

# R Studio 1



10/05/2021

# Logistics

# What's ahead

- This Thursday:
  - NSF panel
  - make sure to post your questions for panelists on the discussion board on canvas

# **Your feedback**



# Your feedback

love all the helpful things we went over. maybe a **bit more engagement with others thinking** about what they use and what their project management tips are

I really appreciated Dr. Gerstenberg being so willing to share his personal organizational process - I am a huge organization freak, and I learned a lot of new tips and tricks, so this was a really helpful session!

I liked hearing all the ways to stay organized, there were a lot of helpful tips! For next time I think the **presentation could have been a bit shorter** and then we could have moved onto something else like grant writing/applications

I enjoyed all of the helpful tips shared!

I really appreciated how detailed much of the advice (e.g. the points about Gmail) was. So many people give high-level productivity tips, but not many people give such fine-grained, tactical guidance. Definitely appreciated it. On the other hand, **one thing that I thought could be improved was the pacing**. There were a few topics that we spent a fair amount of time on though the class didn't seem to be interested, which left less time for other topics that did seem to pique our interest. Therefore, judging the room to determine the pacing would be a good thing to work on.

# Outline

- Folders
- Github
- Filenames
- Email
- Browser
- Calendar
- To do lists
- Notes
- Meeting notes
- **Keyboard shortcuts**
- **Window management**
- **Alfred**

# Keyboard shortcuts



# Keyboard shortcuts

- the goal is to use the mouse as little as possible ...
- why?
  - speed
  - ergonomics
  - satisfaction :)



# Keyboard shortcuts

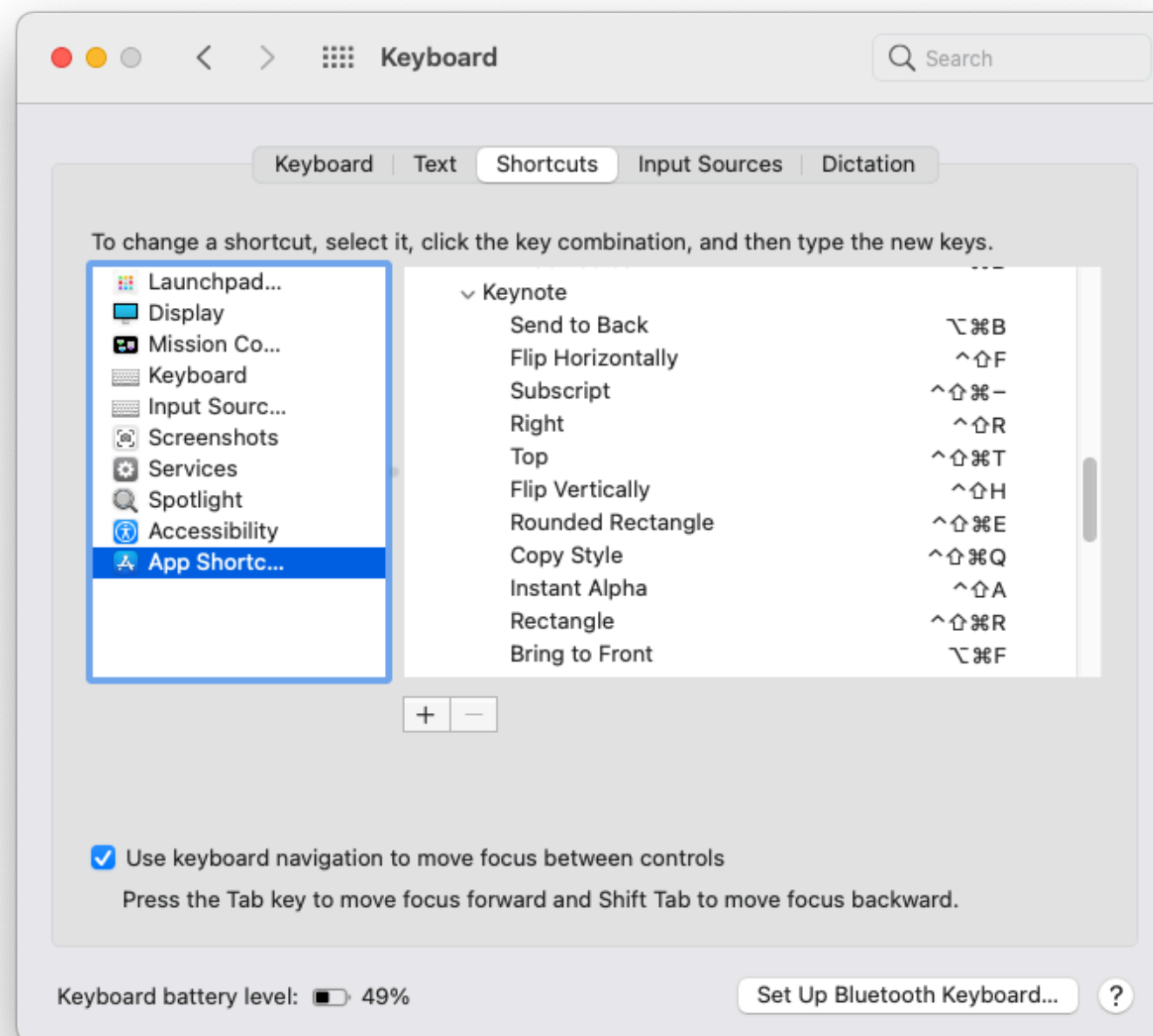
- navigating text:
  - `option + left/right` (jump one word)
  - `cmd + left/right` (beginning end of line)
  - combine with `shift` to highlight text, or with `delete` to delete words/lines (add `fn` to delete forward)
  - `cmd + a` (highlight all text)
- navigating apps (on a mac):
  - `cmd + tab` (switch between apps)
  - `cmd + shift + tab` (switch the other way around)
  - `cmd + `` (switch between windows of the same app)

