md

```

```

```
output:
```

```
 md_document:
```

```
 variant: markdown_github
```

```

```

```
foo.R → foo.html
```

```
#' -
#' title: "Untitled"
#' output: html_document
#' ---
```

```
foo.R → foo.md → foo.html
```

```
#' ---
#' title: "Untitled"
#' output:
#' html_document:
#' keep_md: yes
#' ---
```

```
foo.R → foo.md
```

```
#' ---
#' output:
#' md_document:
#' variant: markdown_github
#' ---
```

# “README.md as index.html”

## STAT 545A

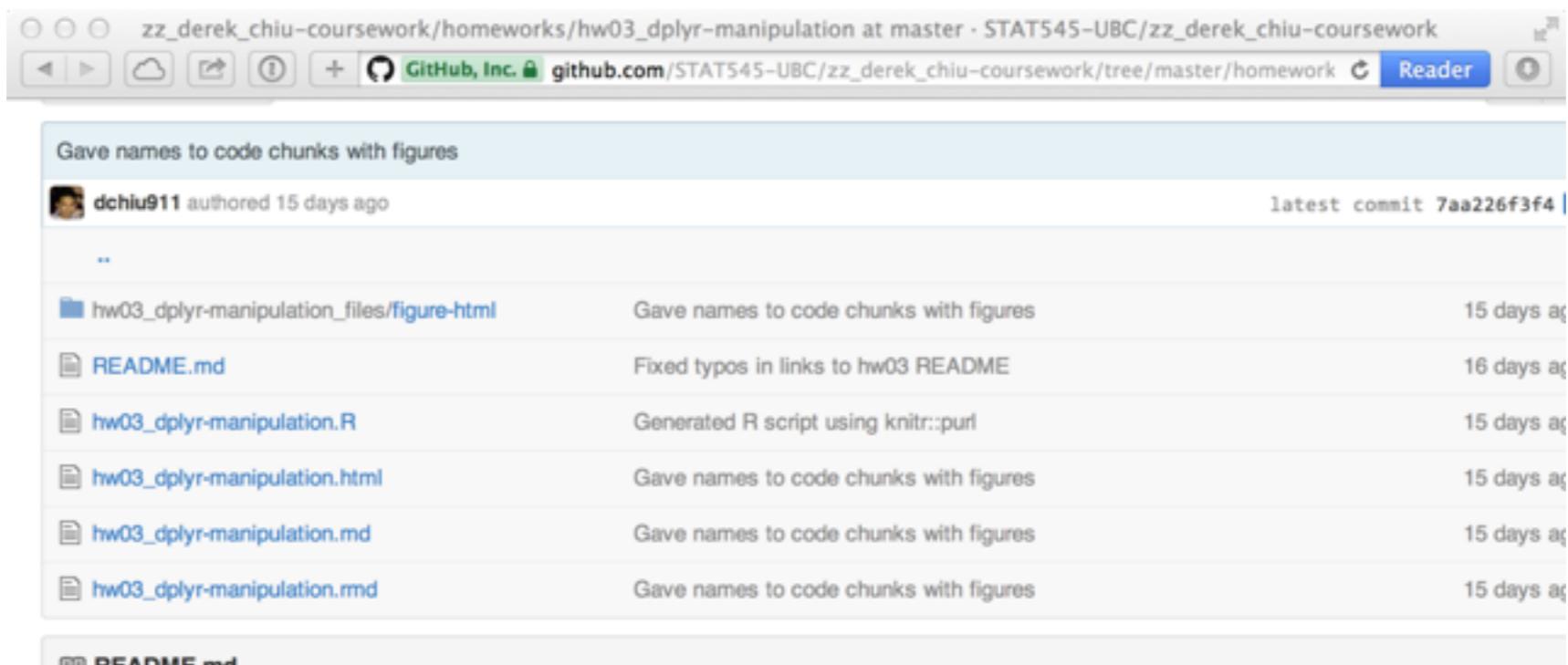
- [Homework 1](#): Edit README.md and experiment with Markdown
- [Homework 2](#): Exploring the Gapminder Dataset
- [Homework 3](#): Manipulation and Visualization Using `dplyr`
- [Homework 4](#): Writing and Testing Functions
- [Homework 5](#): Factor Control and File I/O
- [Homework 6](#): *Optional:* Transition Activities

## STAT 547M

- [Homework 7](#): Data Wrangling Grand Finale
- [Homework 8](#): Data Cleaning
- [Homework 9](#): Automating Data Analysis Pipelines
- [Homework 10](#): Building an R Package
- [Homework 11](#): Building a Shiny App
- [Homework 12](#): Getting Data off the Web

