

The Case for R Packages as Team Collaboration Tools

Stephanie Kirmer, Senior Data Scientist

SEATTLE

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About Me and Uptake

My role includes: modeling, internal tool development, exploratory analysis, customer interaction

Uptake:

- Analytics company serving a variety of areas of industry (rail, mining, oil & gas, trucking, etc)
- We provide data science and analytics insights to help reduce downtime, improve safety, and increase efficiency for our customers.
- 60+ person data science team, with expertise across the field
- Data science is at the core of what our company does!

With a team this big, we have strong techniques for collaboration and sharing knowledge.



Problem:

Data science teams without structured, intentional collaboration leak knowledge and waste resources.



Solution:

Build your team's culture, infrastructure, and tools so that building, retaining, and sharing knowledge is easy and valued.

R packages are a great tool to help you get there.



You could have this!

The screenshot shows the GitHub organization page for `UptakeOpenSource`. The top navigation bar includes links for `Repositories 3`, `People 17`, `Teams 0`, and `Projects 0`. Below the navigation is a search bar with placeholder text `Search repositories...` and filters for `Type: All` and `Language: All`. A green `New` button is visible.

pkgnet
R package for analyzing other R packages via graph representations of their dependencies

R dependency-analysis dependency-graph graph-theory
R ★ 16 8 issues need help Updated 21 hours ago

uptasticsearch
An Elasticsearch client tailored to data science workflows.

elasticsearch data-science r etl nosql document-database
R ★ 22 16 issues need help Updated a day ago

Top languages
R Python

People 17 >

A grid of 17 user profile icons, including several GitHub avatars and one for "TRON PAUL".

<https://github.com/UptakeOpenSource>

Neatly organized packages

Easy to find and contribute to

Thoroughly documented



 **jameslamb** Merge pull request #55 from UptakeOpenSource/feature/release_v0.2.0 ...

 R	Made it a merge instead of rep
 docs	Moved R package up to repo root
 inst/testdata	Moved R package up to repo root
 man	renamed doc_null to doc_shared
 tests	Made it a merge instead of rep
 .Rbuildignore	speed up unpack_nested_data #42
 .gitignore	Deleted "*.html" from gitignore since we'll need to track the docs
 .travis.yml	Moved R package up to repo root
 CONDUCT.md	Updated CONDUCT.md
 DESCRIPTION	Added release v0.2.0
 LICENSE	Moved R package up to repo root
 NAMESPACE	Remove handling of mixed atomic/data.table columns
 NEWS.md	Added release v0.2.0
 README.md	Moved R package up to repo root
 _pkgdown.yml	Moved R package up to repo root
 cran-comments.md	Added release v0.2.0

<https://github.com/UptakeOpenSource/uptasticsearch>

Code can all be installed with a single command.

Versions are automatically managed and are always accessible.



Progression of Team Collaboration Infrastructure

None	Little	Moderate	High
No version control systems.	Minimal, unsystematic use of version control.	Git is in place, but used inconsistently.	Git is an integral part of the workflow for the entire team.
Code sharing via email, when it is shared at all.	Code sharing via email or links/filepaths on a shared file space.	Code sharing is done with git when it happens.	Code is shared & reviewed through git, and continuous integration (CI) system is used.
Code stored locally on hard drives, not accessible to colleagues.	Code stored on shared drive space or a cloud service.	Git is the ideal place to share code, but shared drives are still used.	Packages are shared through an internal CRAN-type system.



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Code sharing via email, when it is shared at all.	Code sharing via email or links/filepaths on a shared file space.	Code sharing with git happens.	<p>This is where using team R packages becomes a real possibility</p> <p>it, tem</p>
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Why?