# Keyboard shortcuts

- `cmd + c` (copy)
- `cmd + x` (cut)
- `cmd + v` (paste)
- `cmd + shift + option + v` (paste using the current style)
- `cmd + w` (close a window)
- `cmd + q` (close an app)
- `cmd + z` (undo)
- ...

# Keyboard shortcuts

- whenever you do something often and it's annoying, set a keyboard shortcut to make your life easier



# Window management



# Window management

- use your keyboard to quickly move windows to where you want them to be
  - sizeup (not free), spectacle (free)

paper (left half of the screen)

references (right half of the screen)

**Psychological Review**  
A Counterfactual Simulation Model of Causal Judgments for Physical Events  
Tobias Gerstenberg<sup>1</sup>, Noah D. Goodman<sup>1</sup>, David A. Lagnado<sup>2</sup>, and Joshua B. Tenenbaum<sup>3</sup>  
<sup>1</sup>Department of Psychology, Stanford University  
<sup>2</sup>Experimental Psychology, University College London  
<sup>3</sup>Department of Brain and Cognitive Sciences, Massachusetts Institute of Technology

How do people make causal judgments about physical events? We introduce the counterfactual simulation model (CSM) which predicts causal judgments in physical settings by comparing what actually happened with what would have happened in relevant counterfactual situations. The CSM postulates different aspects of causation that capture the extent to which a cause made a difference to whether and how the outcome occurred, and whether the cause was sufficient and robust. We test the CSM in several experiments in which participants make causal judgments about dynamic collision events. A preliminary study establishes a very close quantitative mapping between causal and counterfactual judgments. Experiment 1 demonstrates that counterfactuals are necessary for explaining causal judgments. Participants' judgments differed dramatically between pairs of situations in which what actually happened was identical, but where what would have happened differed. Experiment 2 features multiple candidate causes and shows that participants' judgments are sensitive to different aspects of causation. The CSM provides a better fit to participants' judgments than a heuristic model which uses features based on what actually happened. We discuss how the CSM can be used to model the semantics of different causal verbs, how it captures related concepts such as physical support, and how its predictions extend beyond the physical domain.

