13: Summary + Extras

bit.ly/SISBID3

The most important tool is the mindset,
when starting, that the end product
will be reproducible.

– Keith Baggerly

Steps toward reproducible research

- Slow down
- Organize; document
- Everything with code
- Scripts → RMarkdown
- Code → functions → packages
- Version control with Git
- Automation with Make
- Choose a license
- Share your work with others

Make with R Markdown

To use Make with R Markdown, you need to tell your operating system where it can find pandoc. RStudio includes pandoc, but you need to add the relevant directory to your `PATH`.

Mac:

```
/Applications/RStudio.app/Contents/MacOS/pandoc
```

Windows:

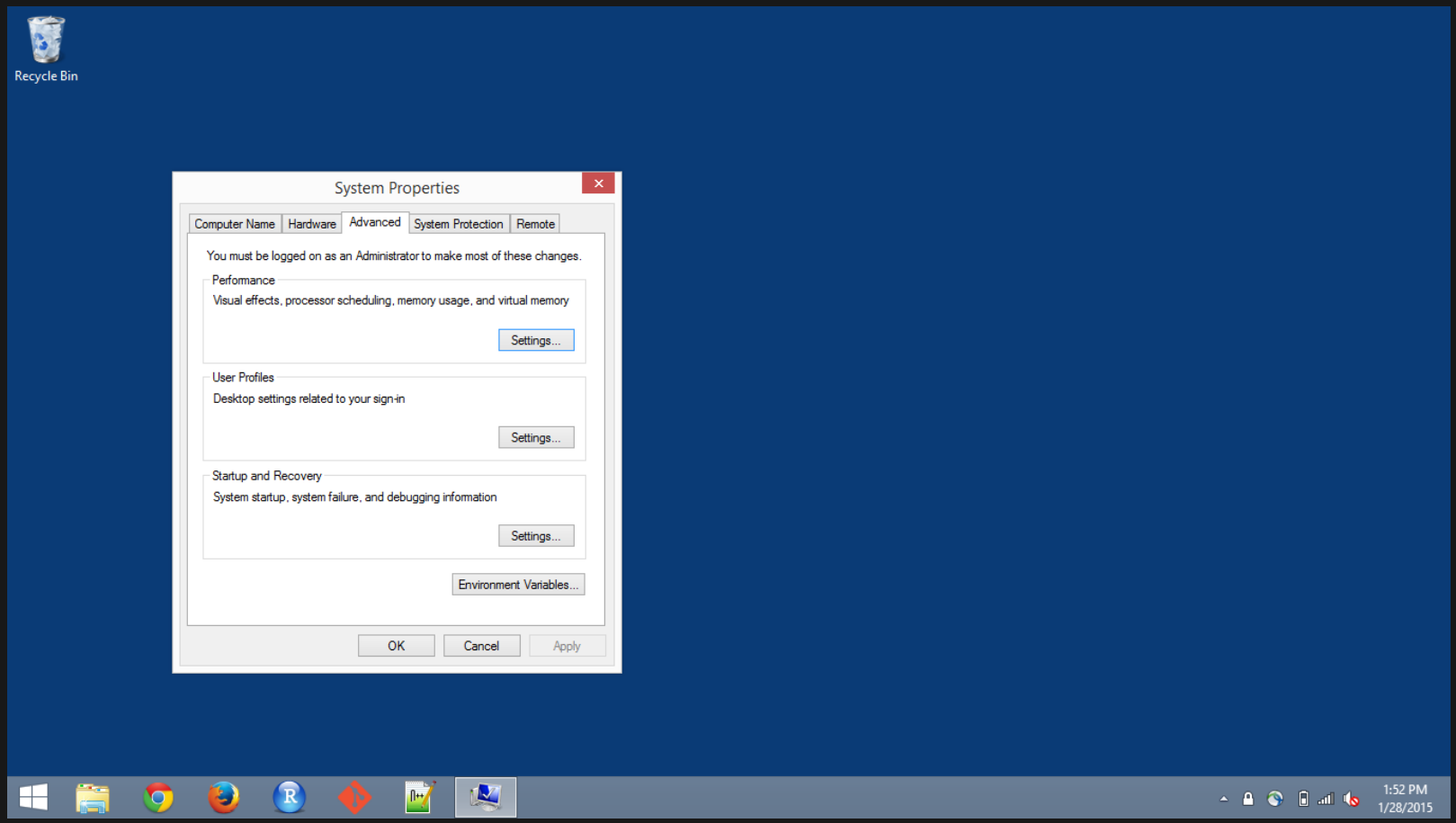
```
"c:\Program Files\RStudio\bin\pandoc"
```