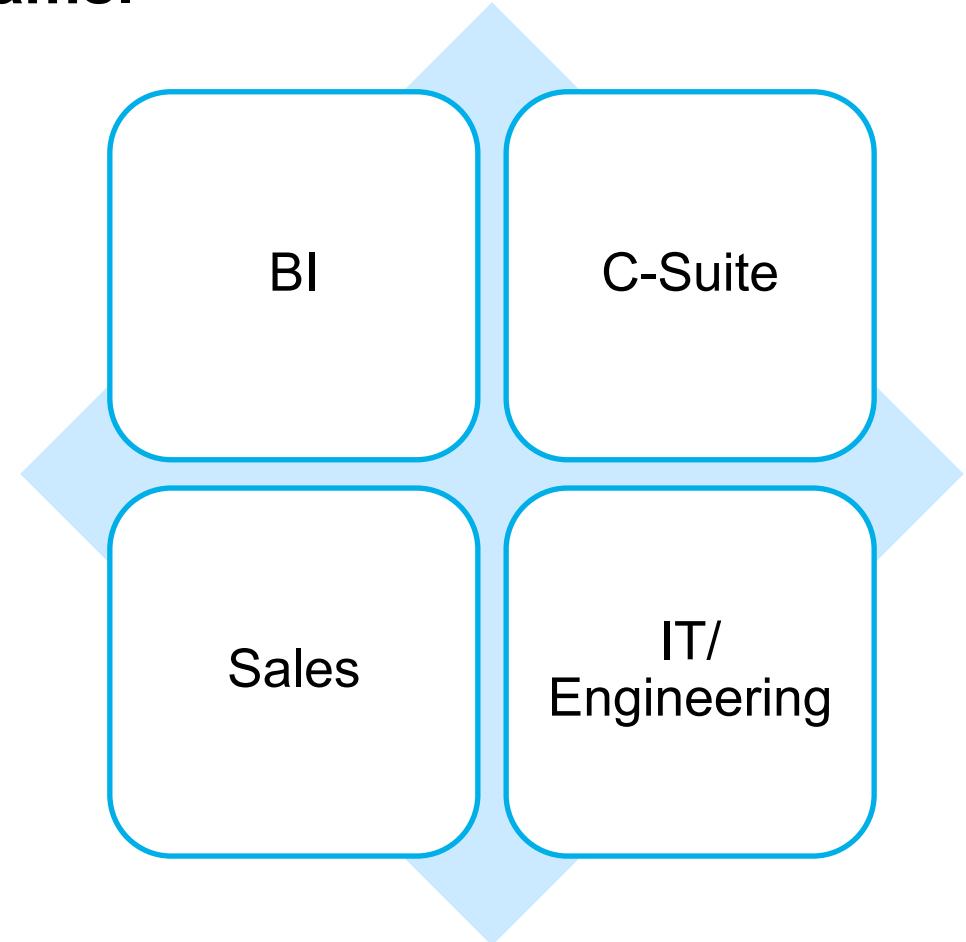
Improve quality and reproducibility by using peer reviewed, validated tools in package form.

- Rewriting code = opportunity for mistakes.
- A shared set of tools creates consistency across projects.
 - Definitions of measures and metrics
 - Data cleaning and management steps



Build package elements for use by other teams.

- Package functionalities can include:
 - Data ETL
 - Basic analysis
 - Visualizations
 - .. and more!
- Teams can also build useful tools for their specific tasks



Empower your colleagues to do routine work, and free up data science to do the complex and innovative projects.

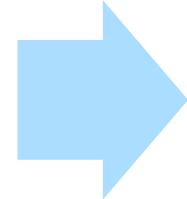


Don't wait until personnel changes to think about your information.

With information managed in packages:

New Hire

- Goes from beginner to contributor – fast!
- Has a welcoming onboarding experience.