**Keywords:** causality, counterfactuals, mental simulation, intuitive physics.

The white billiard ball *caused* the black ball to go into the pocket. Joe suddenly turned around and walked back home *because* he realized that he forgot his wallet. The fall of Lehman brothers is *responsible for* the financial crisis. These sentences all make sense to us. They don't merely tell us *what* happened but also *why*. They explain events by pointing to their causes and reasons. The concept of causation is central to our understanding of the world, and to our understanding of each other (Pearl & Mackenzie, 2018; Sloman, 2005). It is the glue that holds the universe together (Hume, 1748/1975; Mackie, 1974).

So far, no unified account exists of how people make causal judgments. In philosophy, there is a vigorous debate about how to best analyze causation, and the philosophers' struggles of getting to grips with causation is reflected in a mixed bag of empirical findings in psychology about what factors people deem relevant when judging causation (Einhorn & Hogarth, 1986; Lagnado et al., 2007).

The difficulty of finding a unified theory of causation has led some to endorse a pluralistic view, postulating two or more fundamentally different concepts of causation (e.g., Cartwright, 1995, 2004; De Vries, 2006; Godfrey-Smith, 2010; Hall, 2004).

In this paper, we develop the *counterfactual simulation model* (CSM) which provides a unified account of how people make causal judgments about physical events. The CSM draws from philosophical theories about the nature of causation (Beebe et al., 2009; Paul & Hall, 2013), prior psychological work on causal judgment (Kahneman & Tversky, 1982; Wolff, 2007), as well as from recent developments in causal modeling (Lallem, 2016; Halpern & Pearl, 2005; Pearl, 2000). The model rests on the following three key assumptions: First, causal judgments about physical events are about difference-making (Woodward, 2003). Only things that made a difference are causes. Second, to understand causal judgments about specific events ("This stone broke the window.") rather than general

**COUNTERFACTUAL SIMULATION MODEL**  
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Reller, A., Bennett, F., & Gerstenberg, T. (2020). The language of causation. In S. Denison, M. Mack, Y. Xu & B. C. Armstrong (Eds.), *Proceedings of the 42nd annual conference of the cognitive science society* (pp. 3133–3139). Cognitive Science Society.

Blakemore, S. J., Fong, P., Pachot-Cloard, M., Darnon, C., Boyer, P., Meltzoff, A. N., Segebarth, C., & Doerflinger, J. (2001). How the brain perceives causality: An event-related fMRI study. *NeuroReport*, 12(17), 3741–3746.

Bramley, N. R., Gerstenberg, T., & Tenenbaum, J. B. (2016). Natural science: Active learning in dynamic physical microworlds. In A. Papafragou, D. Grodner, D. Mirman, & J. C. Trueswell (Eds.), *Proceedings of the 38th annual conference of the cognitive science society* (pp. 2567–2572). Cognitive Science Society.

Bramley, N. R., Gerstenberg, T., Mayrhofer, R., & Lagnado, D. A. (2018). Time in causal structure learning. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 44(12), 1880–1910.

Bramley, N. R., Gerstenberg, T., Mayrhofer, R., & Lagnado, D. A. (2019). Intervening in time. In S. Kleinberg (Ed.), *Time and causality across the sciences* (pp. 86–115). Cambridge University Press.

Bramley, N. R., Gerstenberg, T., Tenenbaum, J. B., & Gureckis, T. M. (2018). Intuitive experimentation in the physical world. *Cognitive Psychology*, 105, 9–38.

Bramley, N. R., Mayrhofer, R., Gerstenberg, T., & Lagnado, D. A. (2017). Causal learning from interventions and dynamics in continuous time. In G. Gunzelmann, A. Howes, T. Tenenbaum, & E. Davelaar (Eds.), *Proceedings of the 39th annual conference of the cognitive science society* (pp. 150–155). Cognitive Science Society.

Brown, R., & Fish, D. (1983). The psychological causality implicit in language. *Cognition*, 14(3), 257–273.

Burkner, P.-C. (2017). brms: An R package for Bayesian multilevel models using Stan. *Journal of Statistical Software*, 80(1), 1–28. <https://doi.org/10.18637/jss.v080.b01>

Burkner, P.-C., & Vuorre, M. (2019). Online regression models in psychology: A tutorial. *Advances in Methods and Practices in Psychological Science*, 2(1), 77–101.

Buss, A. R. (1978). Causes and reasons in attribution theory: A conceptual critique. *Journal of Personality and Social Psychology*, 36(11), 1311–1321.

