

Make it Clear



Your Turn

Take turns presenting your topics to the group (~5:00 per person).

Record your presentation if you can (perhaps with your laptop or cell phone)

Give feedback to each other.

what will go
wrong?



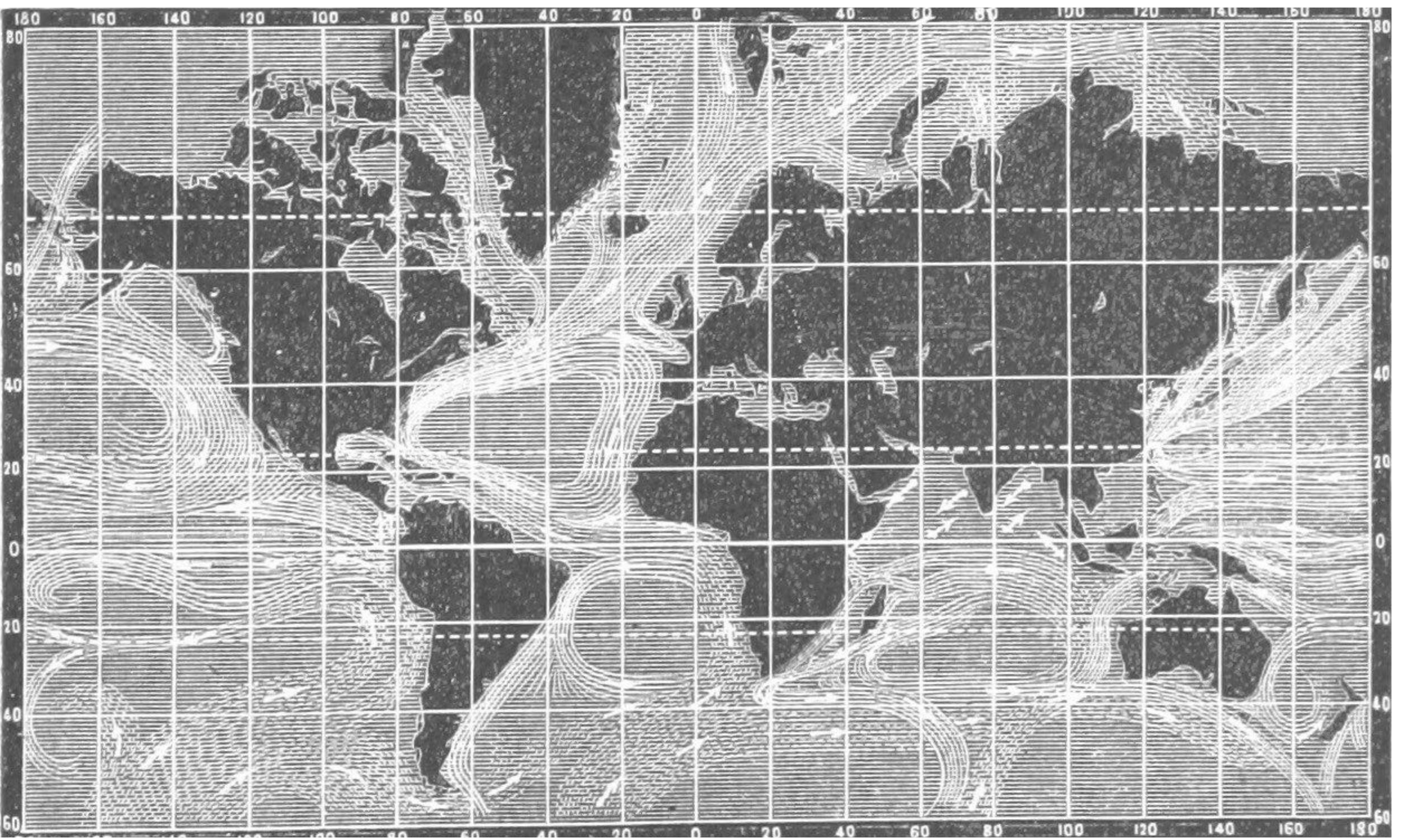
Question

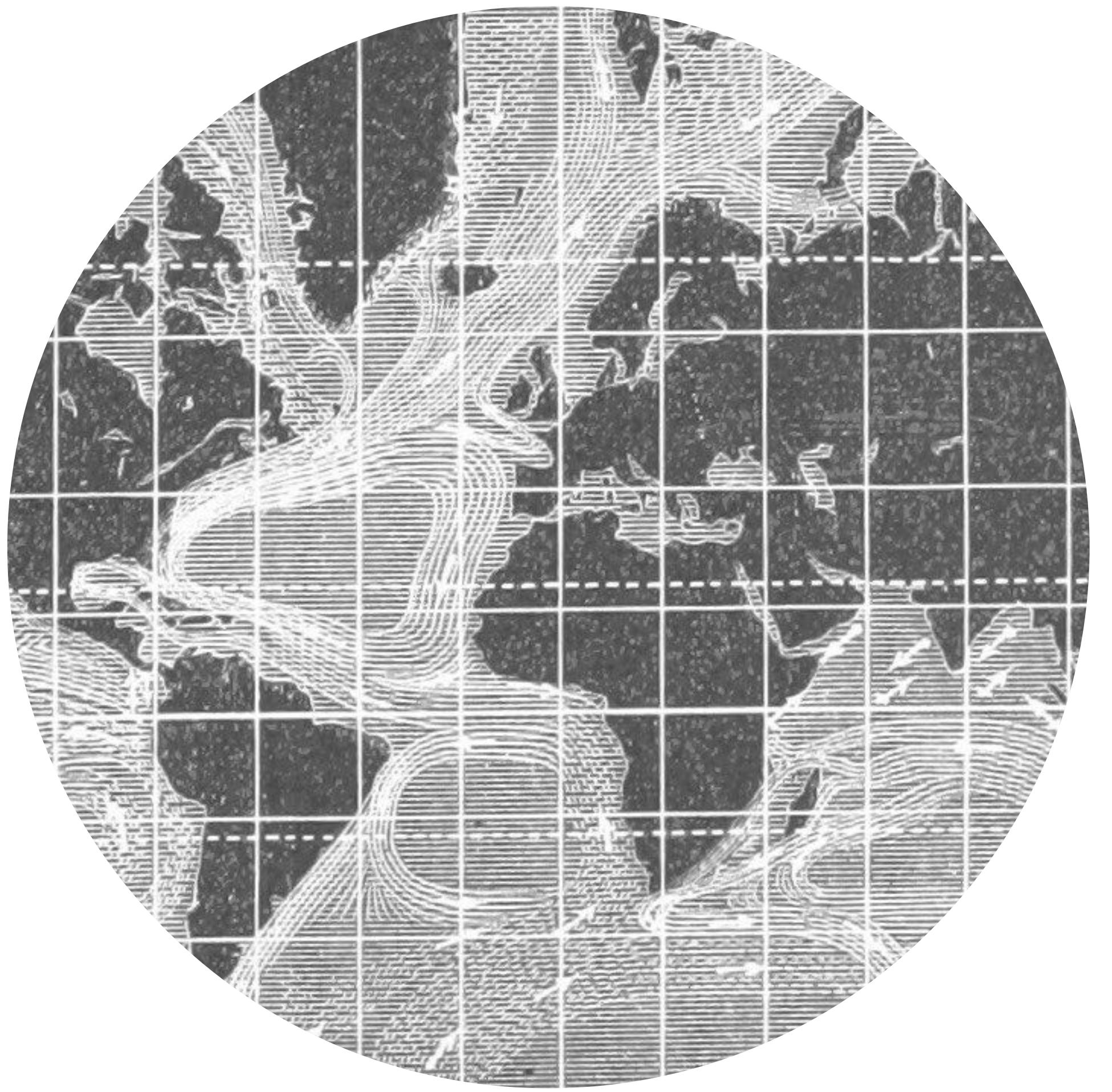
What if a student already has a mental model, *and it is wrong?*

BIG DEAL!!!

Incorrect mental models







RStudio – Open source and enterprise-ready professional software for R

RStudio

Open source and enterprise-ready professional software for R

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Shiny

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Our developers create popular packages to expand the features of R. Includes ggplot2, dplyr, R Markdown & more.

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How do you know that a student
has an incorrect mental model?

Your Turn

```
foo <- function(aa = 1, ab = 2) aa / ab
```

What will `foo(a = 4)` return?

Your Turn

```
foo <- function(aa = 1, ab = 2) aa / ab
```

What will `foo(a = 4)` return?

- A. `a = 4` matches **first** argument
- B. `a = 4` matches **both** argument
- C. `a = 4` matches **no arguments** (and is ignored)
- D. `a = 4` causes an **error**



```
foo <- function(aa = 1, ab = 2) aa / ab
```

What will `foo(a = 4)` return?

- A. 2
- B. 1
- C. 0.5
- D. Error in `foo(a = 4)`: argument 1 matches multiple formal arguments

How do you correct an incorrect mental model?

4-Import-Data

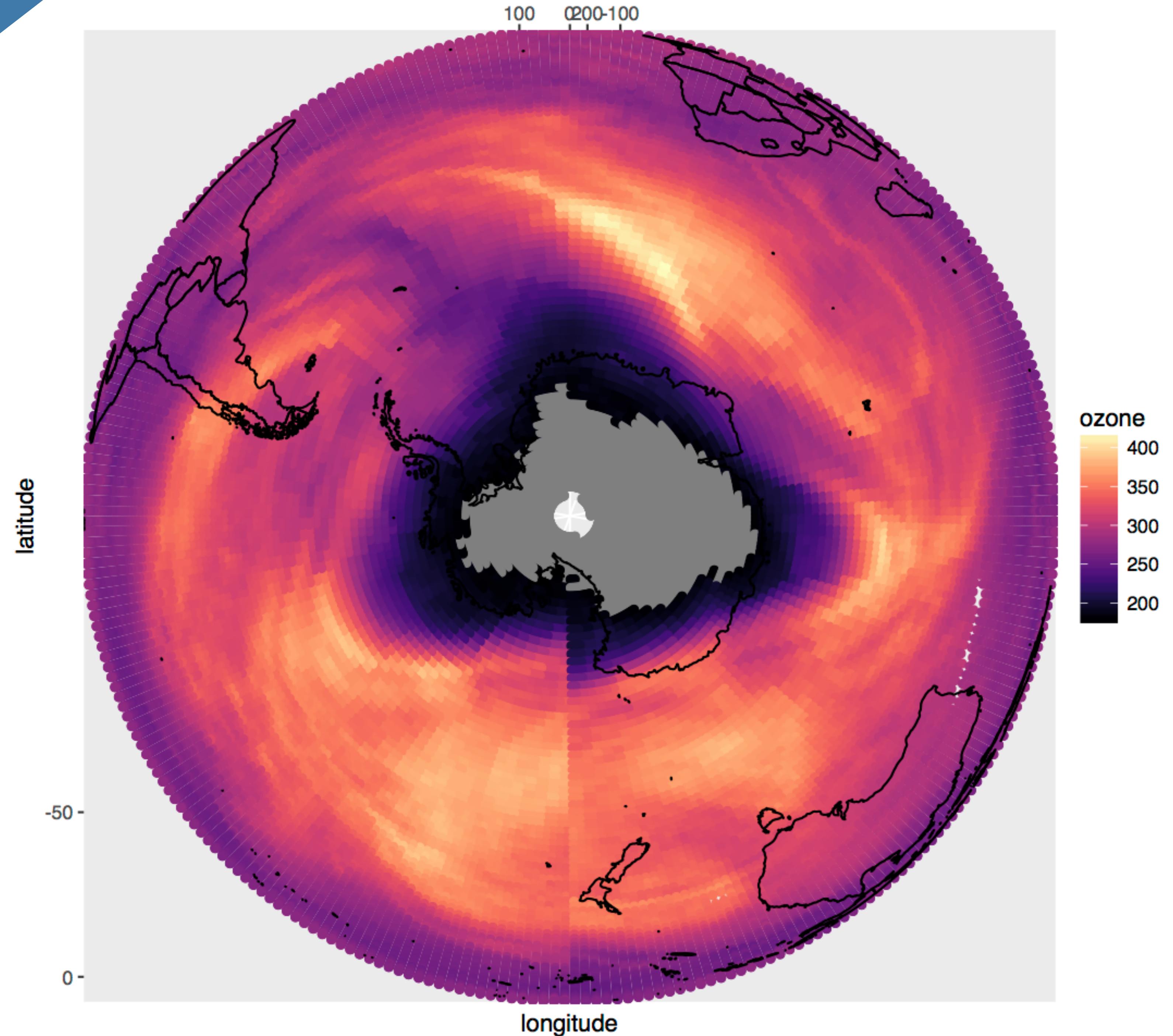


nimbus.csv

```
date,longitude,latitude,ozone
1985-10-01T00:00:00Z,-179.375,-87.5,.
1985-10-01T00:00:00Z,-178.125,-87.5,.
1985-10-01T00:00:00Z,-176.875,-87.5,.
1985-10-01T00:00:00Z,-175.625,-87.5,.
1985-10-01T00:00:00Z,-174.375,-87.5,.
1985-10-01T00:00:00Z,-173.125,-87.5,.
1985-10-01T00:00:00Z,-171.875,-87.5,.
1985-10-01T00:00:00Z,-170.625,-87.5,.
1985-10-01T00:00:00Z,-169.375,-87.5,.
```



4-Import-Data



Expert Blindsight



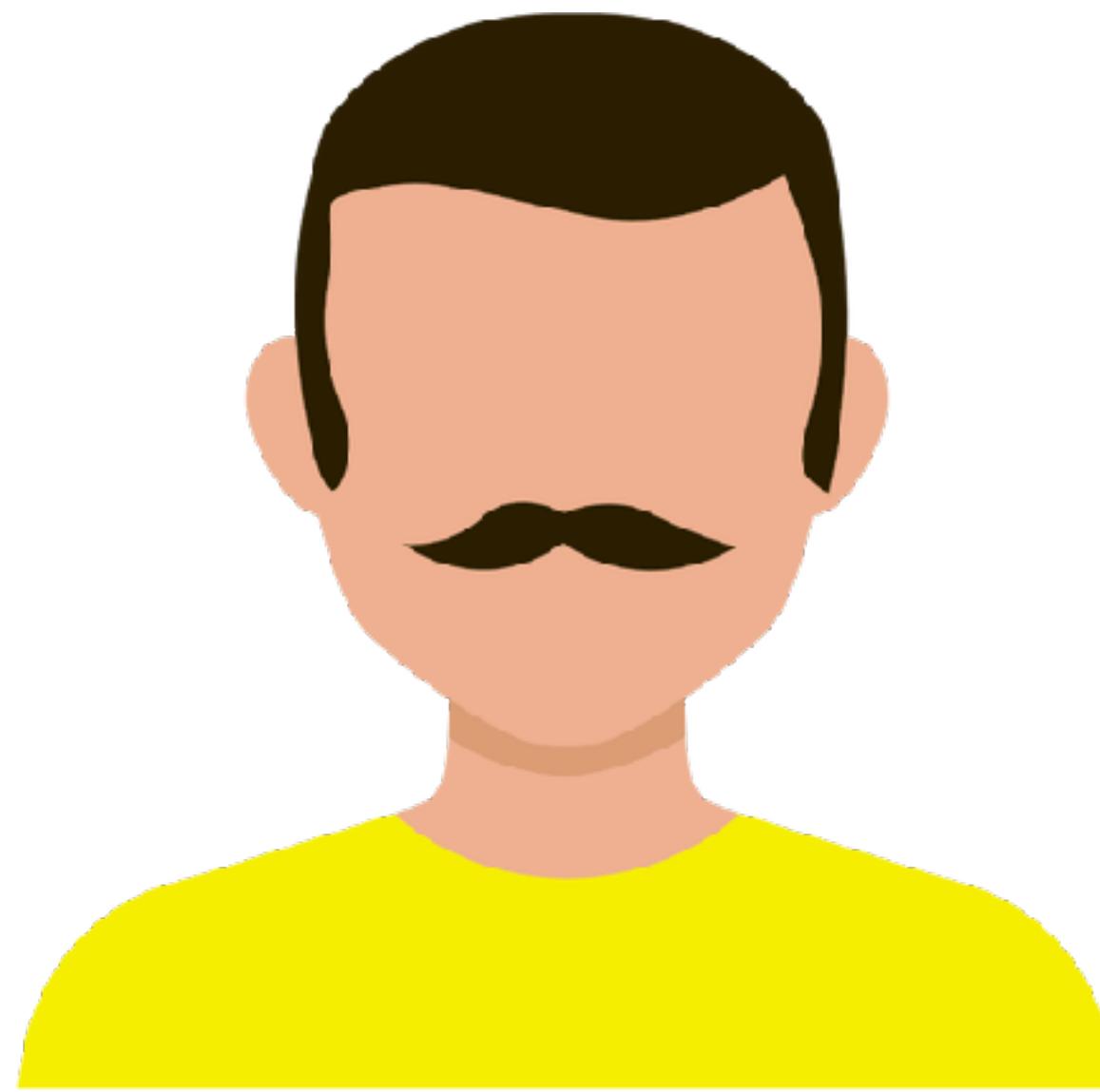
Expert Blindspot

Beginner



"I don't know what
I don't know."