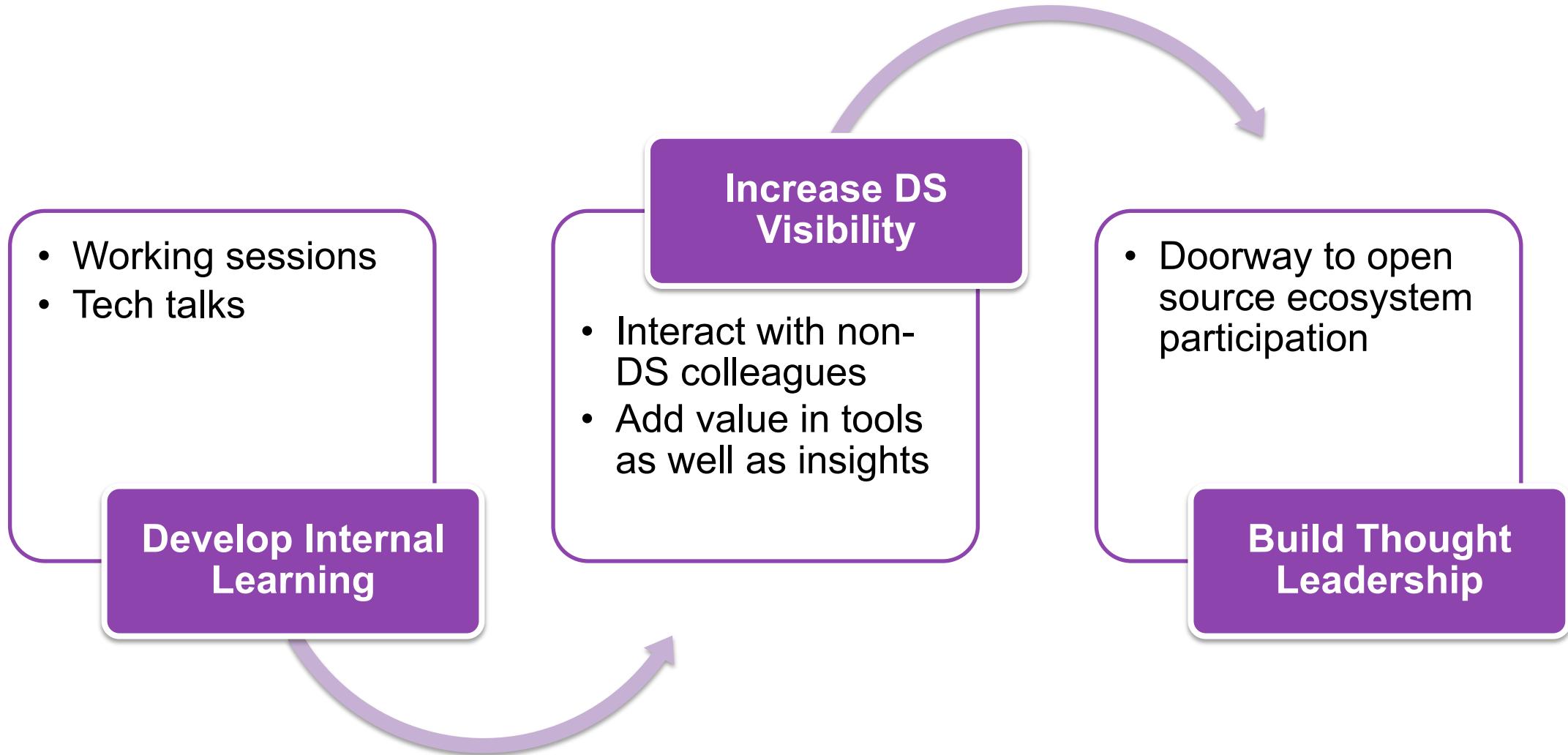
Staff Departure

- Causes no panic or scramble.
- Results in no lost information or knowledge.

Community tools increase the stability of your team for the long term.



Expand a culture of education across your organization.



How?

A group of individual data scientists \neq a collaborative team of data scientists.

Develop a paradigm of thinking that is productive and works towards your objectives.

- Common, understood goals
- Trust in colleagues
- Willingness to share information/tools and help each other



Leadership has to commit to changes.

People need to be incentivized to maintain and contribute to packages through:

- Time
- Compensation
- Recognition



Adam McElhinney

Yesterday at 9:48 AM

in #uptake

Team, Data Science and the Uptake Open Source Committee is pleased to announce that Data Science had their second R package accepted to CRAN! This is a great opportunity for us to showcase our Data Science skills to prospective customers and candidates. Special shoutout to [@brian.burns](#) [@james.lamb](#) [@patrick.boueri](#) [@jay.qi](#) who worked nights and weekends to get this initiative done. (edited)

1 reply



Ganesh Bell 19 hours ago

brilliant.. I want a TShirt "My data scientists work on more impactful problems than yours!"

Have a vision for what sort of system you want your team to have, and build infrastructure that can scale and evolve.



Start by thinking and planning.

Explore your undocumented resources

- Learn your institutional history/knowledge.
- Investigate existing best practices.

Catalog user needs

- Who do you want using your tools? What will they need?

Sketch out your packages

- How many? Defined by theme, or user base?

Think for the long haul

- Your needs today will change tomorrow.



Write functions and documentation intelligently.

Make modular functions, and follow best practices.

- One operation/task = one function.
- Think about readability and future editability.
- Parameterize any aspects the user may want to specify.

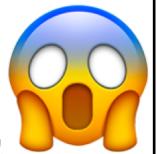
(Remember to plan for growth and change!)

