Lecture 3

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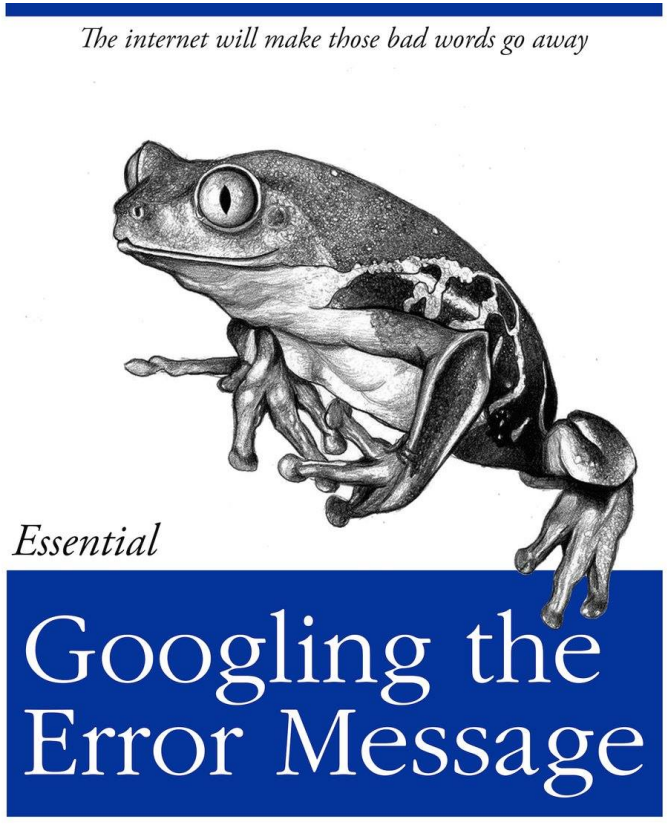
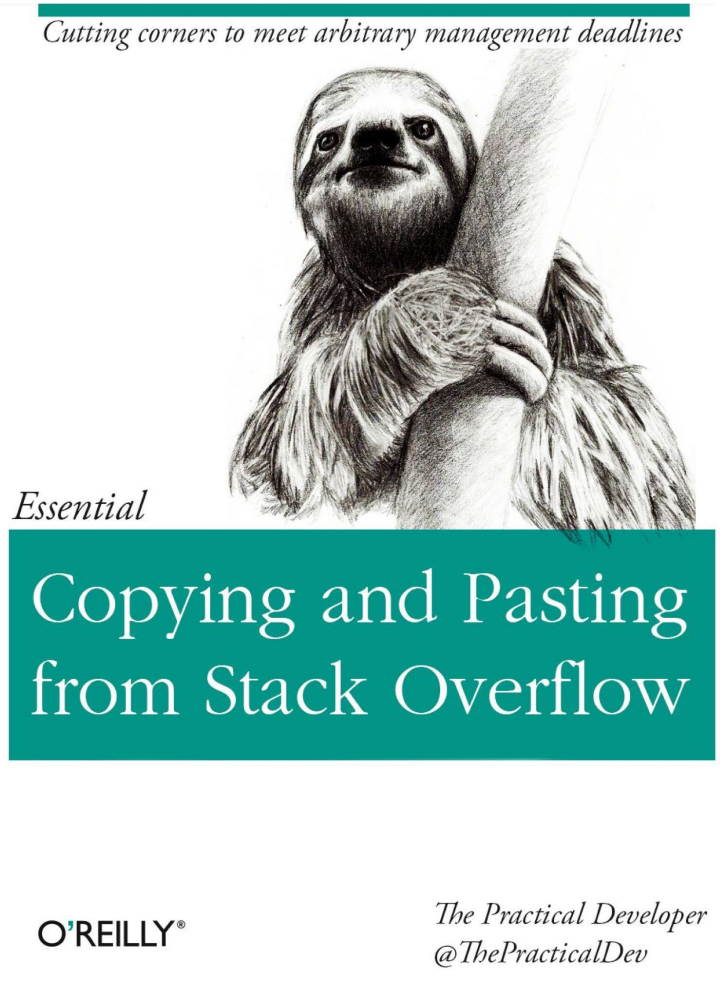
Finding example code

Finding example code





Help forums

StackOverflow

RStudio (posit?)