~/.bash_profile

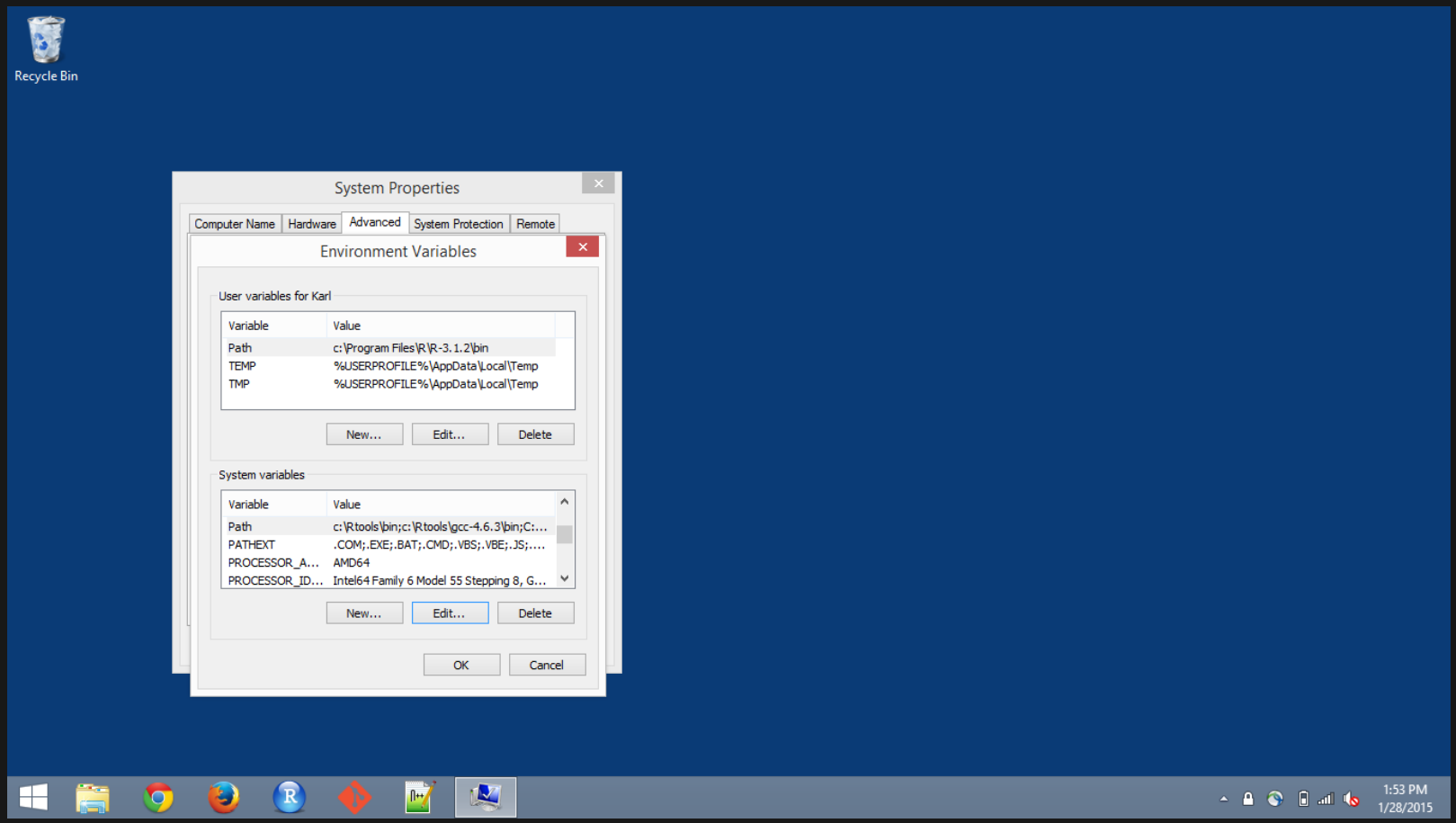
```
export PATH=$PATH:/Applications/RStudio.app/Contents/MacOS/pandoc

noclobber=1    # prevent overwriting of files
IGNOREEOF=1    # disable Ctrl-D as a way to exit
HISTCONTROL=ignoredups

alias cl='clear;cd'
alias rm='rm -i'
alias mv='mv -i'
alias cp='cp -i'
alias ls='ls -GF'
alias 'l.'='ls -d .[a-zA-Z]*'
alias ll='ls -lh'
alias md='mkdir'
alias rd='rmdir'
alias rmb='rm .*~ *~ *.bak *.bk!'

alias Rb='R CMD build --force --resave-data'
alias Ri='R CMD INSTALL --library=/Users/kbroman/Rlibs'
alias Rc='R CMD check --library=/Users/kbroman/Rlibs'
alias Rcc='R CMD check --as-cran --library=/Users/kbroman/Rlibs'
```

PATH in Windows

PATH in Windows



PATH in Windows



Challenges

- Daily maintenance
  - READMEs up to date?
  - Documentation matches code?
- Cleaning up the junk
  - Move defunct stuff into an `Old/` subdirectory?
- Start over from the beginning, nicely?

Sharing your work

- Why share?
  - Funding agency or journal requirement
  - Increased visibility
  - So that others can build on your work
- When?
  - Continuously and instantaneously
  - When you submit a paper
  - When your paper appears
- Risks?

bit.ly/rr_sharing_slides

I’m not worried about being scooped,
I’m worried about being ignored.

– Magnus Nordborg

- Share more
- Share sooner
- Share in a way that it’s easy for others to learn from and build upon

What to share?