Expert



"Neither do I"

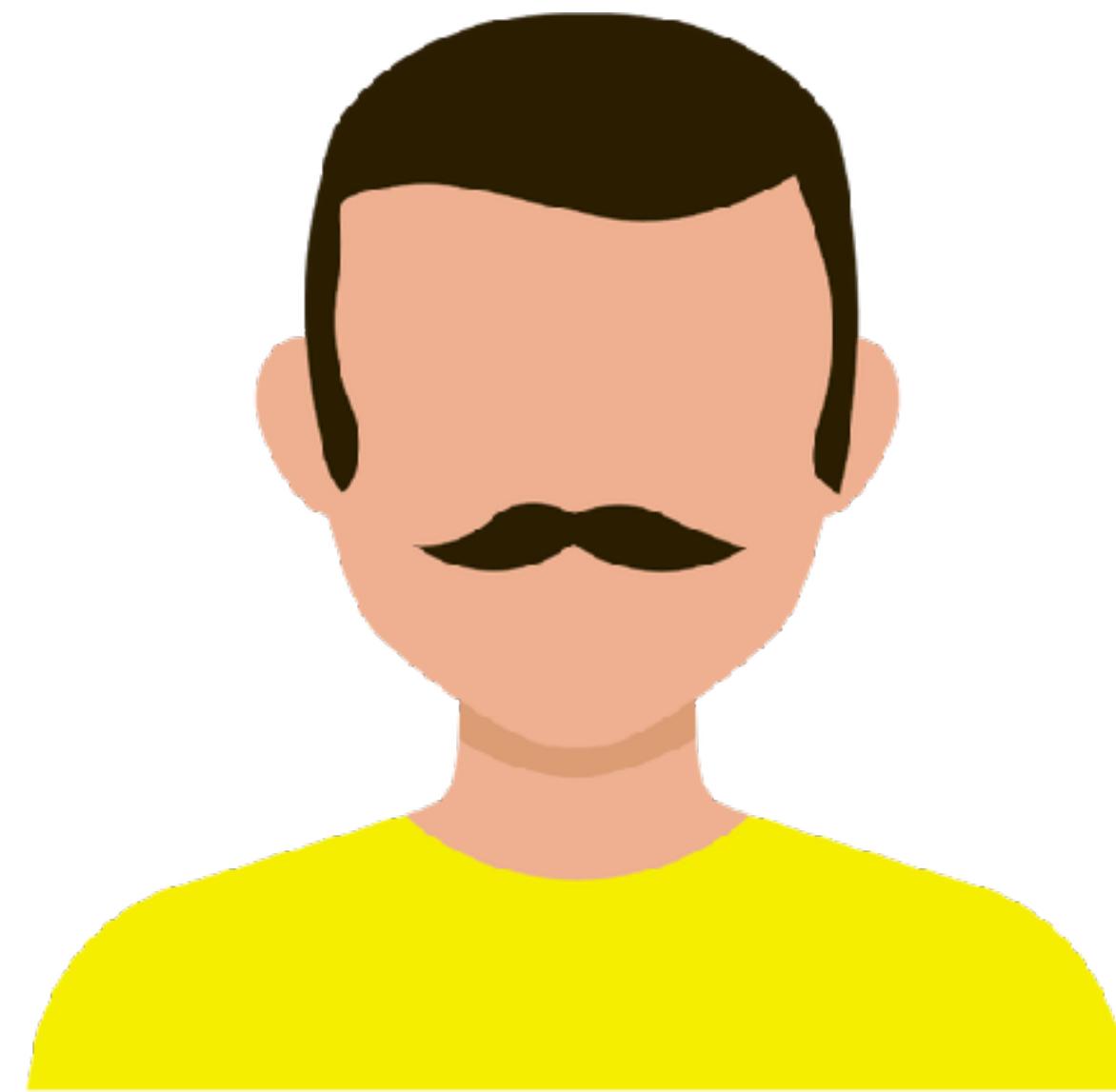
Expert Blindspot

Beginner



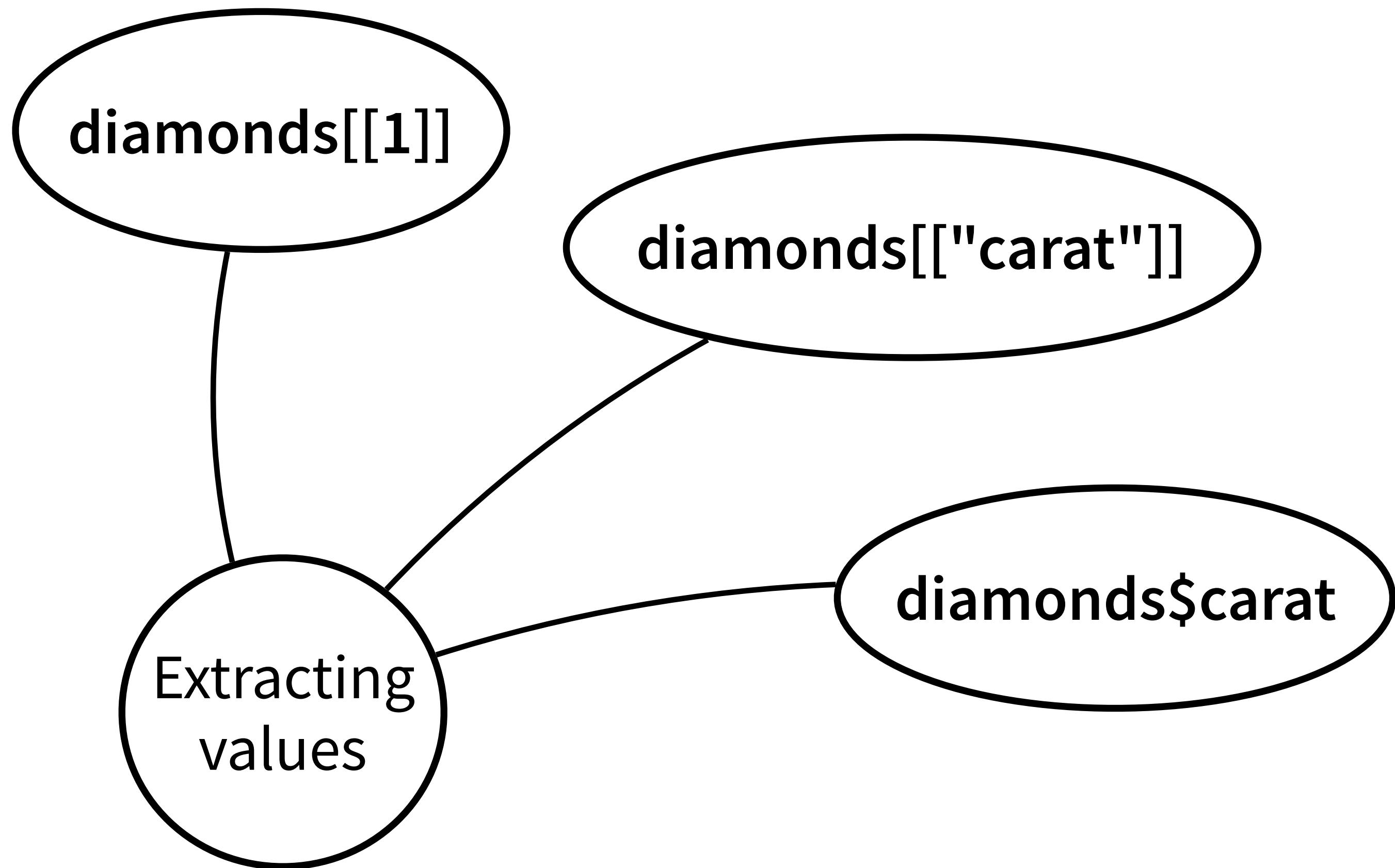
"I don't know what
I don't know."

Expert

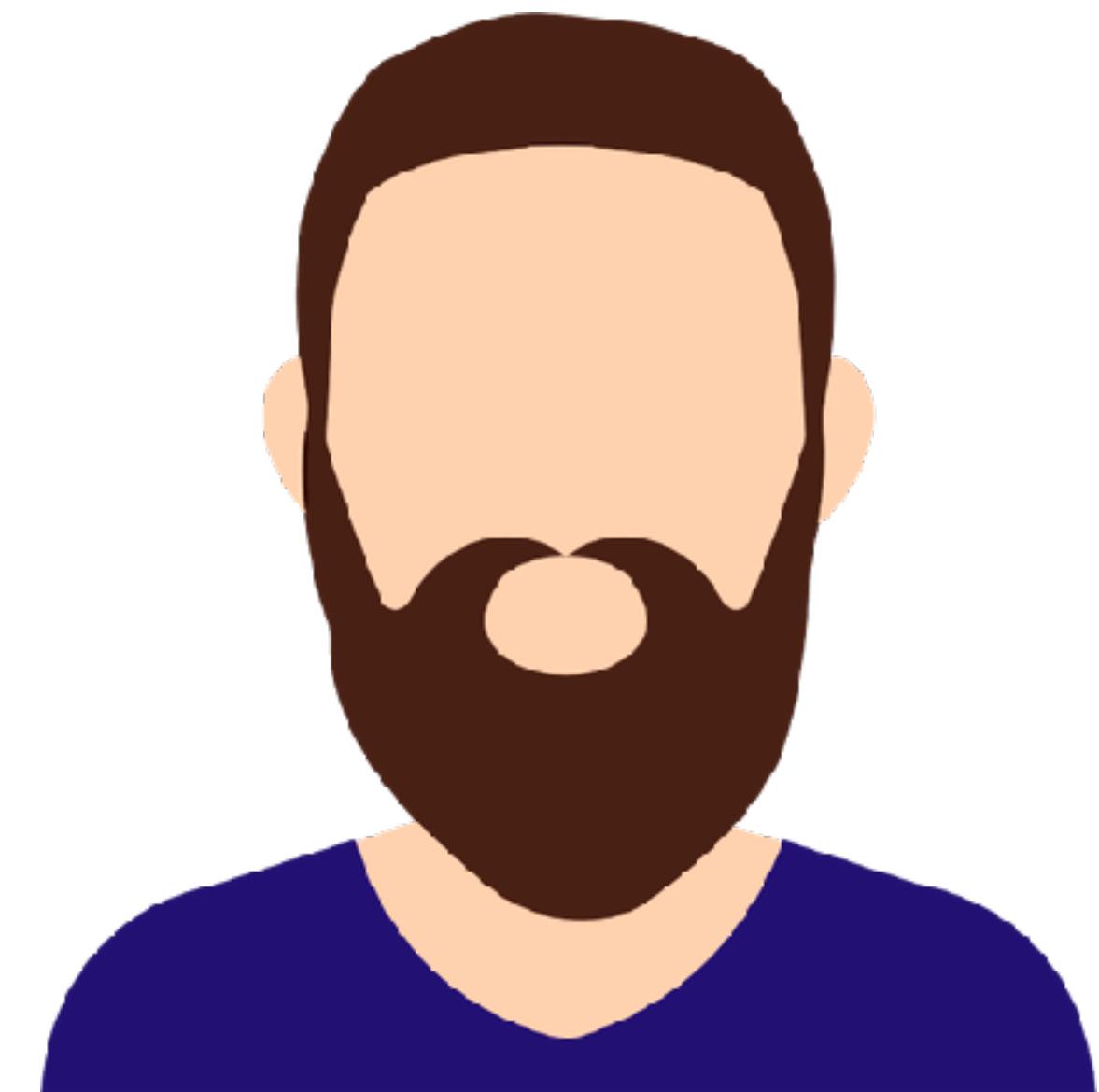


"I don't know what
I **do** know"