Vignettes and helpfiles

Cheatsheets

Blogs and articles

ChatGPT (?), other AI

Finding code for specialized tasks

How to find and evaluate R packages: article

Dissecting example code

Getting example code to work

Start by trying the full piece of code.

Does the example run? If not, try these steps first:

- Make sure you have all the packages that are used in the example installed on your computer
- If there is information on the package versions from the example, compare your versions to those used in the example
- Make sure that you have the example data and it's being loaded or set up correctly in R

If it still won't run, you may have to work through it to find out

Dissecting example code

- Run through code step-by-step. Take apart pipelines if necessary
- For each step, what does input look like? What does output look like?
- Make sure you understand why each function is being called and why any arguments are being used

Dissecting example code

Assess the code as you go:

- Why does it do each step?
- If the steps are inputting and outputting the same thing (e.g., a dataframe), how does that object change from before to after the call?

Dissecting nested code

In R, you'll often find examples of code (and write them yourself) where a function call is nested within another function call.

For example, in the following example code, a `function1` call is nested inside a `function2` call:

```
function2(function1(my_data, n = 5), verbose = TRUE)
```

Dissecting nested code

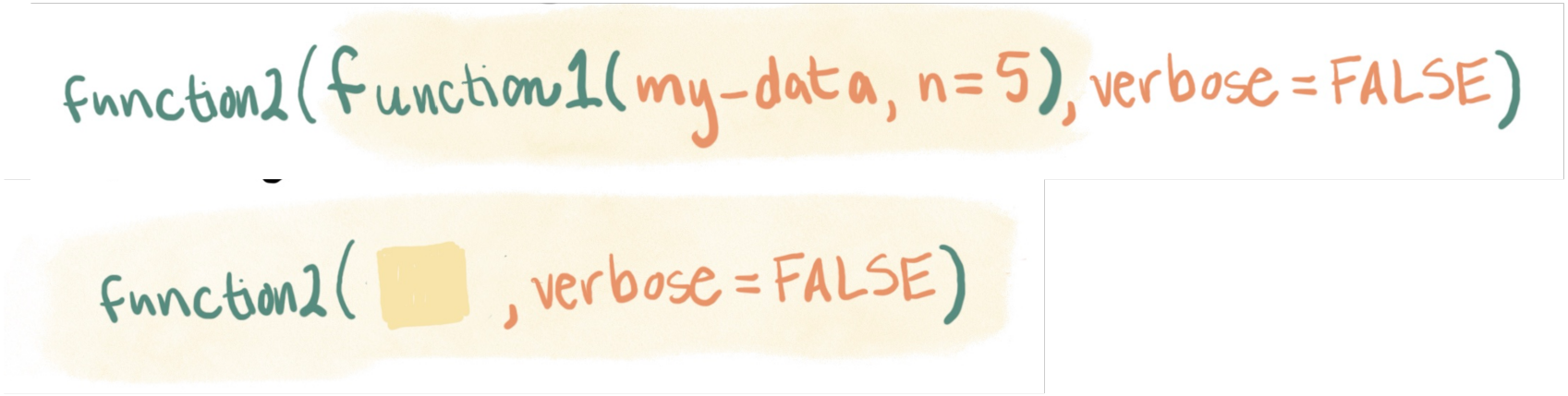
If you are trying to figure out a line of code with nested code, dissect it from the inside out.

Start by figuring out what the innermost function call is doing. For the moment, ignore everything about the other code in which it's estimated.

Dissecting nested code

Once you have figured out the innermost function call, you can think of that part of the code line as the output from that function call.

Now you can proceed to figure out the outer function call.