# “one definitive source”

.rmd → .r, .md, .html



The screenshot shows a GitHub repository page for 'zz\_derek\_chiu-coursework/homeworks/hw03\_dplyr-manipulation'. The repository has 15 commits from user 'dchiu911' over 15 days. The commits include changes to README.md, hw03\_dplyr-manipulation.R, hw03\_dplyr-manipulation.html, hw03\_dplyr-manipulation.md, and hw03\_dplyr-manipulation.rmd, all involving naming code chunks with figures. A file named 'figure-html' was also added.

| File                                      | Description                            | Time Ago    |
|-------------------------------------------|----------------------------------------|-------------|
| hw03_dplyr-manipulation_files/figure-html | Gave names to code chunks with figures | 15 days ago |
| README.md                                 | Fixed typos in links to hw03 README    | 16 days ago |
| hw03_dplyr-manipulation.R                 | Generated R script using knitr:::purl  | 15 days ago |
| hw03_dplyr-manipulation.html              | Gave names to code chunks with figures | 15 days ago |
| hw03_dplyr-manipulation.md                | Gave names to code chunks with figures | 15 days ago |
| hw03_dplyr-manipulation.rmd               | Gave names to code chunks with figures | 15 days ago |

## Homework 3: Manipulation and Visualization Using `dplyr`

This is the directory that contains all the homework files submitted for [Homework 3](#). The material covers data manipulation using `dplyr` with accompanying graphics using `ggplot2`. The contents of this subdirectory are:

- [R Markdown file](#): The main source code for generating the report.
- [Markdown file](#): The intermediate product that is rendered nicely as a pseudo-HTML preview.
- [HTML file](#): The final HTML report in its raw form.
- [R script](#): Takes only the code chunks from the R Markdown file.
- [Figure folder](#): Folder containing figures and formatting files generated from using `ggplot2` for graphics.

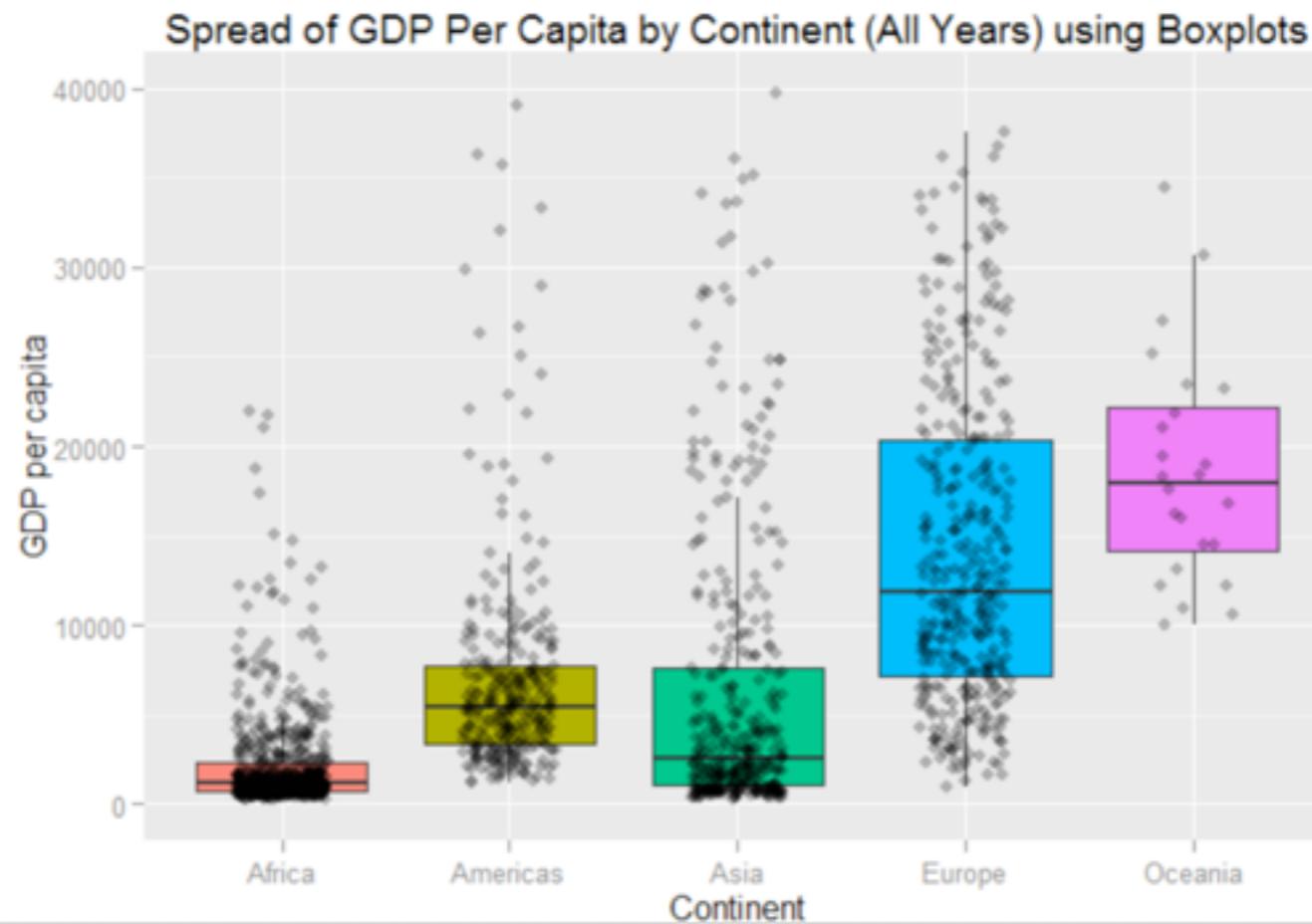
To replicate the analysis:

- Clone the repo into a local directory belonging to an RStudio project

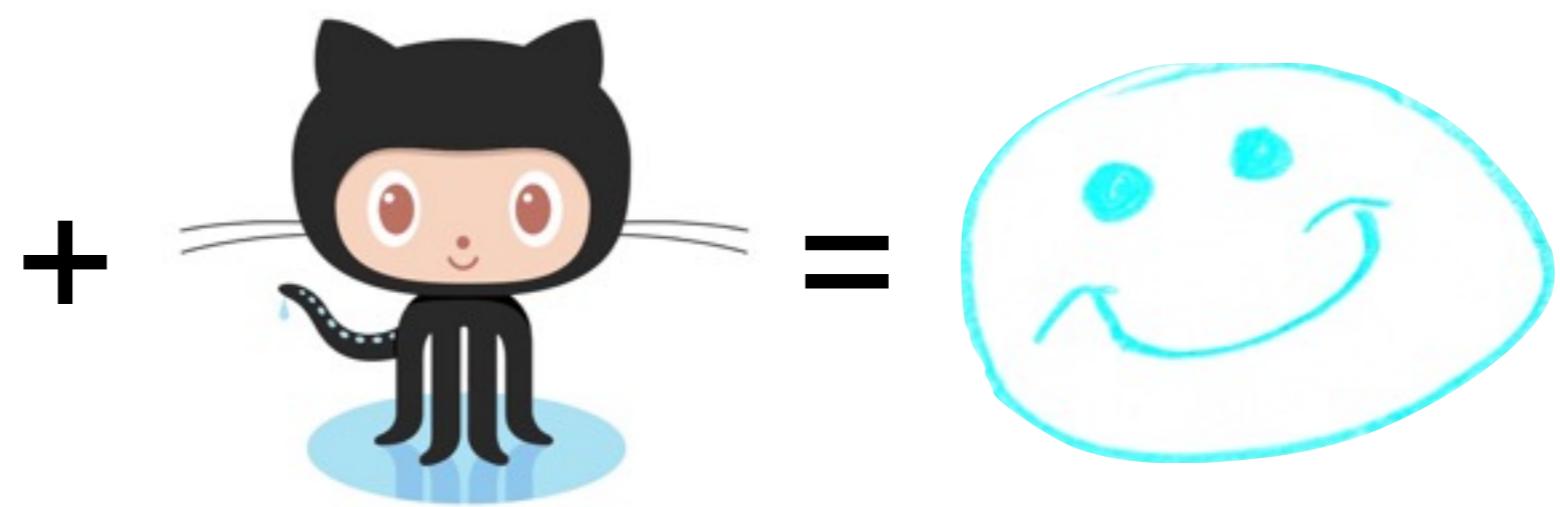
# “party in the back”

In this section, we will use two similar graphs to visualize spread: the **boxplot** and the **violin plot**. Note that the original unmanipulated data frame `gtbl` will be used here.

```
ggplot(gtbl, aes(continent, gdpPerCap))+
 geom_boxplot(aes(fill = continent), outlier.shape = NA)+
 geom_jitter(alpha = 0.3, position = position_jitter(width = 0.2))+
 xlab("Continent") +
 ylab("GDP per capita") +
 ylim(c(0,40000)) +
 theme(legend.position = "none") +
 ggtitle("Spread of GDP Per Capita by Continent (All Years) using Boxplots")
```



R Markdown v2



reproducibility  
presentability

machine & human readability  
collaboration  
pseudo-website  
data analytical regression test

# Happy Git and GitHub for the useR



 [@JennyBryan](https://twitter.com/JennyBryan)

 [@jennybc](https://github.com/jennybc)

STAT  
545

 [@STAT545](https://twitter.com/STAT545)  
 [stat545-ubc.github.io](https://stat545-ubc.github.io)