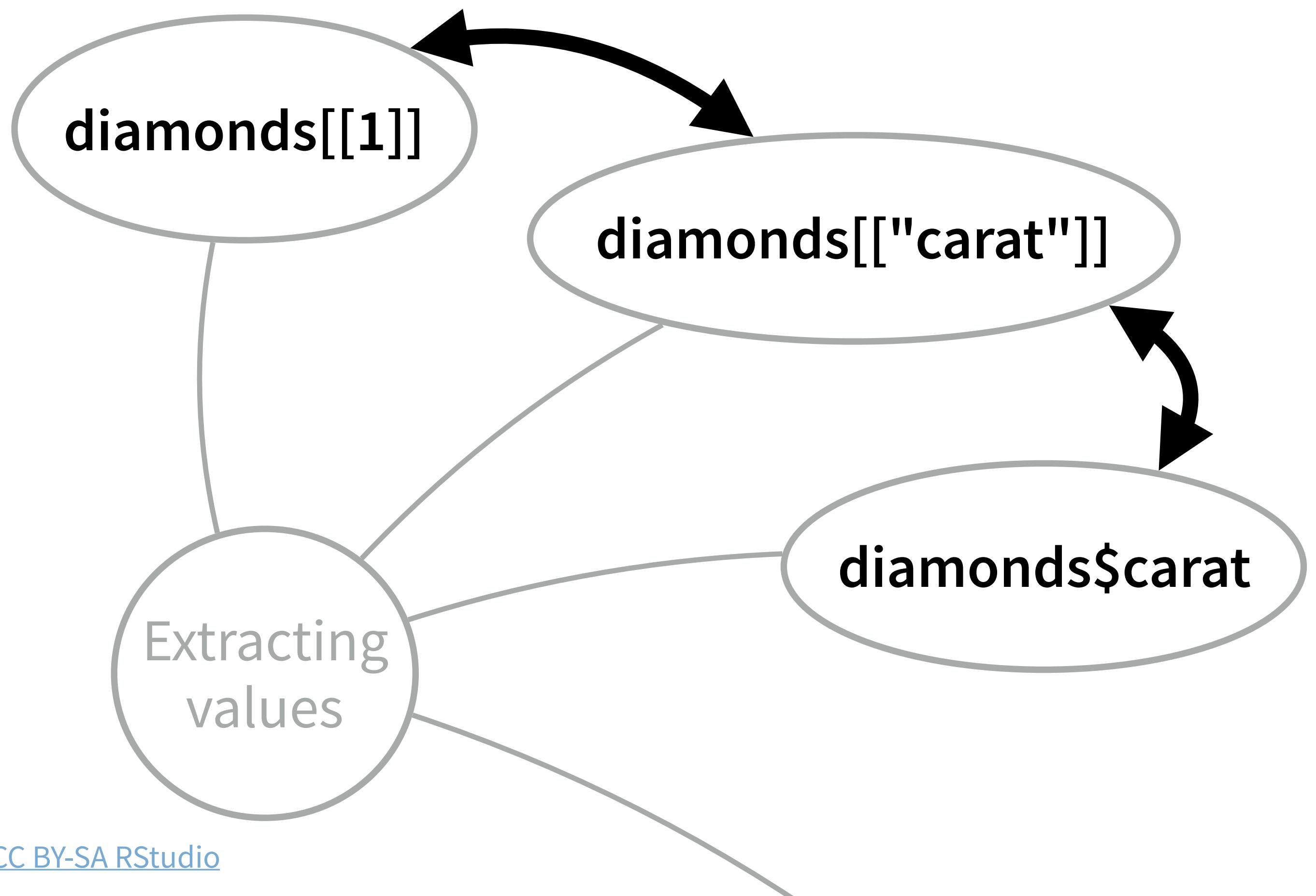
Expert Blindspot



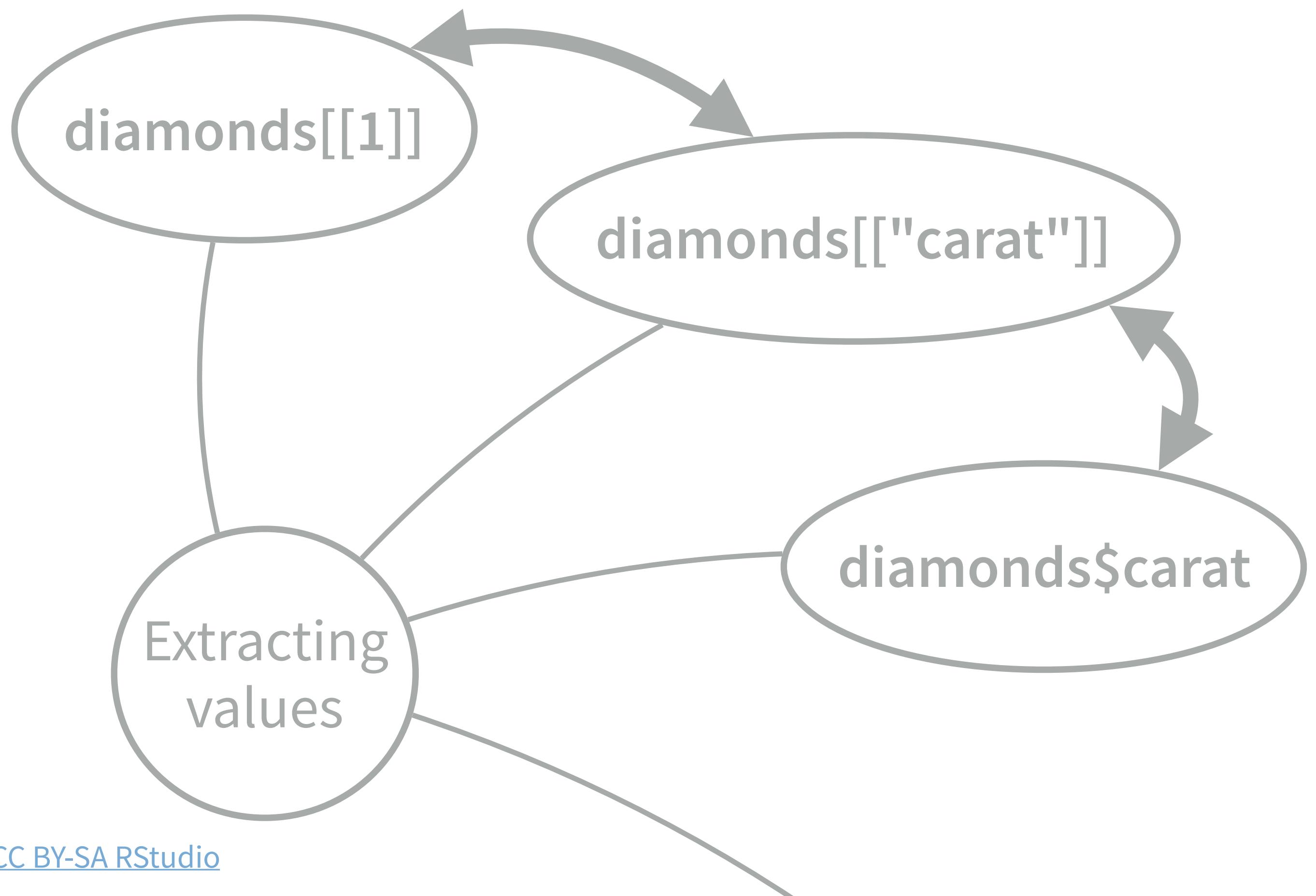
Beginner



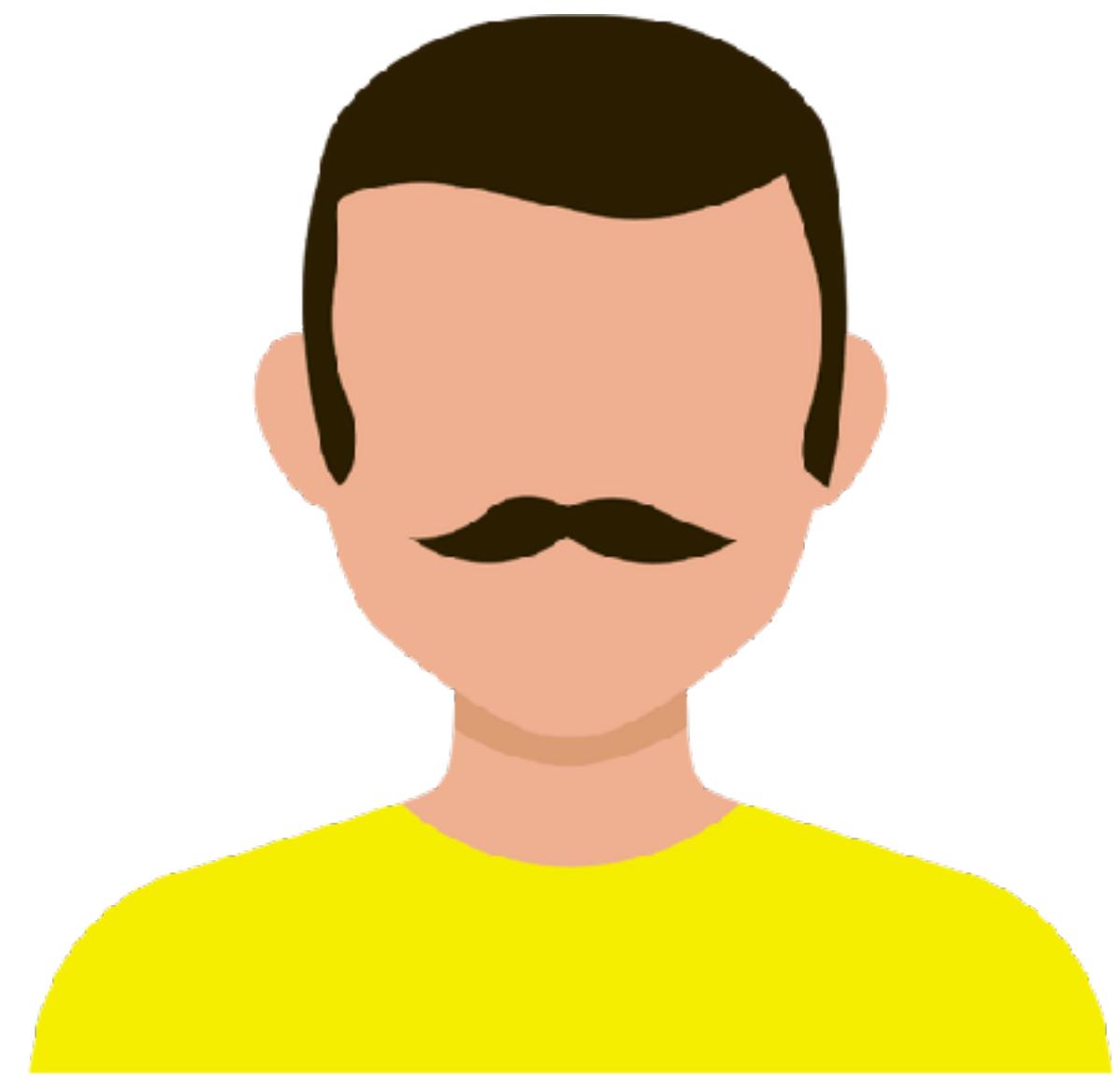
Expert Blindspot



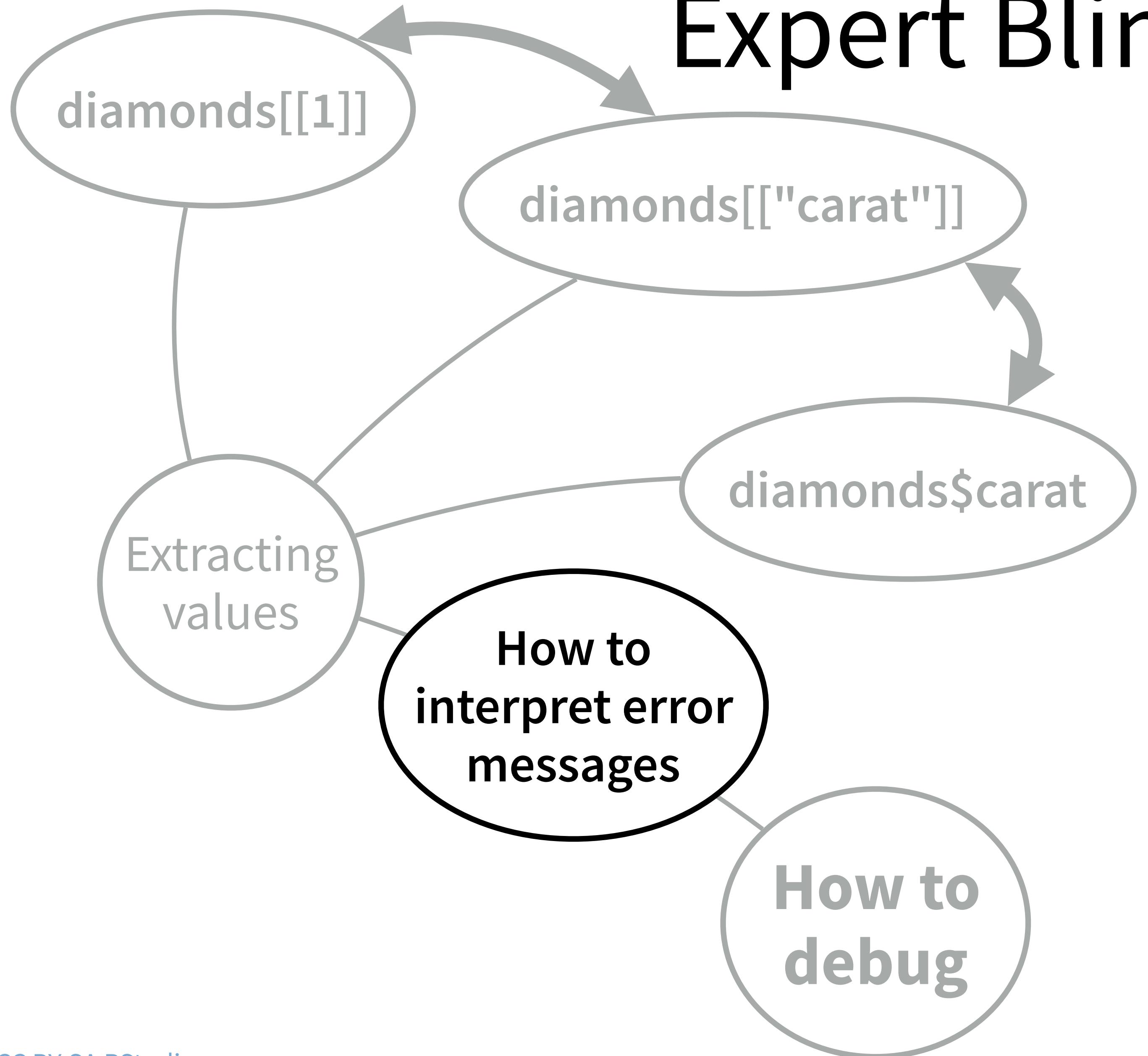
Expert Blindspot



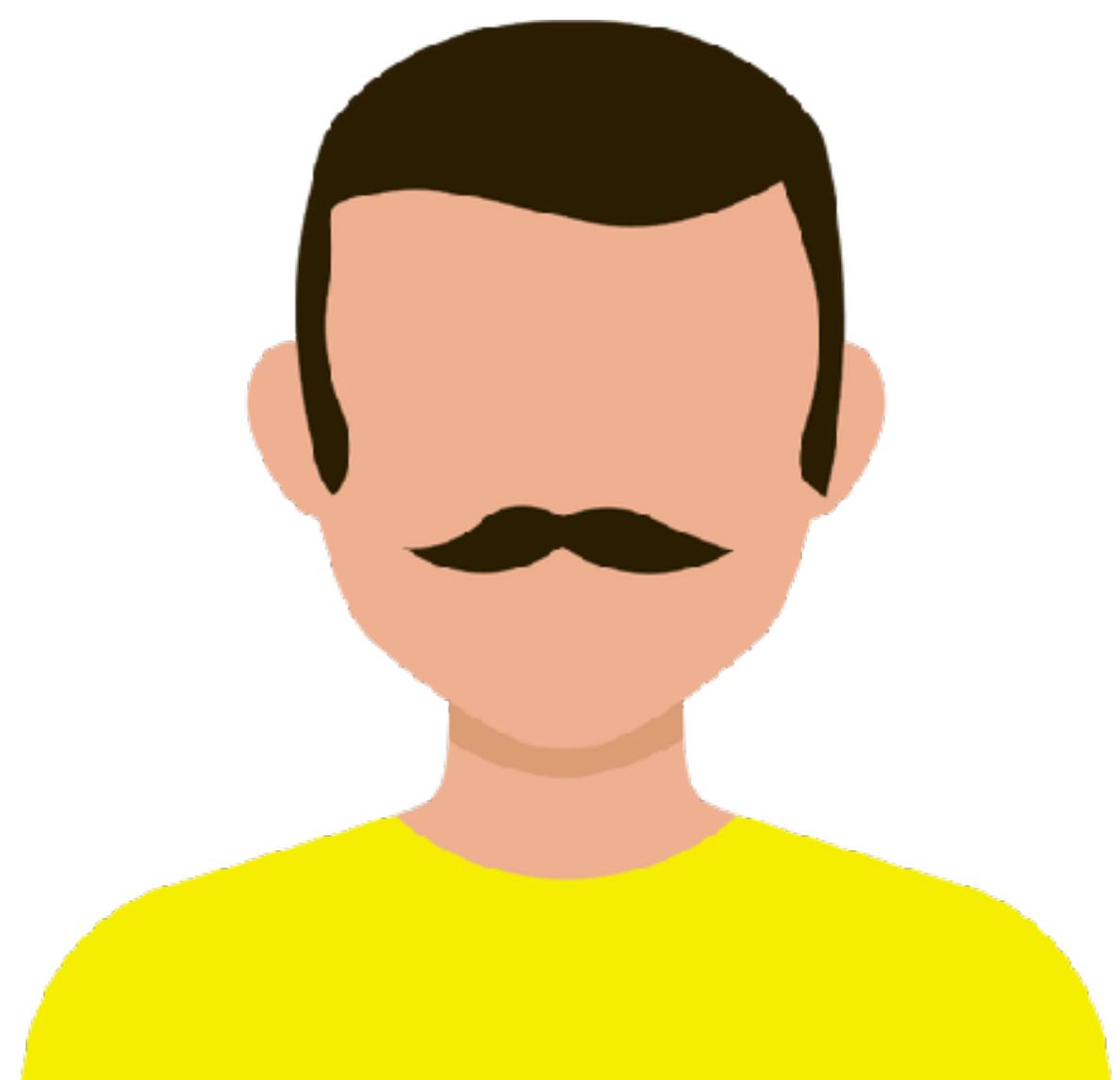
Expert



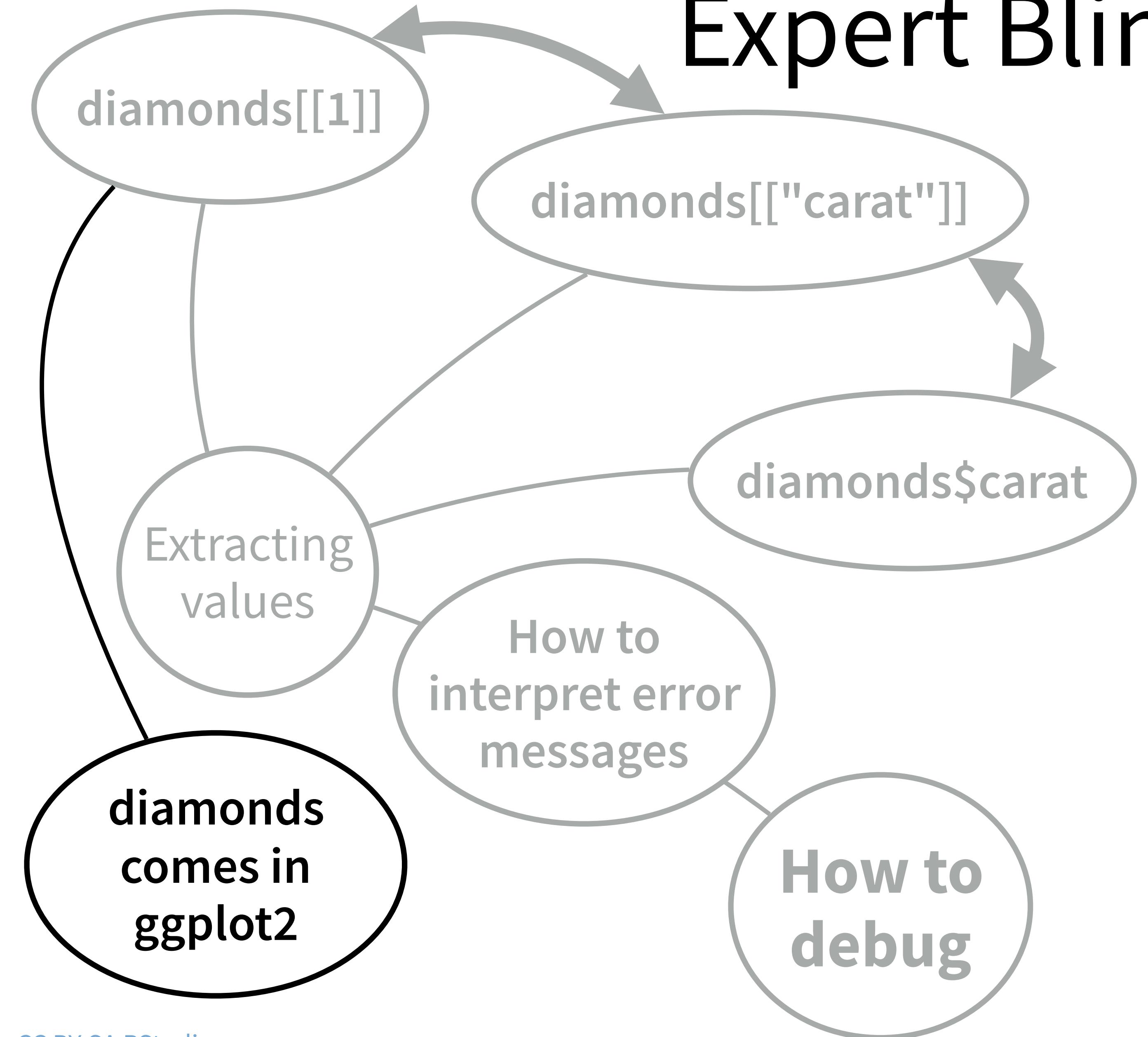
Expert Blindspot



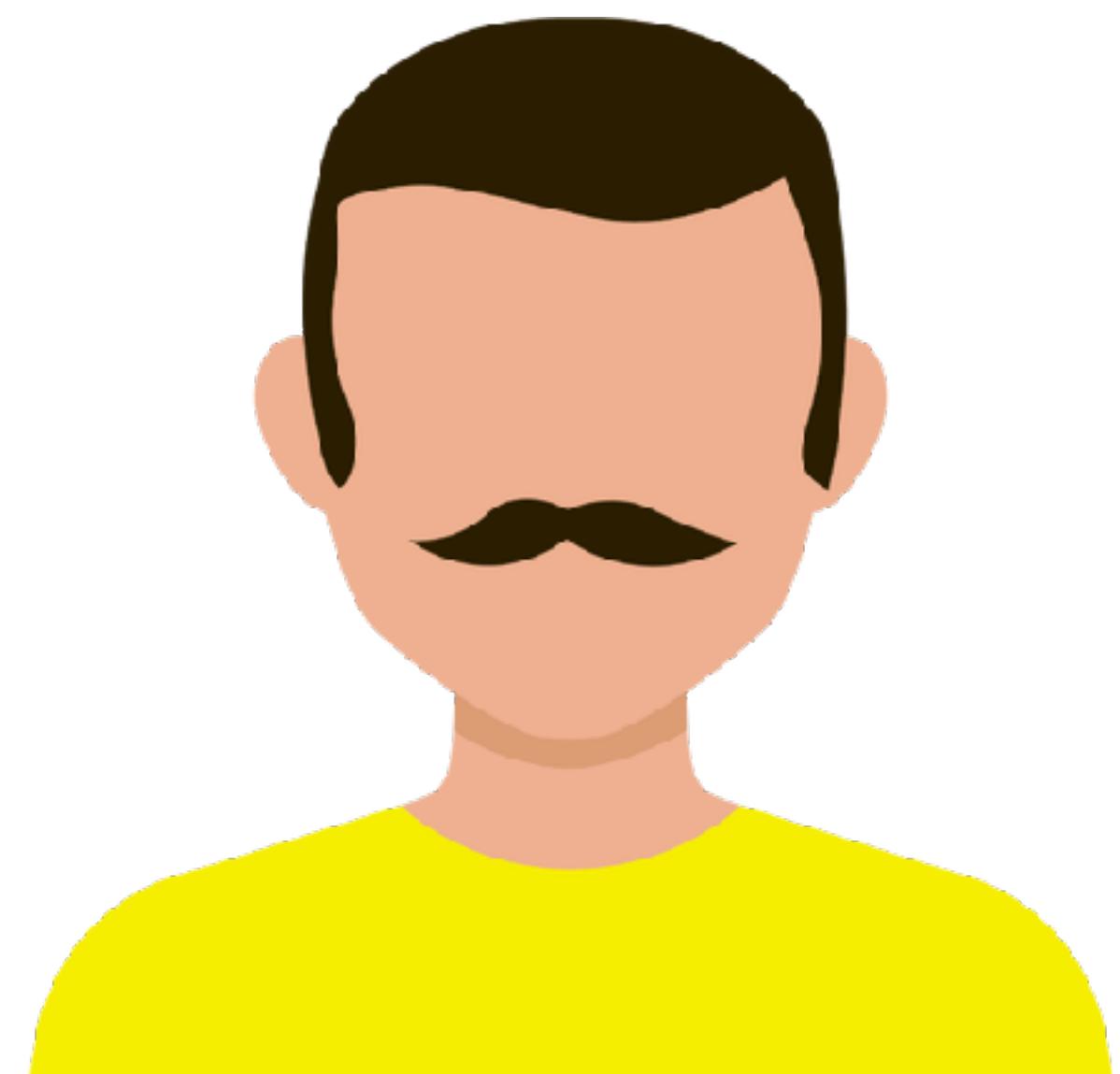
Expert



Expert Blindspot



Expert



Saving plots

Find the largest carat size in diamonds

```
library(ggplot2)  
max(diamonds$carat)  
# 5.01
```



Saving plots

Find the largest carat size in diamonds

```
max(diamonds$carat)  
# Error: object 'diamonds' not found
```