Dissecting piped code

Often, an example will include a series of piped functions calls.

```
my_data <- my_data %>%
  rename(better_name = `Bad Name!`) %>%
  mutate(animal_species = fct(animal_species))
```

Dissecting piped code

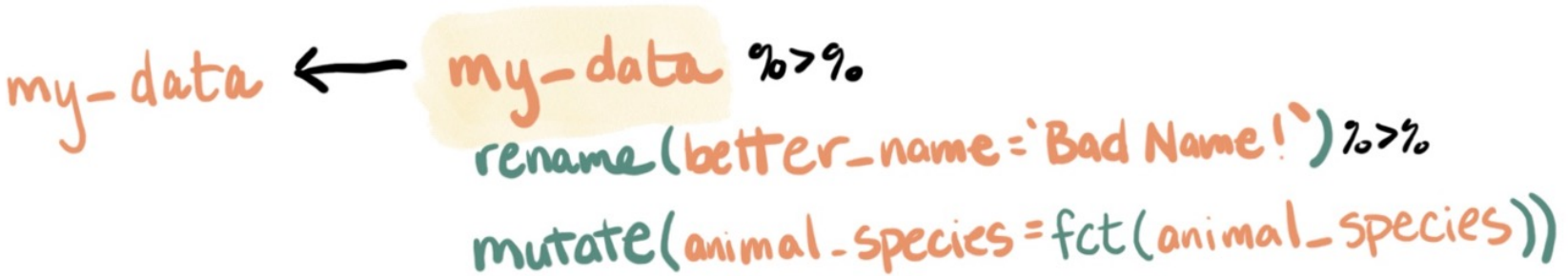
In this type of piped code, the output of one function call is sent directly as input into the next function call.

This type of code can be very clear and efficient in performing a series of simple steps. However, it's useful to have some strategies for how to dissect example code that is in a pipeline, as this isn't always as straightforward.

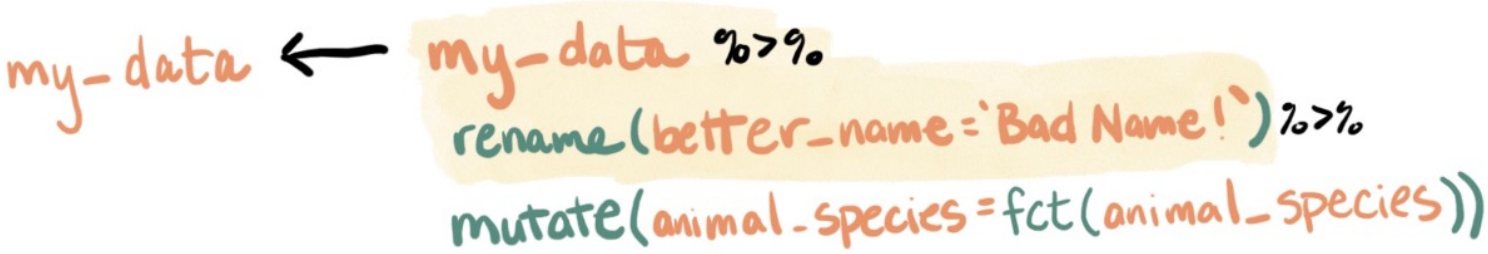
Dissecting piped code

It's a good strategy to dissect the code line by line. Figure out everything up to the first pipe before you look at the next line up to the next pipe, and so on.

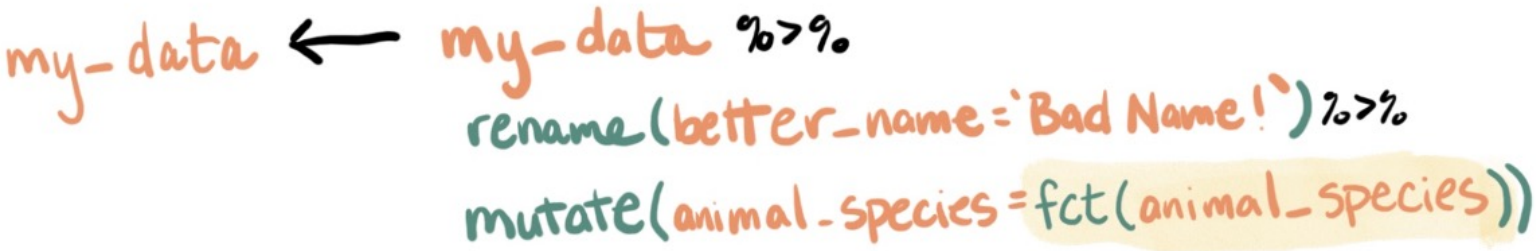
For the example code, you could start just by looking at the data input to the first pipe. In RStudio, you can do this by highlight only that dataframe name (`my_data`) and clicking the Run button (or using the keyboard shortcut for "Run"):