Good jobs for one function:

- Calculate a value
- Generate one plot
- Produce one dataframe

BAD job for one function:

- Calculate seventeen values, produce six dataframes, and produce four plots based on those dataframes



Many useful tutorials exist to help you along (see reference slide)



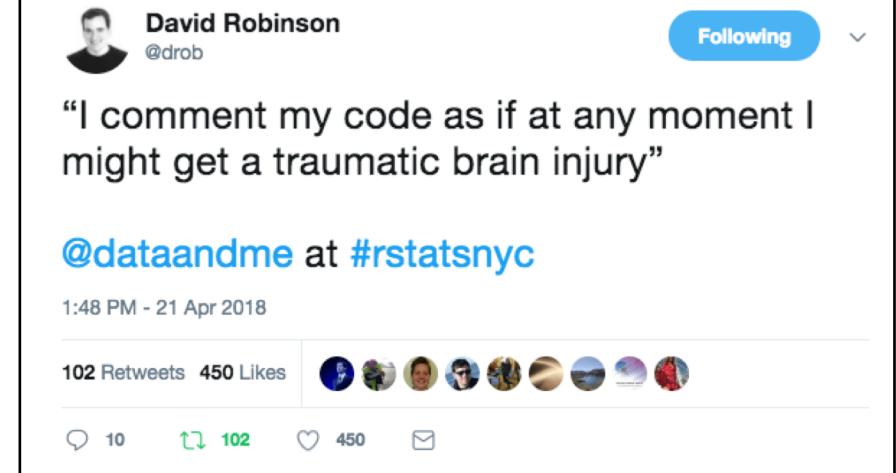
Make robust documentation a norm and a habit.

At the earliest stages of team infrastructure, documentation is haphazard.

Write for the layperson or for ‘future you’.

R packages have a huge assortment of documentation possibilities!

- Function help docs
- Vignettes
- Package level descriptive documents
- Websites via pkgdown (<http://pkgdown.r-lib.org/>)



David Robinson (@drob) Following

“I comment my code as if at any moment I might get a traumatic brain injury”

@dataandme at #rstatsnyc

1:48 PM - 21 Apr 2018

102 Retweets 450 Likes

10 102 450



Chris Albon (@chrisalbon) Following

Comment code like you're quitting tomorrow.

3:27 AM - 2 May 2018

18 Retweets 76 Likes

11 18 76



When you have tools ready to be used, teach your colleagues.

Let data scientists who authored functions teach their peers.

Proactively teach BI, analytics, executive, and sales staff

- What is this, and why should they care?
- Empower your colleagues to be your collaborators.

Over time, add more things that people need – new functions or whole new packages.



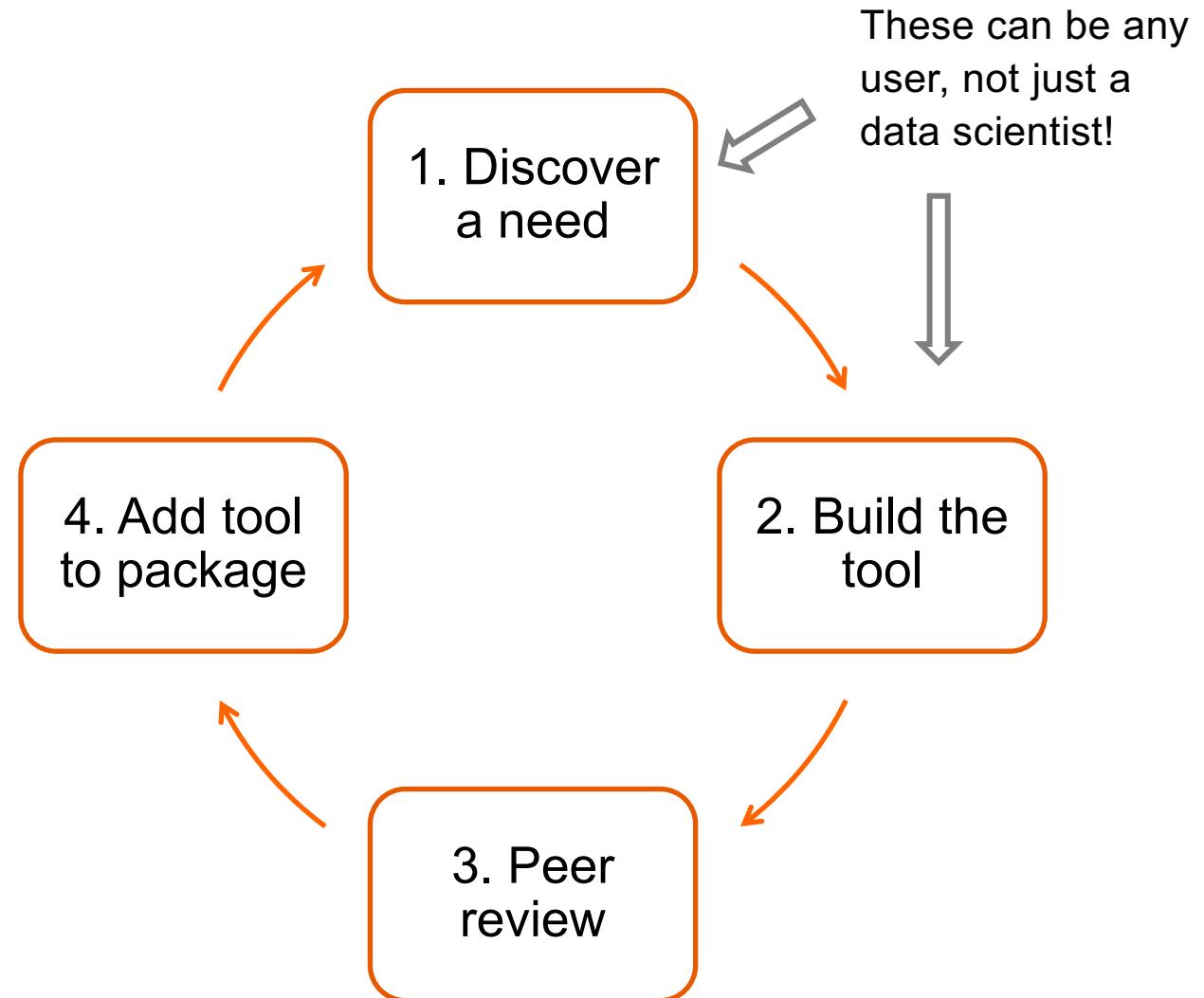
Be friendly and encouraging!