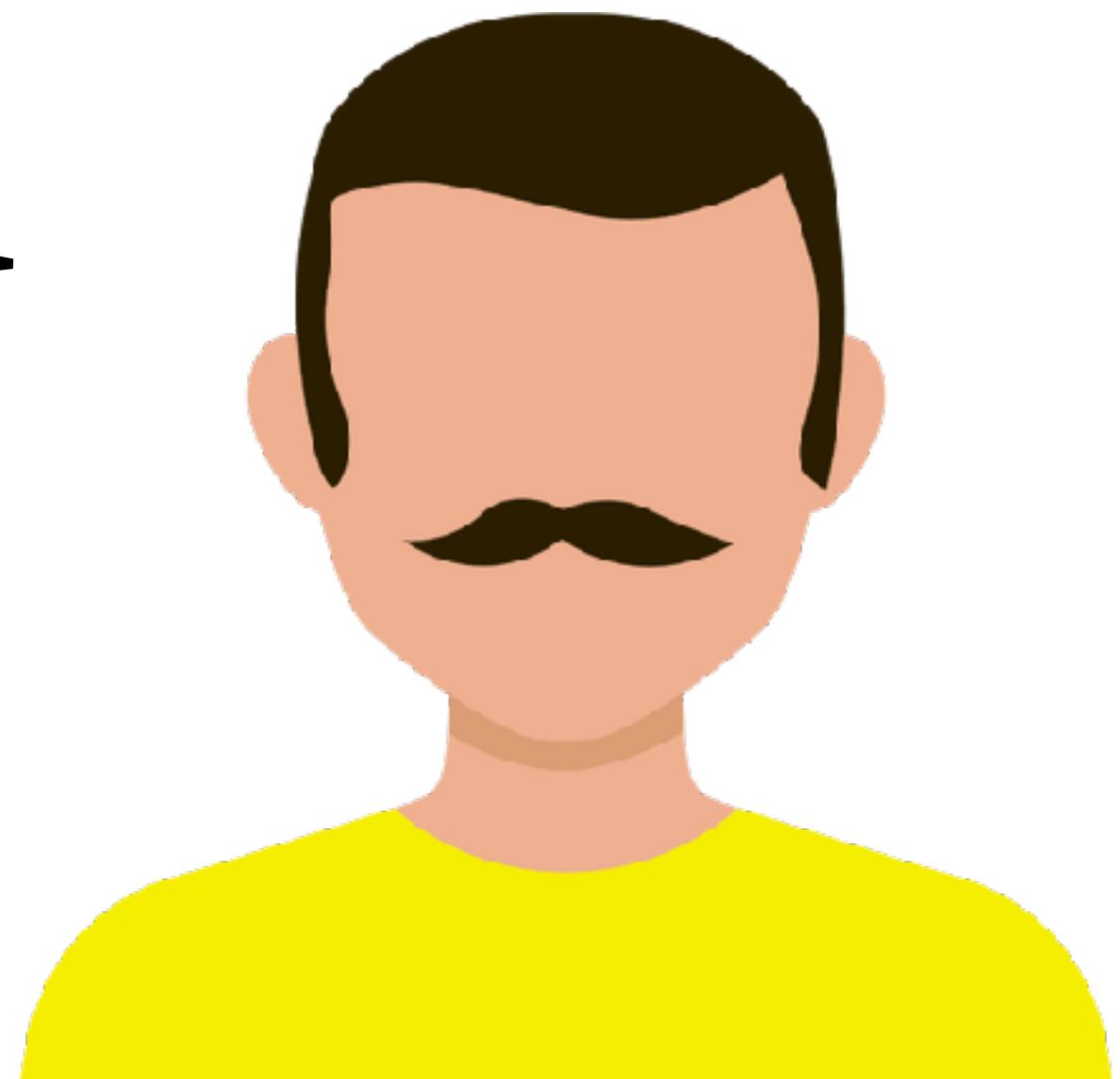
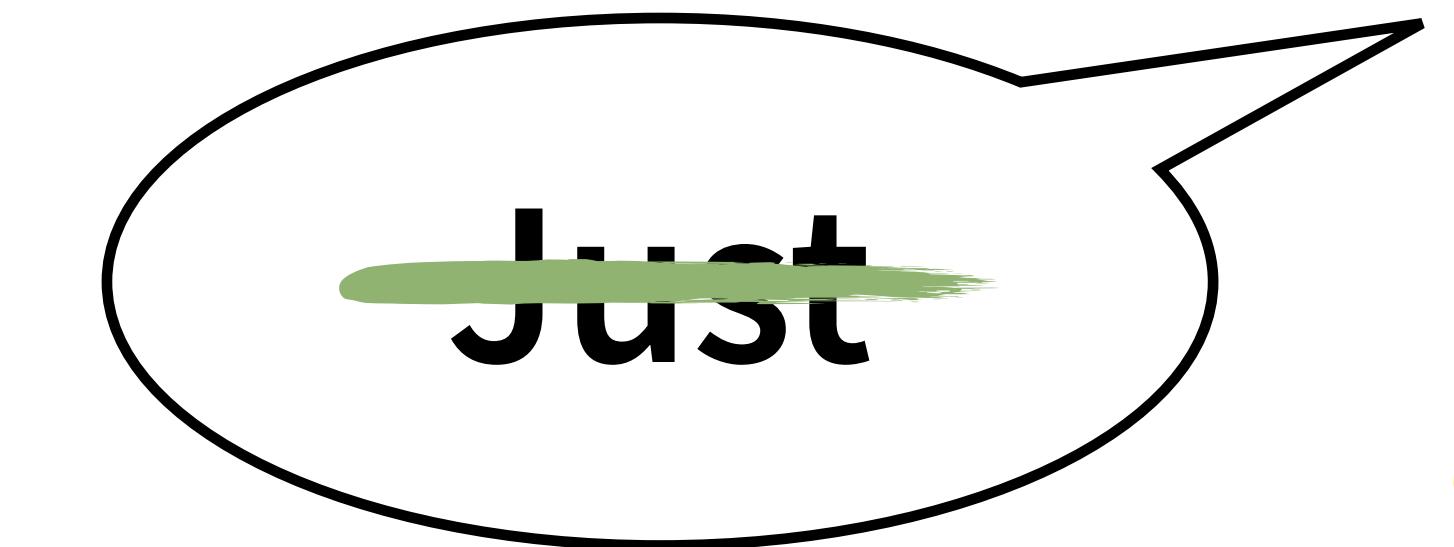
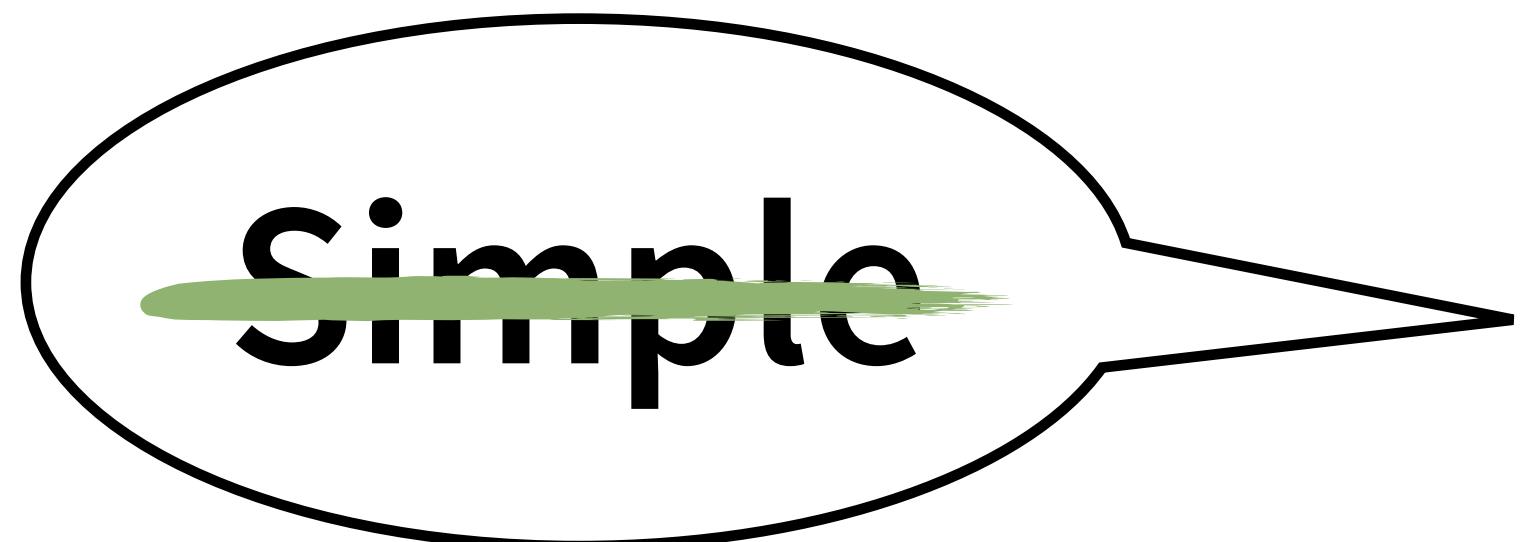
Suggestions

1. Be consistent
2. Steer around errors and bugs
3. Provide frequent opportunities for technical help
4. Avoid after the fact information.

Expert Blindspot



Expert



Your Turn

What are some blindspots that we should add to our tidy data map (or avoid altogether)?

Your Turn

Examine your topic concept map.

Add topics that you may have missed due to expert blindspot. Alter your outline if necessary.

Note on the back expert things related to your topic that you should **avoid** doing.