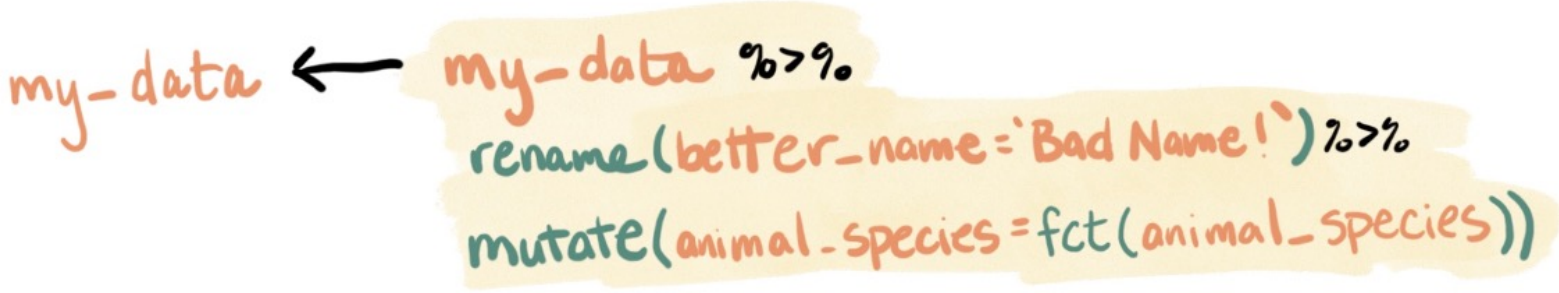
Dissecting piped code



Dissecting piped code



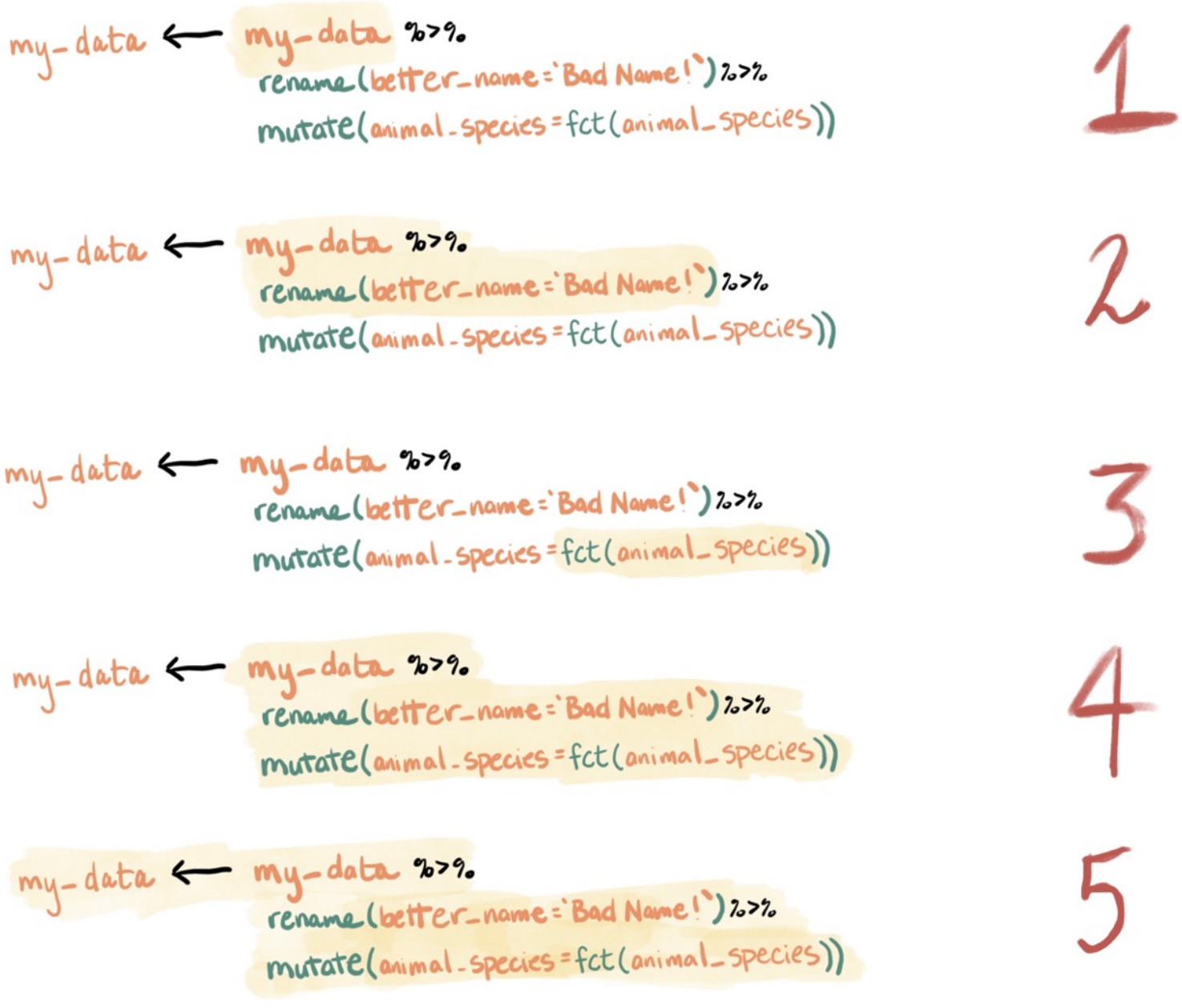
Dissecting piped code



Dissecting piped code

```
my_data <- my_data %>%
  rename(better_name = `Bad Name!`) %>%
  mutate(animal_species = fct(animal_species))
```

Full process of dissecting piped code



Can you spot the differences?