Add new features when the need arises, in a systematic way.

Ideas for new features can come from **any user** – explicitly welcome feedback and contributions.

Don't skimp on the peer review element!

Do occasional housecleaning to ensure things are still working, efficient, and relevant.



Make collaboration a core priority across the team.

Support improving the package, not just creating the package.

Stagnating documentation/tools < than no tools at all.

Move from single user ownership to team ownership.

- How you talk about the tool matters. Get people invested in it!

The screenshot shows a GitHub issue page for the repository 'f2m2 / apidocs'. The 'Issues' tab is selected, showing 2 open issues. The specific issue discussed is '#35 Outdated dependency.', which was opened by 'Addgod' on Mar 6 and has 2 comments. The first comment is from 'Addgod' on Mar 6, saying 'Hi. Is there a reason that you are using so old a version of reflection-docblock? You are depending on version 2.0-ish, and they are up to 4.3 atleast.' The second comment is from 'f2m2rd' on Mar 6, edited, and says 'Contributor Thanks for the feedback. The version of reflection-docblock was current at the time of development. Please feel free to update it. Pull requests are welcome!' There are also 'Watch' and '4' notifications buttons at the top right.



Wrapping Up

Having smooth functioning, collaborative data science is possible!

You can do work that is reproducible, high quality, and less effort.

Your entire organization can be more data literate and self supporting, freeing up data scientists for innovation.

You can build a culture of learning and education for your whole organization, starting from data science.

Suggested Roadmap

1. Develop collaborative culture;
2. Get leadership support;
3. Plan and think ahead;
4. Build tools and write code thoughtfully;
5. Don't skip documentation;
6. Educate your organization;
7. Maintain the tools!



Reference Material

How-To:

- Write your own functions:
<https://nicercode.github.io/guides/functions/>
- Write great documentation: <http://r-pkgs.had.co.nz/man.html>
- Construct an R package:
 - https://github.com/skirmer/r_packages
 - <https://github.com/jtleek/rpackages>
- Build websites from package documentation:
<http://pkgdown.r-lib.org/>
- Get familiar with git:
 - <https://product.hubspot.com/blog/git-and-github-tutorial-for-beginners>
 - <https://guides.github.com/>
 - <https://try.github.io/levels/1/challenges/1>
- Write unit tests:
 - <https://katherinemwood.github.io/post/testthat/>
 - <http://r-pkgs.had.co.nz/tests.html>

Case Studies:

Capital One:

https://github.com/emilyriederer/references/blob/master/tidycf_Riederer_rstudio.pdf

Airbnb: <https://peerj.com/preprints/3182/>

Tools:

- <https://bitbucket.org/>
- <https://about.gitlab.com/>
- <https://jenkins.io/>
- <https://travis-ci.org/>

@data_stephanie

www.stephaniekirmer.com
<https://github.com/skirmer/>