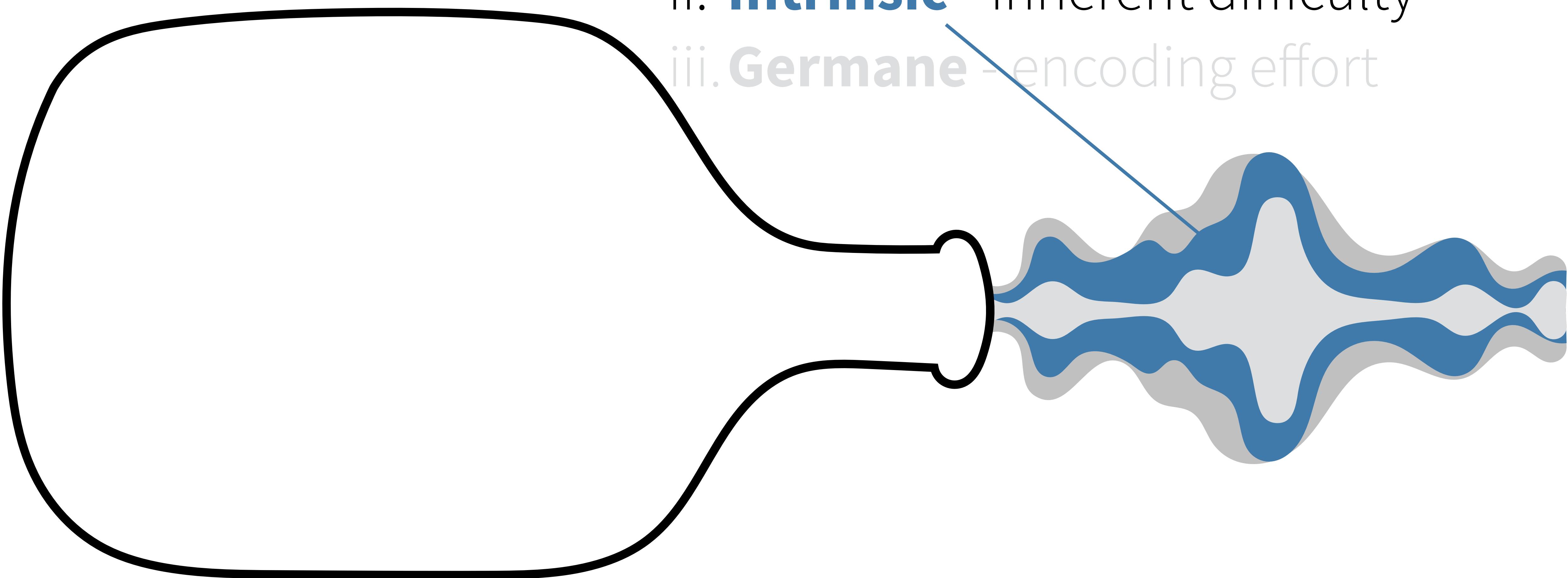


Extrinsic Load

R
R

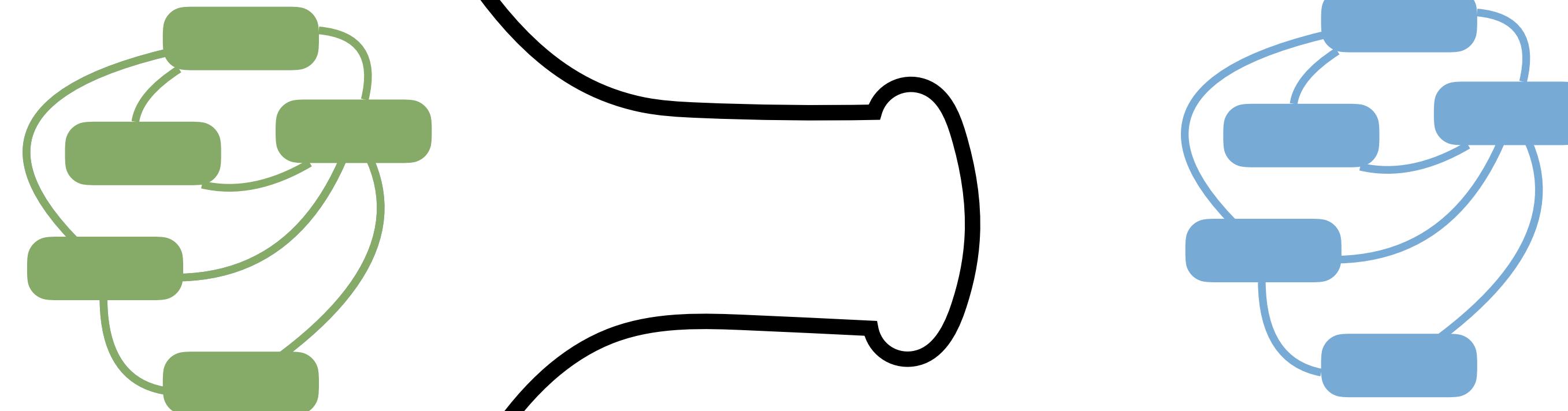
3. Learning tasks involve **three types of load**

- i. **Extraneous** - lost to distractions
- ii. **Intrinsic** - inherent difficulty
- iii. **Germane** - encoding effort



3. Learning tasks involve **three types of load**

- i. **Extraneous** - lost to distractions
- ii. **Intrinsic** - inherent difficulty
- iii. **Germane** - encoding effort

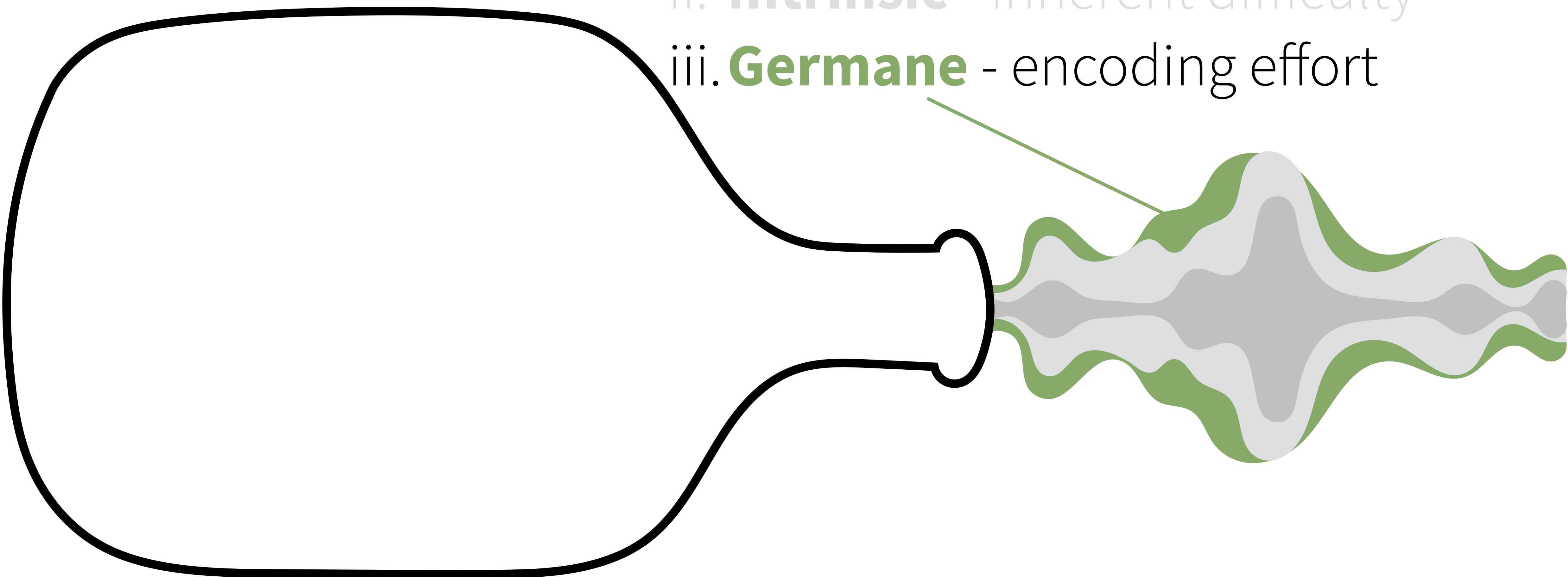


Everything should be made as simple
as possible, but not simpler.

- Albert Einstein

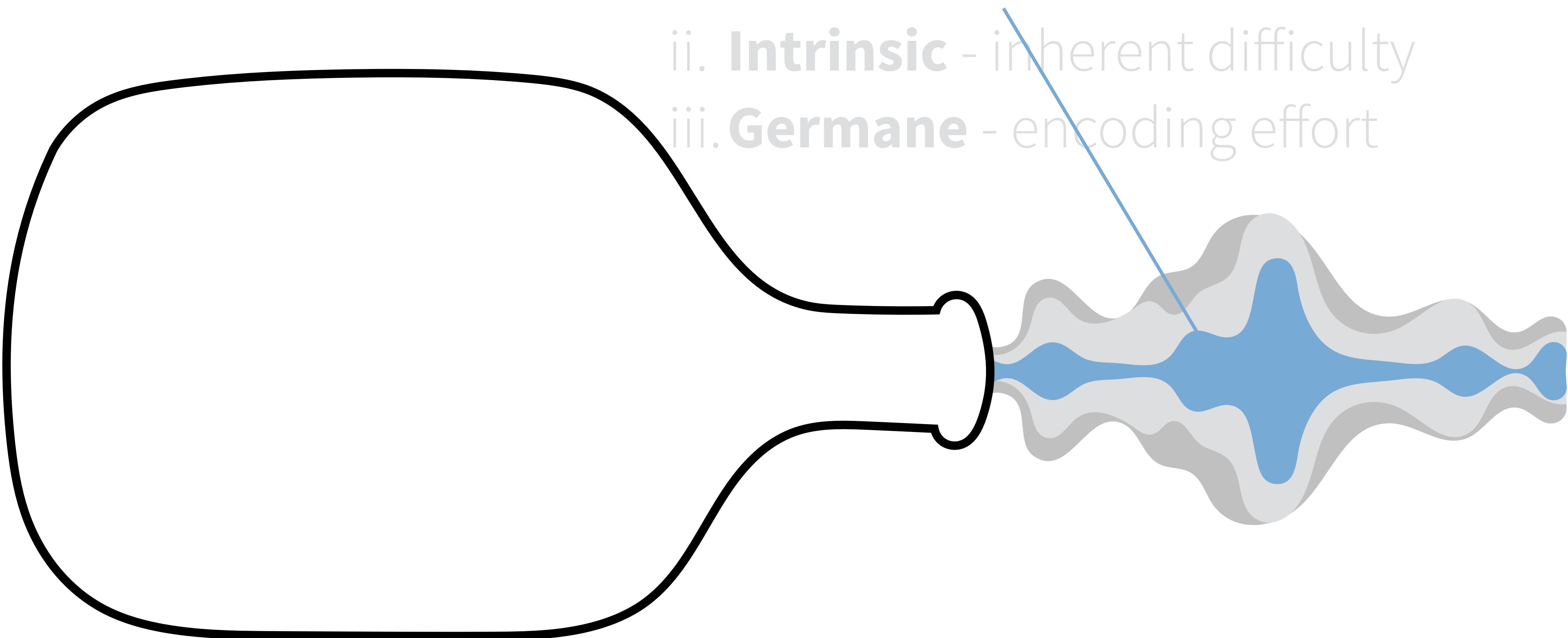
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3. Learning tasks involve **three types of load**

- i. **Extraneous** - lost to distractions
- ii. **Intrinsic** - inherent difficulty
- iii. **Germane** - encoding effort



Your Turn

Examine the recording of your presentation.

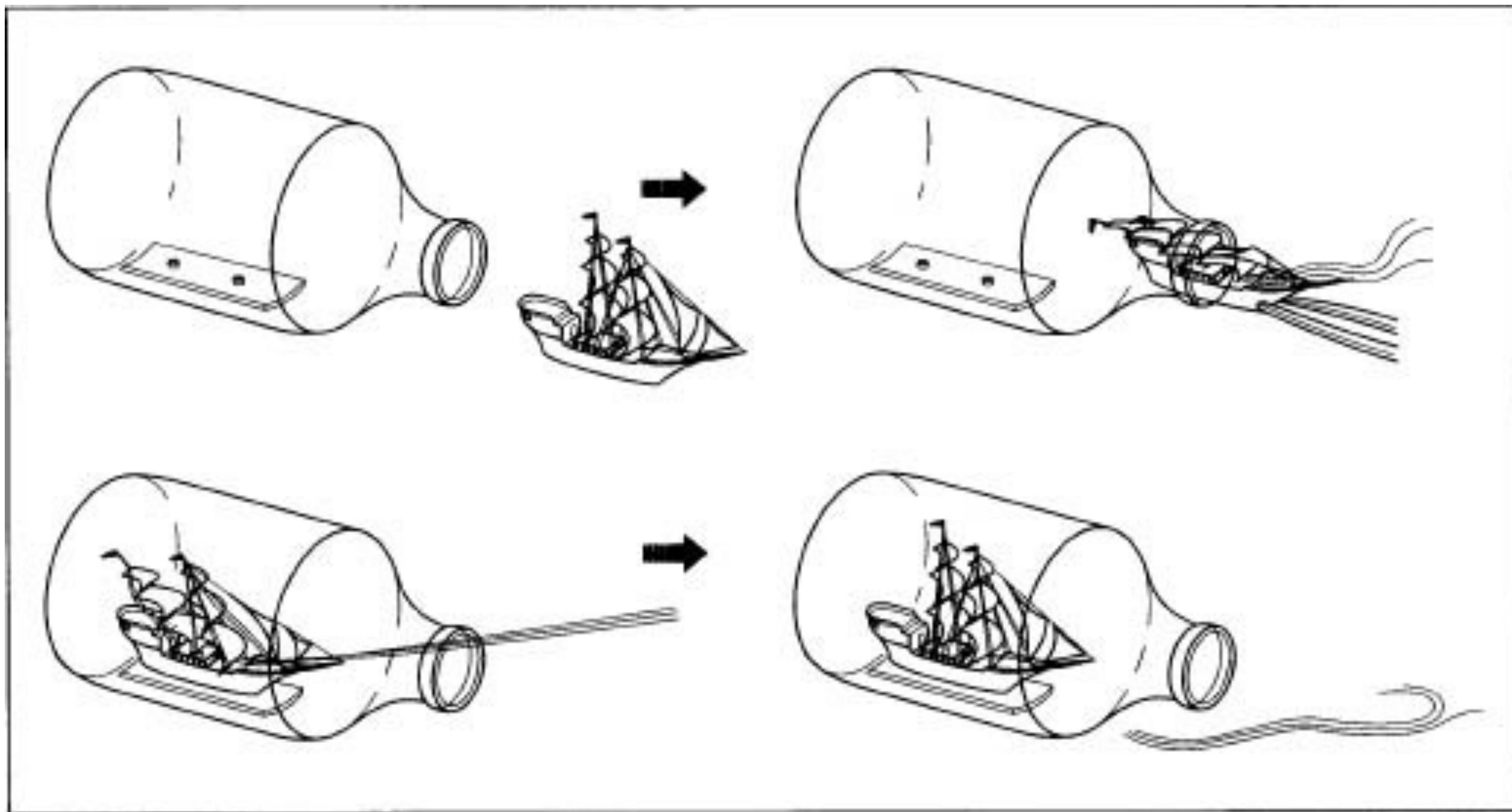
What is distracting?

What did you not expect to see?