If the function call outputs a revised version of the original object, compare that object before and after the call to make sure you understand how it's changed.

```
library(stringr)
fruit <- c("apple", "bell pepper", "coconut")

fruit
```

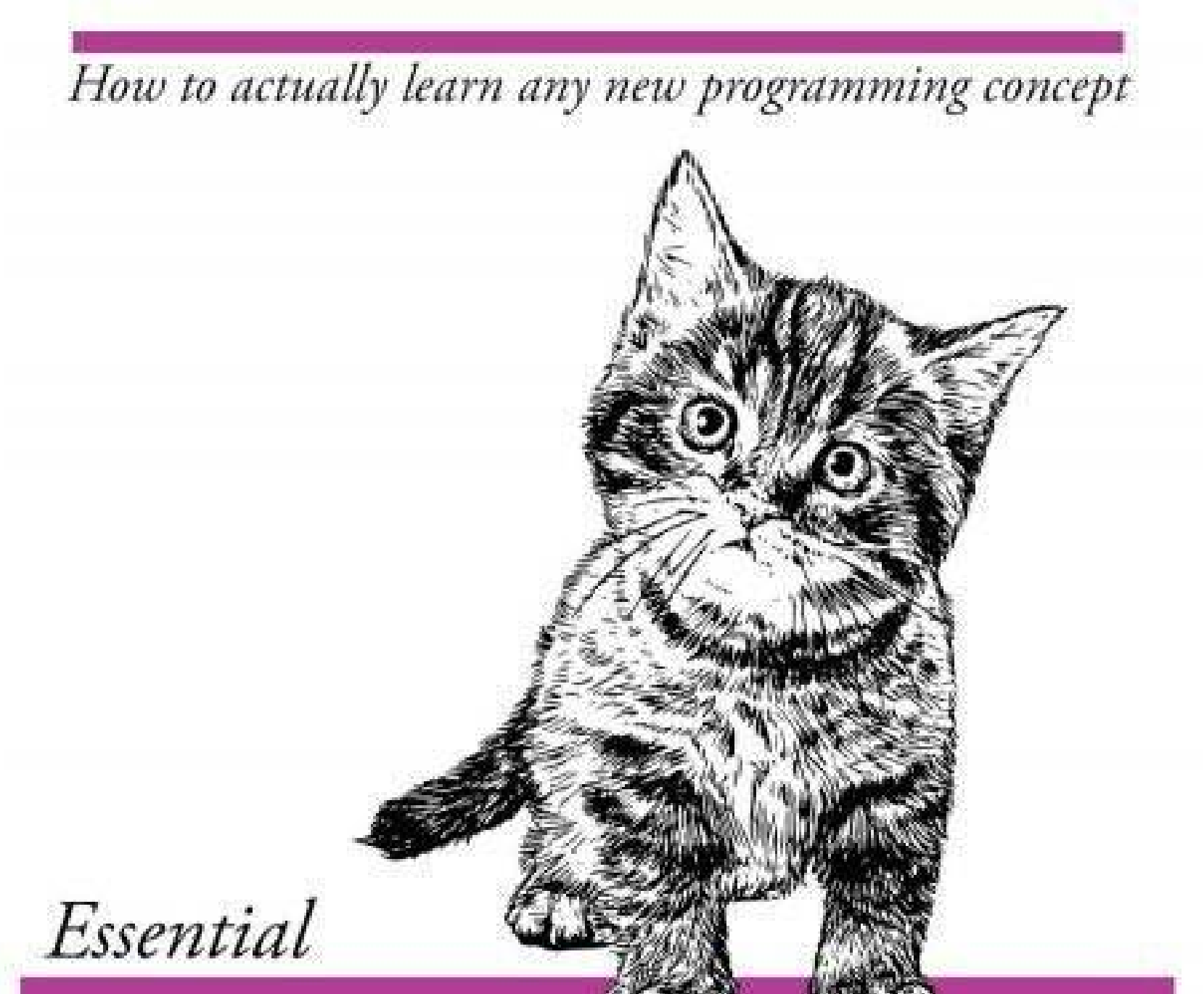
```
## [1] "apple"       "bell pepper" "coconut"
```

```
str_to_title(fruit)
```

```
## [1] "Apple"       "Bell Pepper" "Coconut"
```