- For sure
  - Primary dataset
  - Metadata
  - Data cleaning scripts
  - Analysis scripts
- It could help
  - Very-raw data
  - Processed/clean data
  - Intermediate results
- No
  - Confidential data (e.g. HIPAA data)
  - Passwords, private keys

Where to share?

- Domain-specific repository
  - Genbank, dbGaP, etc.
  - See `re3data.org`
- Figshare, Dryad, Zenodo
- Institutional repository
- GitHub, BitBucket

Resources

- R Markdown
  - rmarkdown.rstudio.com
- R Packages
  - Releasing to CRAN: r-pkgs.had.co.nz/release.html
  - Leek group: github.com/jtleek/rpackages
  - When to trust an R package: bit.ly/trust_r_pkg
- Make
  - kbroman.org/minimal_make
  - remake R package, github.com/richfitz/remake
- Git
  - Git branches: nicercode.github.io/git/branches.html
  - Hadley on Git/GitHub: r-pkgs.had.co.nz/git.html
  - Git subtrees: bit.ly/git_subtree
- Also see bit.ly/sisbid3_resources

Some of the things we didn’t cover

R CMD BATCH

Why is it cool?

- Scripting lets you run everything in the background
- Increases the odds you've got *everything* reproducible

Why didn't we cover it?

- A bit geek-heavy

Where would we point you?

- Stackoverflow discussion: `bit.ly/so_rscript`
- Codecademy Learn the Command Line lesson: `bit.ly/learn_command_line`

Coding conventions

Why are they cool?

- They help you keep things consistent between team members
- They make code easier to read, and more likely to be used

Why didn't we cover them?

- Not enough time

Where would we point you?

- Hadley's recommendations `adv-r.had.co.nz/Style.html`
- Google's recommendations `google.github.io/styleguide/Rguide.xml`

Code review

Why is it cool?

- Helps to find bugs and clean up confusing bits
- Potentially a test of the reproducibility of your work

Why didn't we cover it?

- Not enough time

Where would we point you?

- Software Carpentry blog post, `bit.ly/swc_codereview`
- Titus Brown's blog post, `http://bit.ly/titus_codereview`

Software testing

Why is it cool?

- Explicit tests help you to avoid bugs, and to find bugs sooner

Why didn't we cover it?

- Not enough time

Where would we point you?

- testthat package, `github.com/hadley/testthat`
- Testing R Code book

Continuous integration (eg Travis)

Why is it cool?

- Automatically build and run tests when you push to GitHub

Why didn't we cover it?

- Not enough time

Where would we point you?

- Julia Silge blog post, `juliasilge.com/blog/beginners-guide-to-travis`
- Hadley's R packages book, `r-pkgs.had.co.nz/check.html#travis`

Capturing dependencies

Why is it cool?

- Ensure that your carefully constructed reproducible project doesn't fail due to a change in one of the packages you use

Why didn't we cover it?

- Not enough time

Where would we point you?

- packrat package, `github.com/rstudio/packrat`
- checkpoint package, `github.com/RevolutionAnalytics/checkpoint`

Containers (e.g. docker)

Why are they cool?

- Capture your entire environment, so your project is *for sure* fully reproducible.

Why didn't we cover them?

- A bit technical

Where would we point you?

- Rocker: Docker for R
- R Docker tutorial

R Markdown templates

Why are they cool?

- More complete control over the appearance of your document

Why didn't we cover them?

- A bit technical

Where would we point you?

- R Markdown documentation

knitr Bootstrap

Why is it cool?

- Allows for generation of slicker reports

Why didn't we cover it?

- A bit technical

Where would we point you?

- `github.com/jimhester/knitrBootstrap`

GitHub pages

Why are they cool?

- Webpages built entirely in Markdown, providing nicer interfaces to your content

Why didn't we cover them?

- Tangential to *reproducible research*?

Where would we point you?

- `pages.github.com`
- `kbroman.org/simple_site`
- `bookdown.org/yihuit/blogdown`

Bookdown

Why is it cool?

- Write a book (or book-like object) entirely in R Markdown

Why didn't we cover it?

- Not enough time

Where would we point you?

- bookdown.org/yihui/bookdown

Shiny!

Why is it cool?

- Interactive pictures have pizzazz.

Why didn't we cover it?

- Tangential to *reproducible research*?

Where would we point you?

- `shiny.rstudio.com`
- `shiny.rstudio.com/tutorial`

Feedback we'd like from you (1)

What motivated us to teach this course?
What would we see as a positive outcome?

- Given this motivation, are we doing things right?
- What motivated you to take this course?
- Were there specific sessions you found really useful/really useless?
- Points you'd like us to expand on?
- Were there points you were hoping we'd cover that we didn't?

Feedback we'd like from you (2)

- Do you have examples/anecdotes you think we might be able to use that you'd be willing to share?
- Were there ways we could've used time more effectively?
- Were there ways we could've used our TAs more effectively?
- Can you see things you learned in this course changing how you do things day to day?
  - Why or why not?
  - Can we ask you again in 6 months?
  - Can we ask you again in a year?
- Could you write this down now? (anonymous is fine)