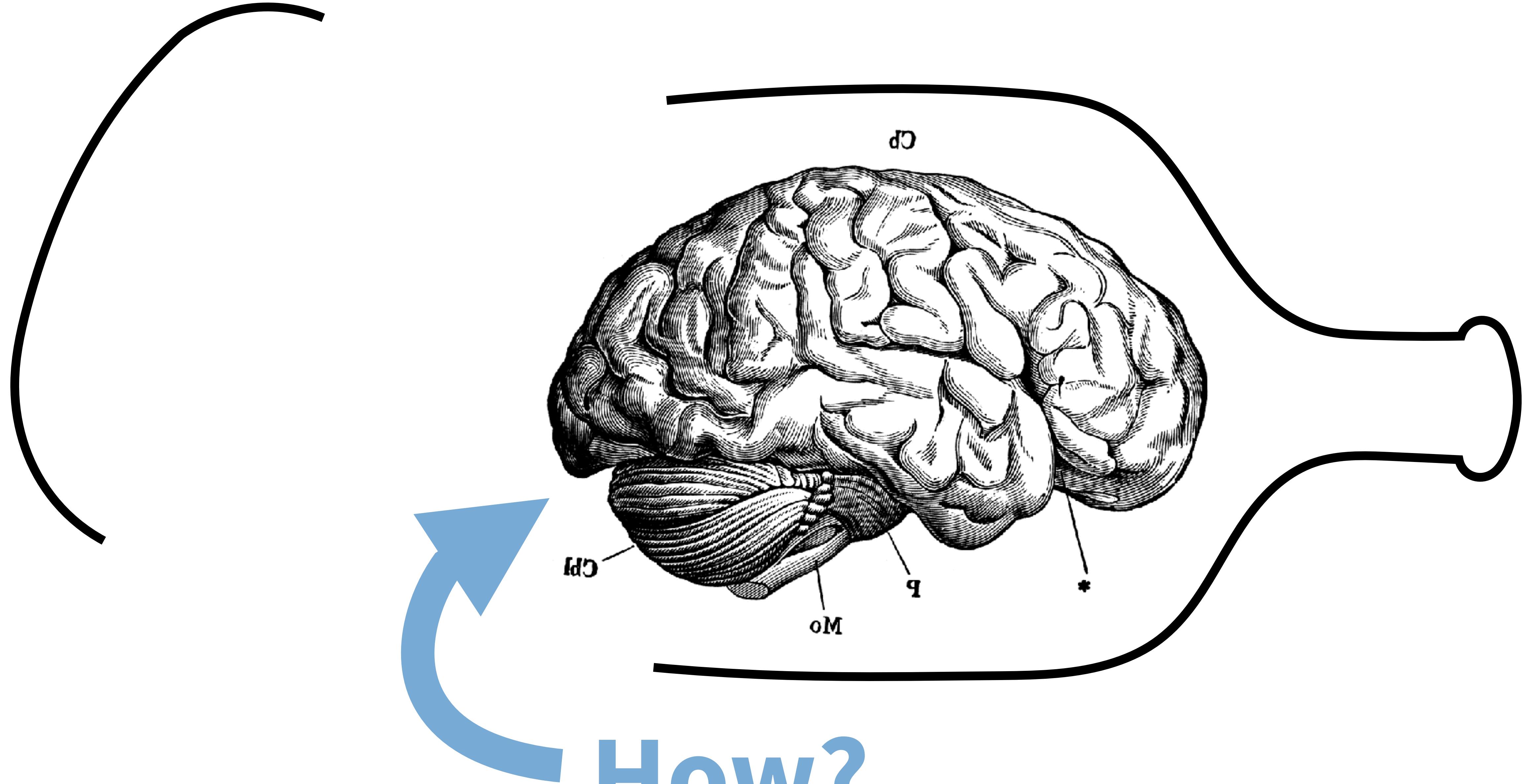


Look out for

1. Um's, Uh's, Ah's
2. Speaking to the board (or computer)
3. Speaking too quietly, mumbly
4. Speaking too fast



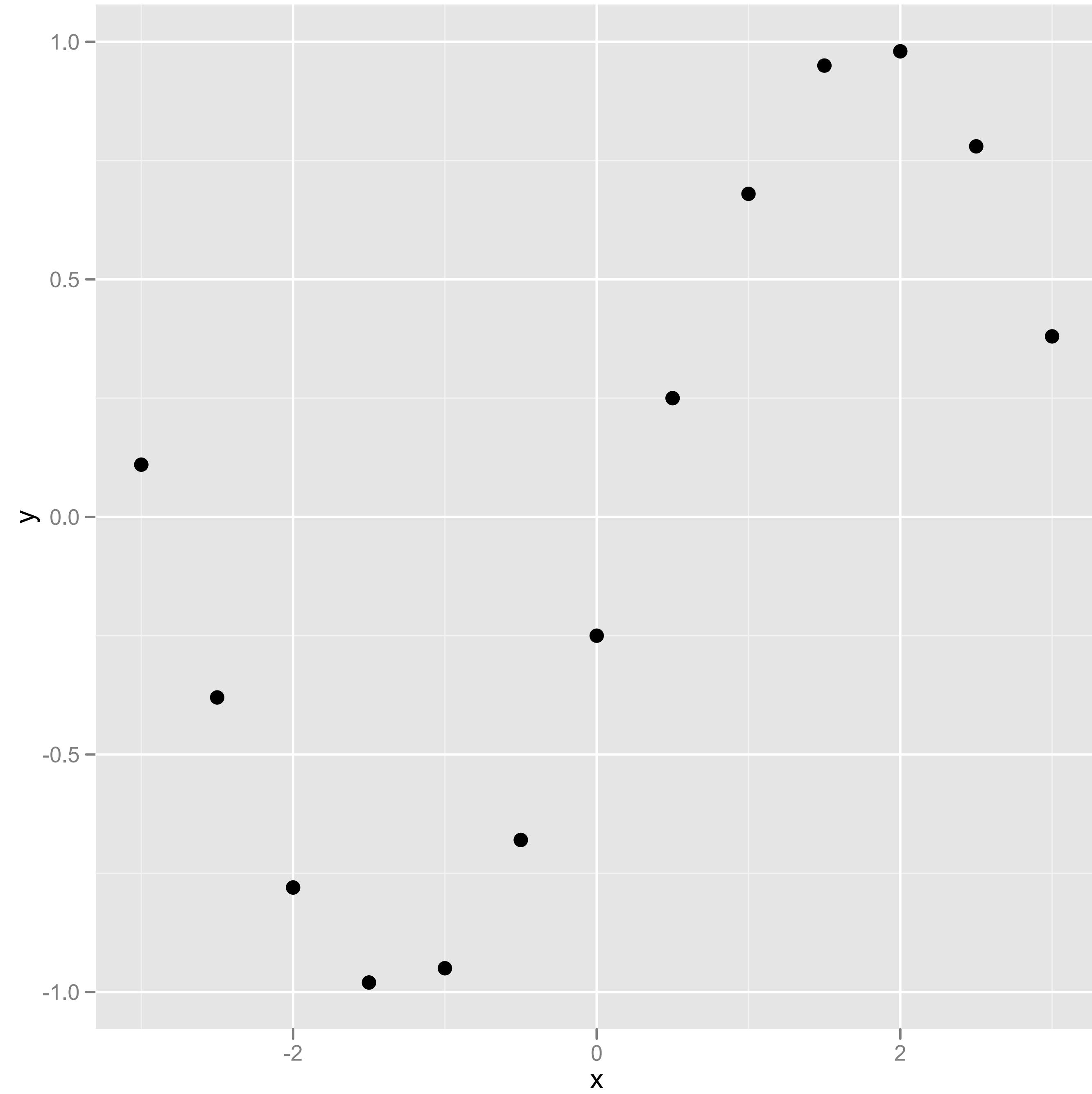




Visualization

R

x	y
0	-0.25
-0.5	-0.68
-1	-0.95
-1.5	-0.98
-2.5	-0.38
0.5	0.25
2	0.98
1.5	0.95
3	0.38
1	0.68
2.5	0.78
-3	0.11
-2	-0.78



x	y
0	-0.25
-0.5	-0.68
-1	-0.95
-1.5	-0.98
-2.5	-0.38
0.5	0.25
2	0.98
1.5	0.95
3	0.38
1	0.68
2.5	0.78
-3	0.11
-2	-0.78

Vision

83% of info

30% of neurons

Hearing

11% of info

2% of neurons

Smell

3.5% of info

Touch

1.5% of info

8% of neurons

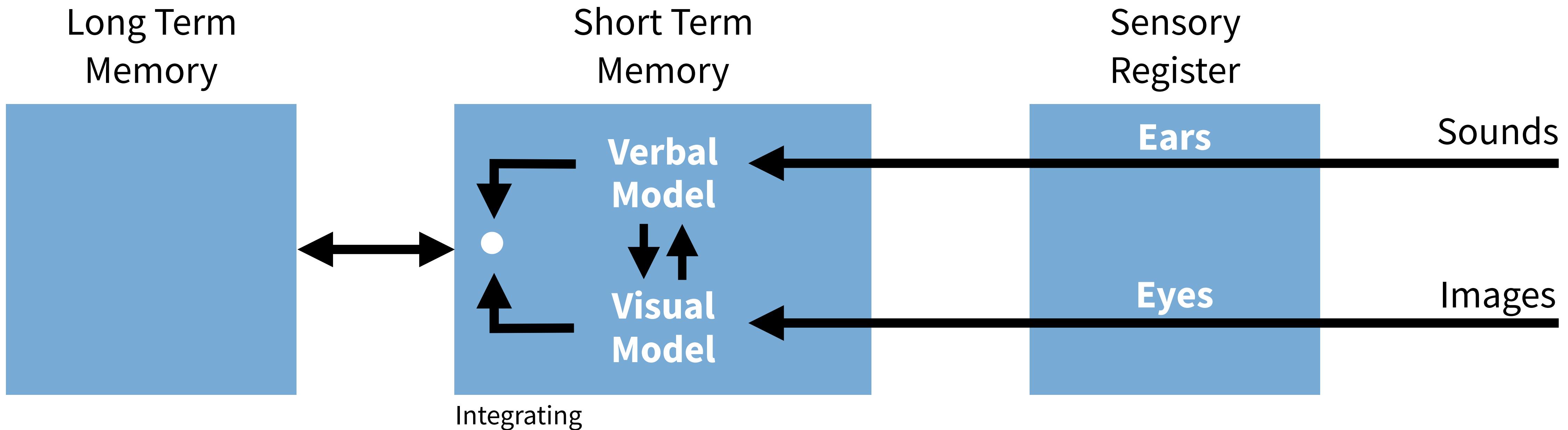
Taste

1.0% of info

[Telling Ain't Training](#)

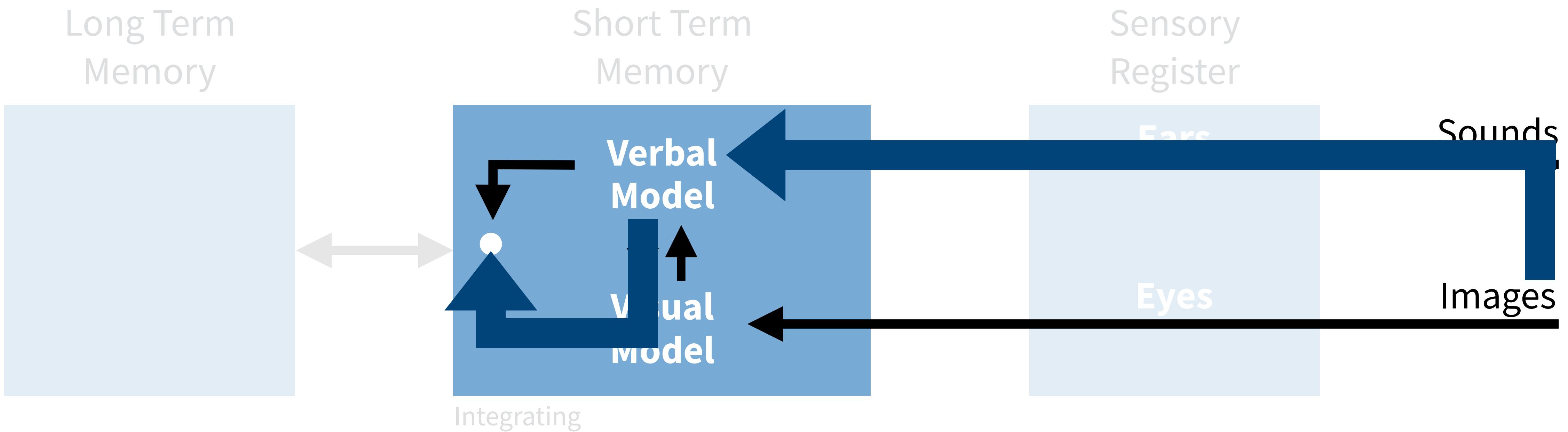
[nationalgeographic.com](#)

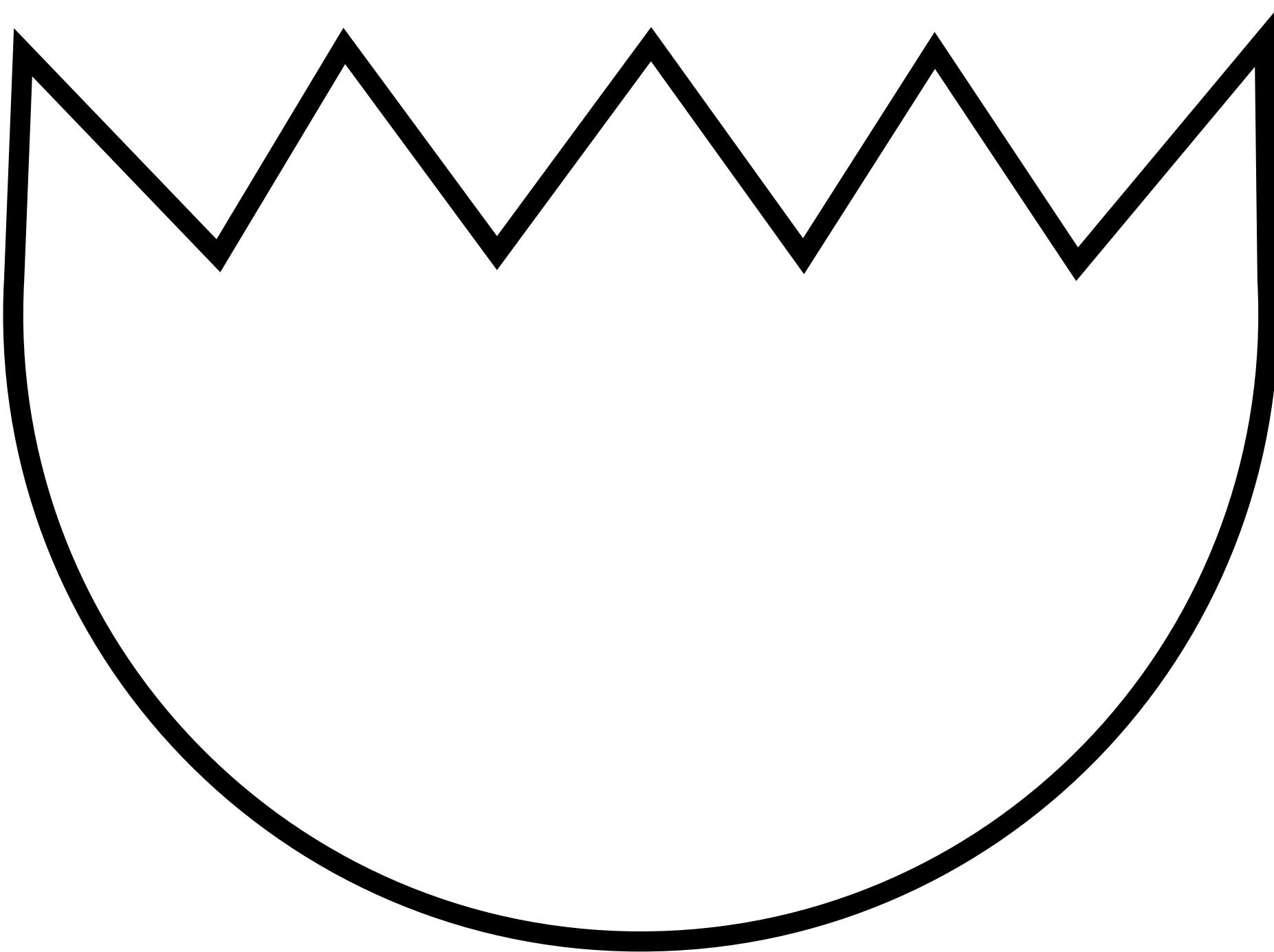
Dual Coding Theory



- Adapted from Mayer, R. E. (2002). Multimedia learning. Psychology of learning and motivation, 41, 85-139. Chicago