Can you spot the differences?

Try changing parameters



Adapting example code

Adapting example code

Two steps:

1. Get it to work
2. Edit it to make it more robust and reproducible

Adapting example code

Solutions that might fix the problem without breaking anything

Essential

Hoping This

Adapting example code

Practical approaches:

- How does your data compare to the example data they use? How do you need to change it's format (or the example code) so it will work with the example code?
- Are there functions in the example code that are not in your normal set of tools? Could they be replaced with something in your usual toolset?

Adapt to your tools

We talked in the introductory lecture about how you should have a set of core tools that you know well and use often.

When you pull code from an example, it's useful to edit it to use your set of core tools if it doesn't already.

Adapt to your tools

You gain several advantages by editing code to use your own toolset:

- Bugs are less likely (especially since defaults can be different across R functions that other perform similar actions)
- If there are bugs, you will catch them more quickly
- The code will be easier for you to understand in the future

Adapt to your tools

For example, you might find an example of how to change a column in your data to a factor data class.

The example might be written using base R functions:

```
df$borough <- as.factor(df$borough)
```

If you tend to use tidyverse tools as your core toolset, you could edit the example to use those tools:

```
df <- df %>%
  mutate(borough = fct(borough))
```

What is a kluge?

From the Jargon File:

kluge: /klooj/

[from the German ‘klug’, clever; poss. related to Polish & Russian ‘kluczˊ (a key, a hint, a main point)]

1. n. A Rube Goldberg (or Heath Robinson) device, whether in hardware or software.

2. n. A clever programming trick intended to solve a particular nasty case in an expedient, if not clear, manner. Often used to repair bugs. Often involves *ad-hockery* and verges on being a *crock*.