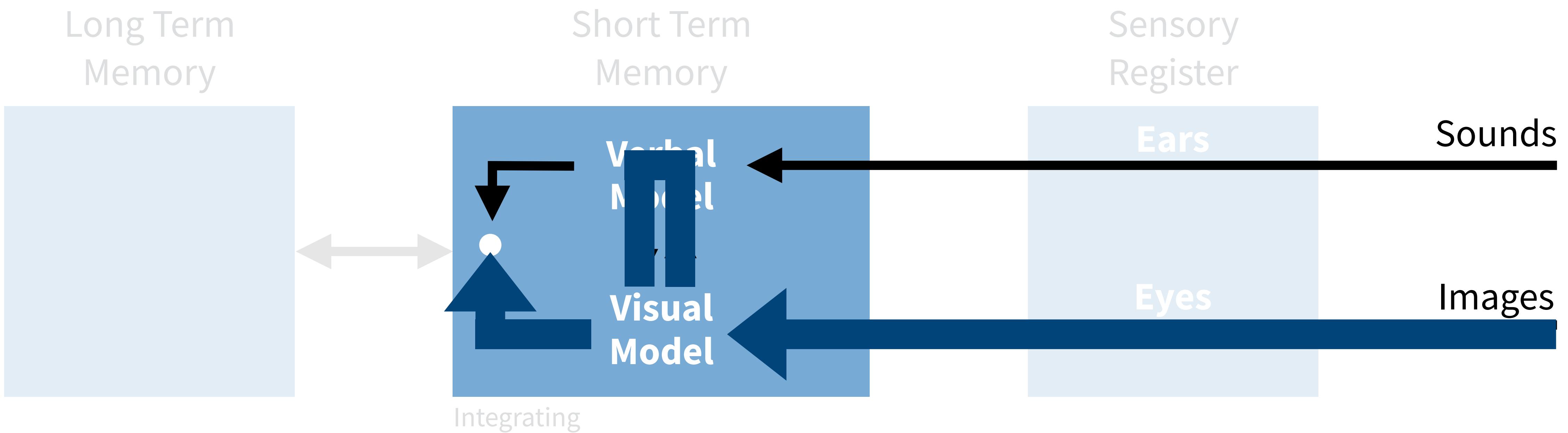
Dual Coding Theory



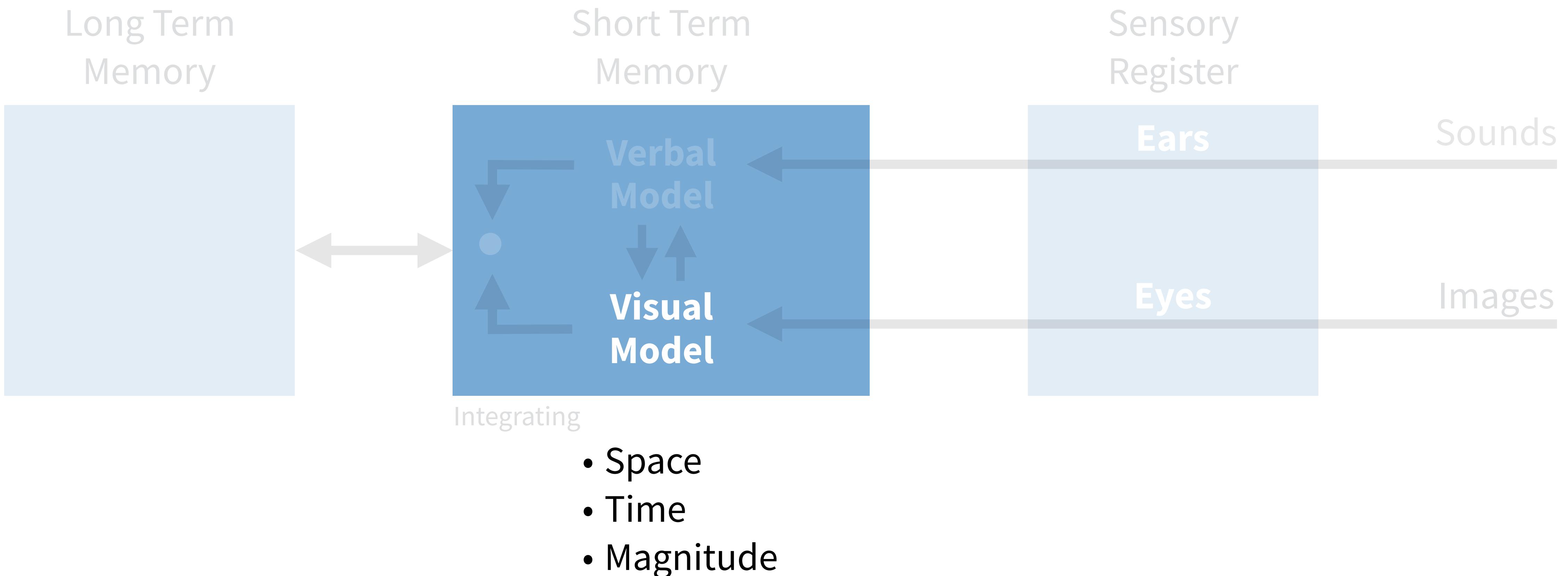


Picture a shape that is a half circle on the bottom, but a flat squiggly line across the top.

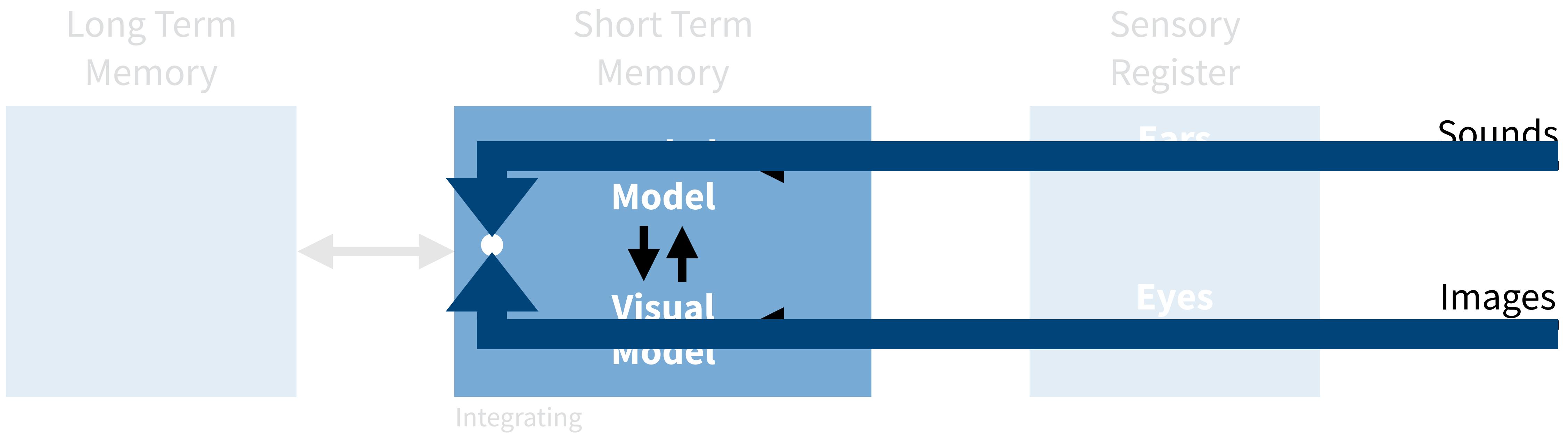
Dual Coding Theory



Dual Coding Theory



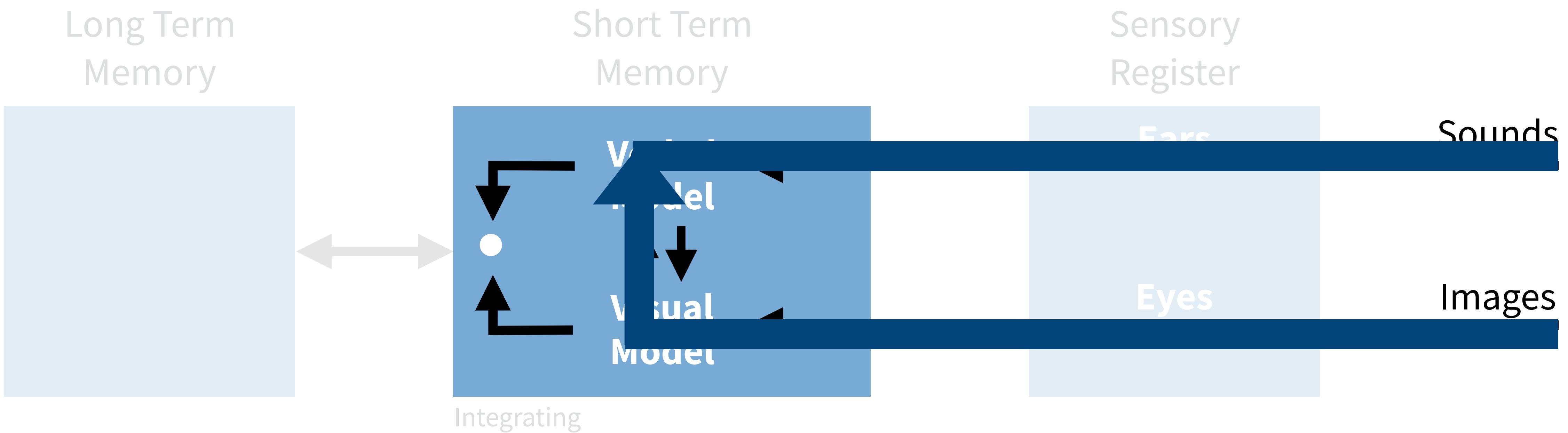
Dual Coding Theory



We're excited to announce community.rstudio.com, a new site for discussions about RStudio, the tidyverse, and friends. To begin with, we're focussing on three main areas: The Tidyverse, Shiny, and the RStudio IDE.

In the near future, we expect to launch a category for RStudio admins. This will be a place to coordinate knowledge about best practices for installing, configuring, and managing RStudio products, and for running R in production. Stay tuned for more details!

Dual Coding Theory



Your Turn

What is the most common way to pair visual and verbal information in a presentation?

Slides

The image shows a collage of four overlapping slides. The top-left slide has a green background with a faint circular watermark. The top-right slide has a light blue background with a faint circular watermark. The bottom-left slide has a white background with a faint circular watermark. The bottom-right slide has a white background with a faint circular watermark. Overlaid on these slides is a large, semi-transparent white rectangle containing the text "Make it Clear". Inside this rectangle is a black and white engraving of a person standing on a rocky shore, looking through a telescope at the horizon.

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Make it Clear



Slides

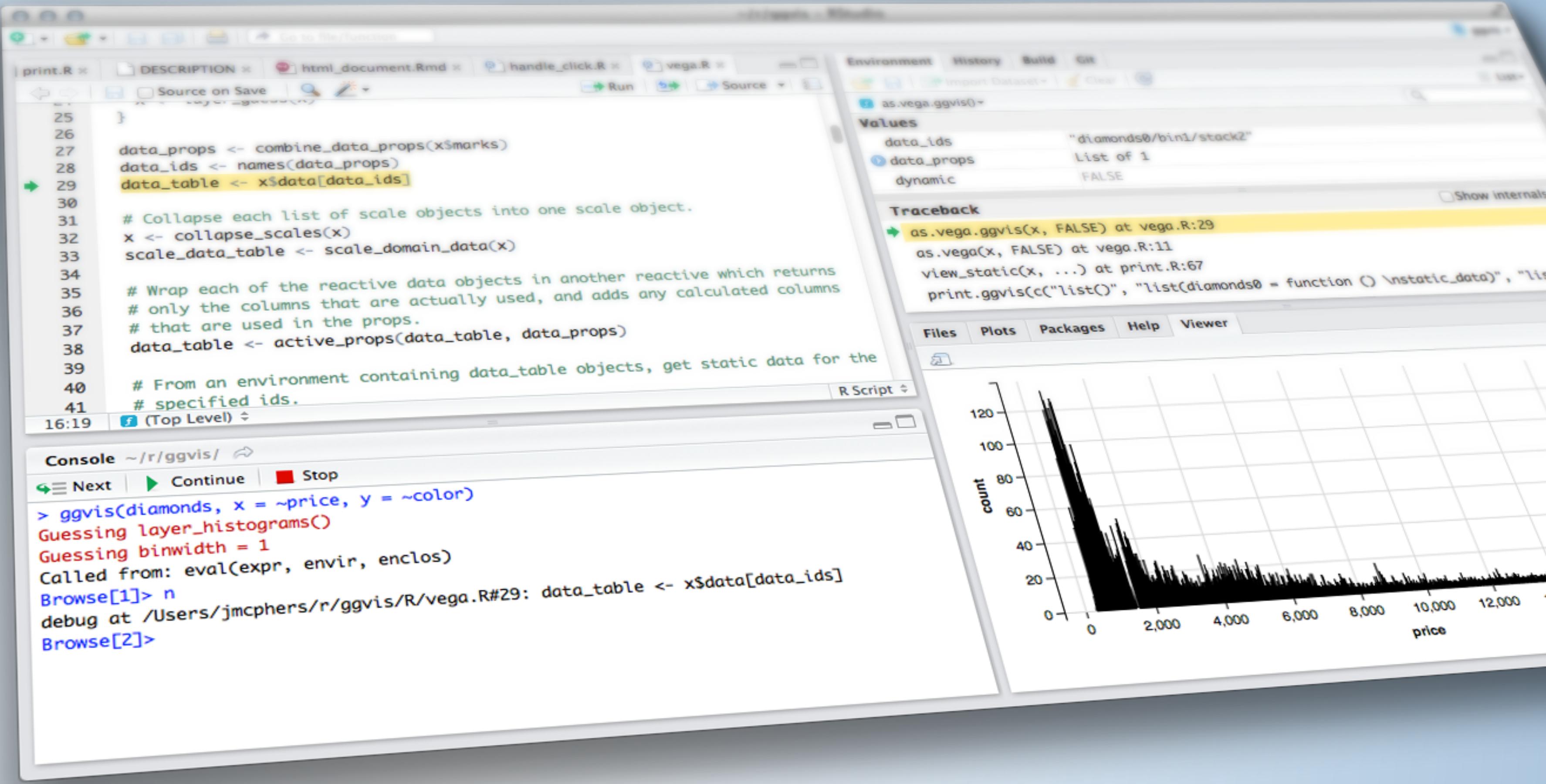


Your Turn

What works **well** in the following slide presentation?

What works **poorly** in the following slide presentation?

WHAT IS SHINY?



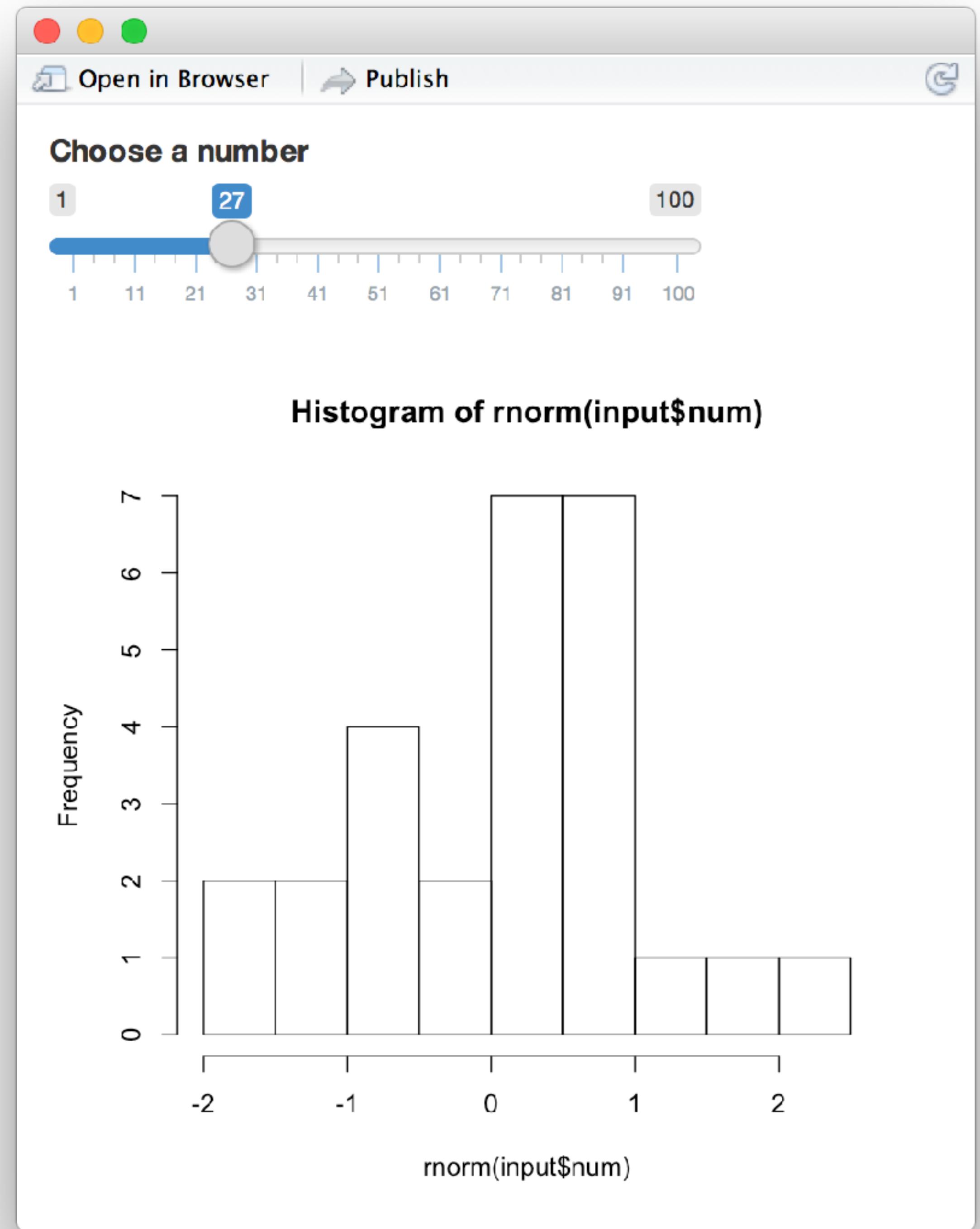
Shiny from  R Studio

Shiny is an R package that makes it easy to build interactive web apps straight from R.

Shiny applications have two components, a user interface object and a server function. You create an app by defining these components and then passing them as arguments to the `shinyApp()` function.

When you run `shinyApp()`, R launches a web server that serves up a webpage, the one defined by the user interface object of your app. Parts of that webpage will be interactive. For example, they might contain drop down menus or sliders. A user can interact with these parts to change an input value used by the app. When this happens, R will immediately run code to update the output values displayed by the app.

You can launch this webserver locally on your computer, or you can place the app online with a Shiny Server Pro or shinyapps.io.



Multimedia Learning Theory

Multimedia Learning Theory

1. There are **two channels** for processing information:
visual and verbal/acoustic.
2. Each channel has a **limited capacity**.
3. Learning is an **active process**.
 - [Mayer, R. E. \(2002\). Multimedia learning. Psychology of learning and motivation, 41, 85-139. Chicago](#)

Multimedia Learning Theory

1. Dual Coding Theory

2. Cognitive Load Theory

3. Active Learning

- Mayer, R. E. (2002). Multimedia learning. Psychology of learning and motivation, 41, 85-139. Chicago

Your Turn

Complete your handout in your own words as we go.

Multimedia Principle

city	large	small
New York	23	4
London	2	6
Beijing	121	56

city	large	small
New York	23	4
London	2	6
Beijing	121	56

Variables in the columns



Redundancy Principle

	city	large	small
New York	3	4	
London	2	6	
Beijing	121	56	

Variables in the columns



	city	large	small
New York	3	4	
London	2	6	
Beijing	121	56	

Variables in the columns



**Variables in
the columns**



Coherence Principle

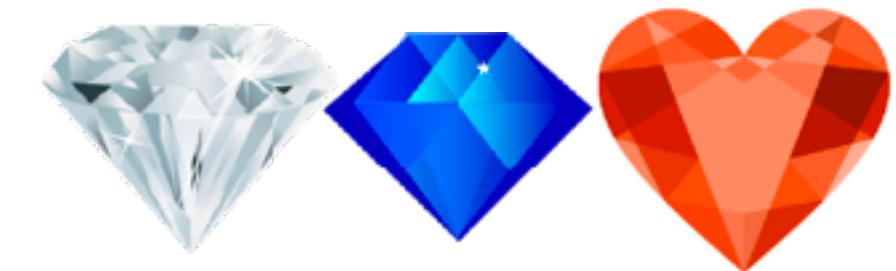
	city	large	small
city	New York	13	4
large	London	2	6
small	Beijing	121	56

Variables in the columns



	city	large	small
city	New York	13	4
large	London	2	6
small	Beijing	121	56

Variables in the columns



diamonds from
the ggplot2
package

Blah...

Blah...

Blah...

Pre-Training Principle

Previously...

Variables are



Columns are



	city	large	small
New York	3	4	
London	2	6	
Beijing	121	56	

*Variables in the
columns*



city	large	small
New York	3	4
London	2	6
Beijing	121	56

*Variables in the
columns*



Signaling Principle

```
babynames %>%  
  group_by(name, sex) %>%  
  ungroup() %>%  
  summarise(total = sum(n)) %>%  
  arrange(desc(total))  
#> #> total  
#> #> 1 340851912
```

```
babynames %>%  
  group_by(name, sex) %>%  
  ungroup() %>%  
  summarise(total = sum(n)) %>%  
  arrange(desc(total))  
#> #> total  
#> #> 1 340851912
```

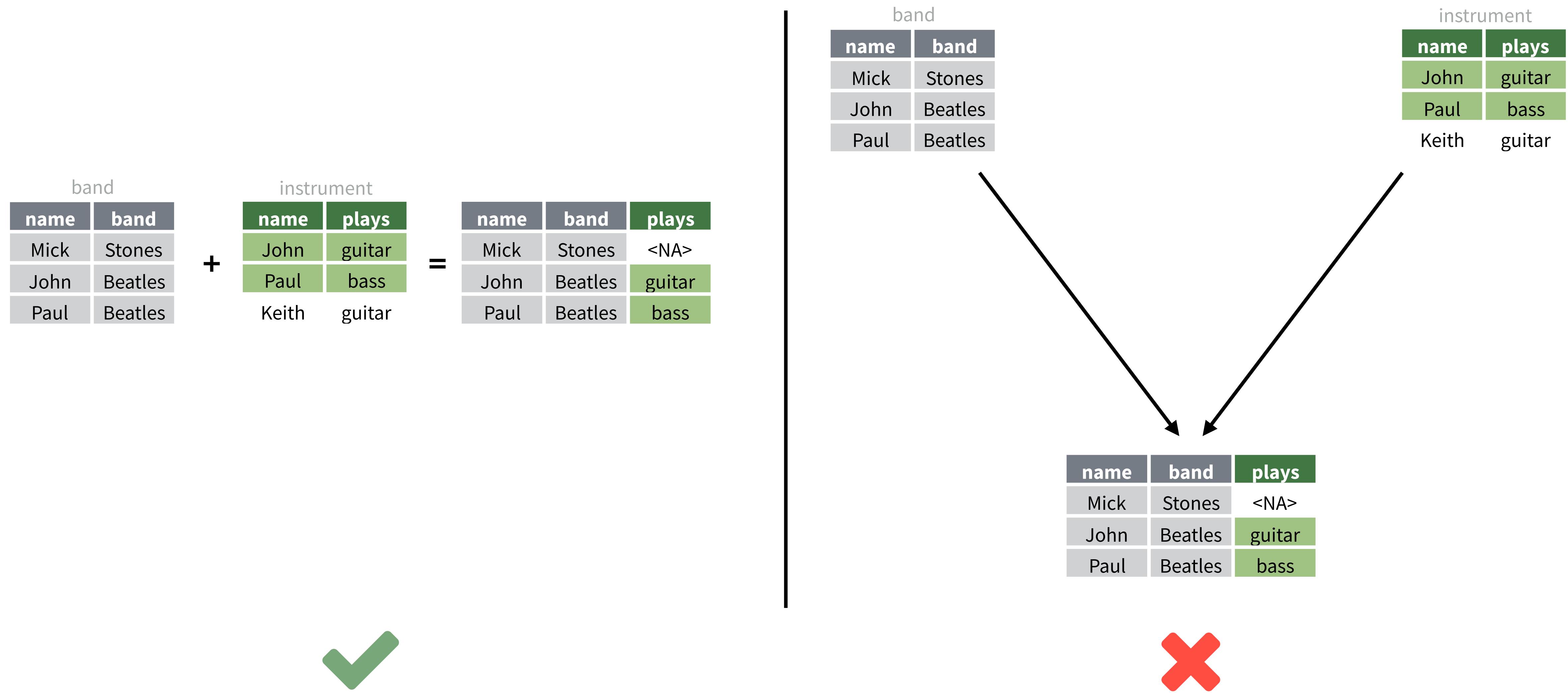
*Use ungroup()
to...*



*Use ungroup()
to...*



Spatial Contiguity Principle



Temporal Contiguity Principle

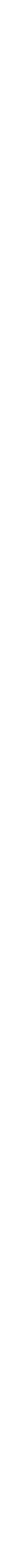
band	
name	band
Mick	Stones
John	Beatles
Paul	Beatles

+

instrument	
name	plays
John	guitar
Paul	bass
Keith	guitar

=

name	band	plays
Mick	Stones	<NA>
John	Beatles	guitar
Paul	Beatles	bass



Modality Principle

```
mod <- (tc2009 ~ low, data = crime)
```

*modelling
functions share
the same syntax*

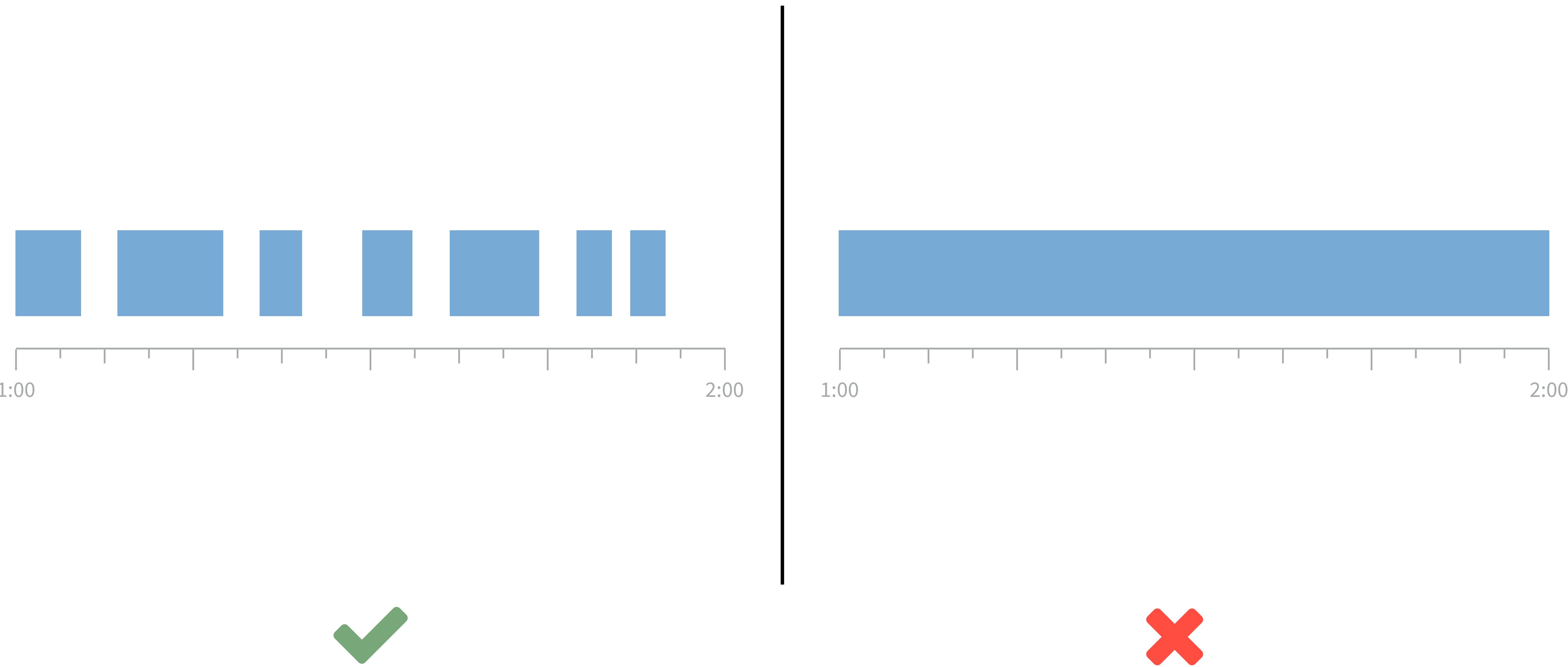


Modelling functions share a syntax

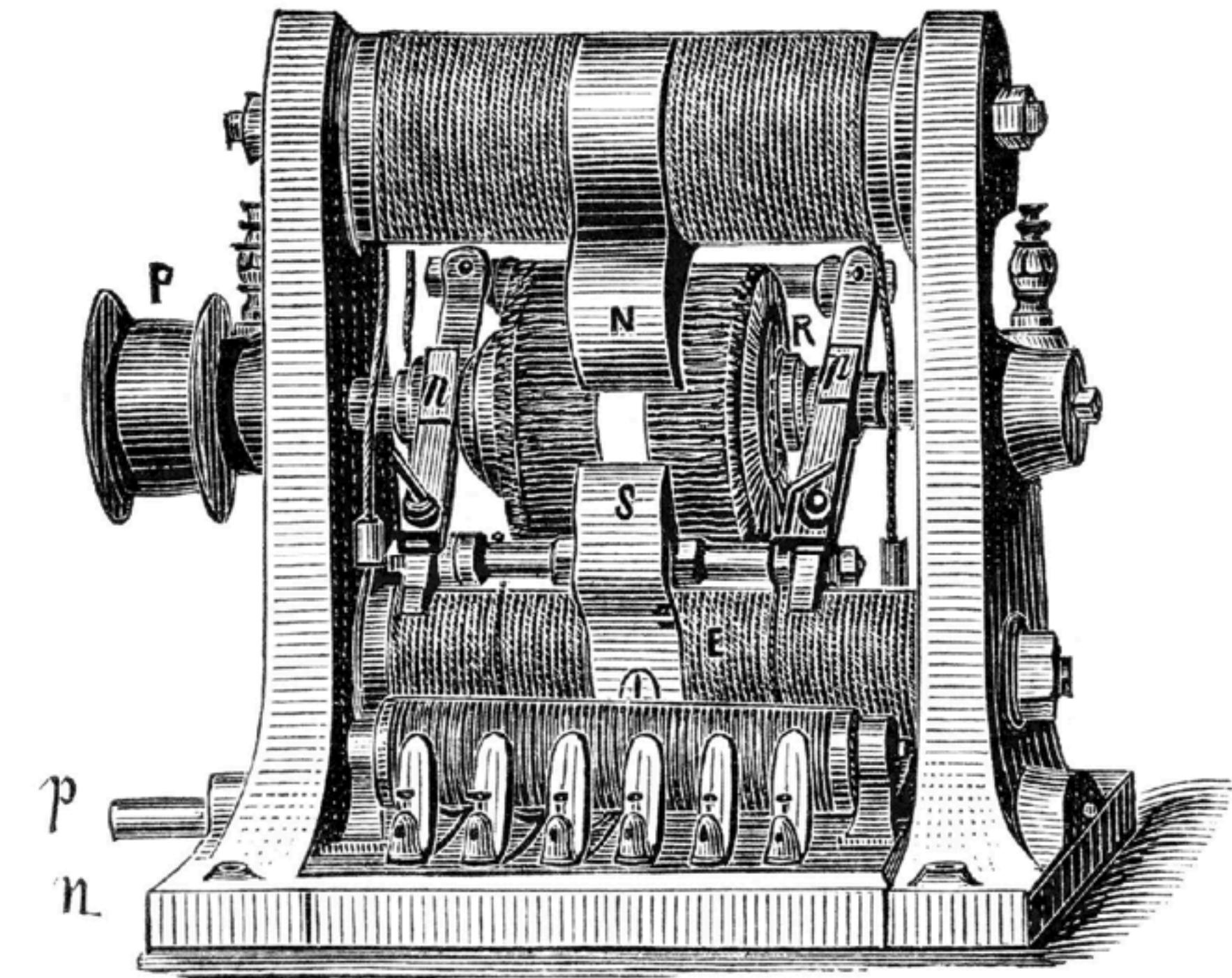
```
mod <- (tc2009 ~ low, data = crime)
```



Segmenting Principle



Voice Principle



oldbookillustrations.com



Personalization Principle



Application

R

Your Turn

Use what you have learned to recreate your explanation as a visual and verbal presentation.
(~5:00).

Use images.* as a resource for building slides.

Your Turn

In your original group, take turns delivering your presentations and providing feedback.

Make it Clear