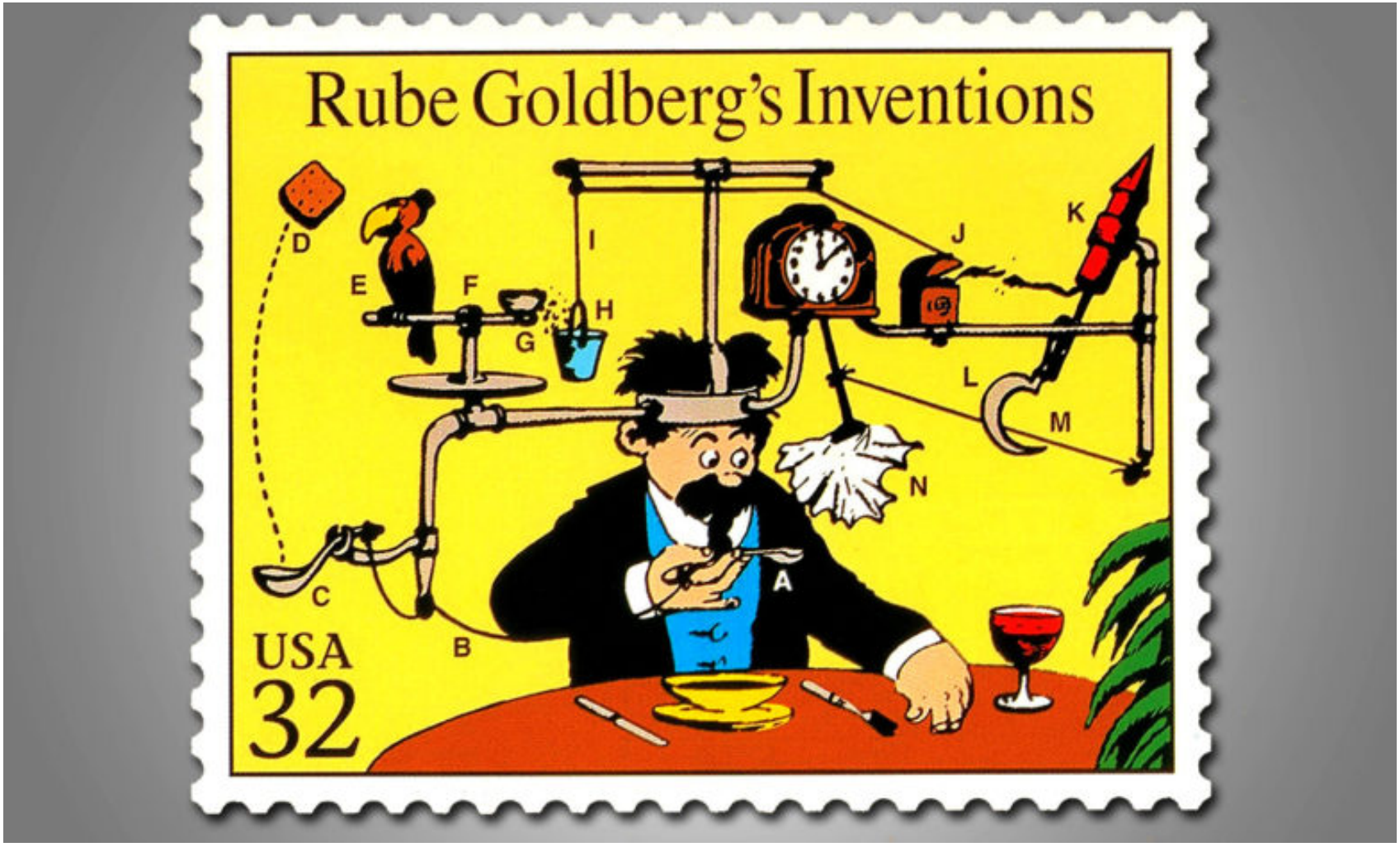
3. n. Something that works for the wrong reason.

4. vt. To insert a kluge into a program. “I've kluged this routine to get around that weird bug, but there's probably a better way.”

5. [WPI] n. A feature that is implemented in a *rude* manner.

What is a kluge?

A kluge by Rube Goldberg:



What is a kluge?

A kluge to make an iPhone speaker (MacGyver-style kluge):

What is a kluge?

A kluge for plowing a field (a "There I Fixed It"–style kluge):

What is a kluge?

A kluge for fixing a bike (a "There I Fixed It"–style kluge):

What is a kluge?

"There isn't much to say about the blog"There I Fixed It", other than that you should add it to your RSS reader immediately. It's a gallery of user-submitted hacks, the twist being that these hacks are disastrous, usually dangerously so, and many of them could quite possibly end in death."
— Wired Magazine, https://www.wired.com/2009/07/there-i-fixed-it-gallery-of-dangerous-hilarious-hacks/

Find and fix kluges

> *"The essence of proper kluge building is the designer who is so clever that he outwits himself. —"How to Design a Kluge", Datamation magazine*

You want to edit out kludges because:

- They often use longer code than you need.
- The logic of the code is not clearly linked to the logic of the problem
- They are hard to maintain, understand, and debug

Don't prioritize **concision** or **efficiency** over **clarity**.

Finding R packages