Carpenter, B., Gelman, A., Hoffman, M. D., Lee, D., Goodrich, B., Bitancourt, M., Brubaker, M. A., Cuo, J., Li, P., & Riddell, A. (2017). Stan: A probabilistic programming language. *Journal of Statistical Software*, 76(1), 1–32.

Corcoran, N. (1995). False idealism: A philosophical threat to scientific method. *Philosophical Studies*, 77(2), 239–252.

Corcoran, N. (2004). Causation: One word, many things. *Philosophy of Science*, 71(5), 805–820. <https://doi.org/10.1086/426771>

Chang, W. (2009). Connecting counterfactual and physical causation. In N. Taatgen & H. van Rijn (Eds.), *Proceedings of the 31st annual conference of the cognitive science society* (pp. 1983–1987). Cognitive Science Society.

Chater, N., & Oaksford, M. (2013). Programs as causal models: Speculations on mental programs and mental representation. *Cognitive Science*, 37(6), 1171–1191.

Cheng, P. W. (1997). From covariation to causation: A causal power theory. *Psychological Review*, 104(2), 367–405.

Cheng, P. W., & Novick, L. R. (1990). A probabilistic contrast model of causal induction. *Journal of Personality and Social Psychology*, 58(4), 545–567.

Cheng, P. W., & Novick, L. R. (1991). Causes versus enablement conditions.

Checkler, H., & Halpern, J. Y. (2004). Responsibility and blame: A structural-model approach. *Journal of Artificial Intelligence Research*, 22(1), 93–115.

Collins, J. (2000, April). Preemptive prevention. *The Journal of Philosophy*, 97(4), 223–234. <https://doi.org/10.2307/2678391>

Collins, J. D., Hall, B. J., & Paul, L. A. (2004). *Causation and counterfactuals*. MIT Press.

Craik, K. J. W. (1943). *The nature of explanation*. Cambridge University Press.

Croft, W. (1991). *Syntactic categories and grammatical relations: The cognitive organization of information*. University of Chicago Press.

Crump, M. J. C., McDonnell, J. V., & Gureckis, T. M. (2013, March). Evaluating amazon's mechanical Turk as a tool for experimental behavioral research. *PLOS ONE*, 8(3). Article e57410. <https://doi.org/10.1371/journal.pone.0057410>

Cushman, F., & Young, L. (2011). Patterns of moral judgment derive from nonmoral psychological representations. *Cognitive Science*, 35(6), 1052–1075.

Danks, D. (2013). Functions and cognitive bases for the concept of actual causation. *Erkenntnis*, 78(51), 111–128. <https://doi.org/10.1007/s10670-013-9439-2>

Danks, D. (2017). Singular causation. In M. Waldmann (Ed.), *The oxford handbook of causal reasoning* (pp. 201–215). Oxford University Press.

De Vries, L. (2006). Pluralism in the philosophy of causation: Desideratum or not? *Philosophica*, 77, 5–13.

Dowe, P. (2000). *Physical causation*. Cambridge University Press.

Dowe, P. (2001, June). A counterfactual theory of prevention and "causation" by omission. *Australasian Journal of Philosophy*, 79(2), 216–226. <https://doi.org/10.1080/014467223>

Downing, C. J., Sternberg, R. J., & Ross, B. H. (1985). Multicausal inference: Evaluation of evidence in causally complex situations. *Journal of Experimental Psychology: General*, 114(2), 239–263.

Ehring, D. (1980). The transference theory of causation. *Synthese*, 67(2), 249–258.

Einhorn, H. J., & Hogarth, R. M. (1986). Judging probable cause. *Psychological Bulletin*, 99(1), 3–19.

Filiis, K., Wong, C., Nye, M., Sablé-Meyer, M., Cary, L., Morales, L., Hewitt, L., Solar-Lezama, A., & Tenenbaum, J. B. (2020). *Dreamcoder: Growing generalizable, interpretable knowledge with wake-sleep bayesian program learning*. arXiv preprint arXiv:2006.08381.

Evans, O., Stahlmüller, A., Salvatier, J., & Fien, D. (2017). *Modeling agents with probabilistic programming*. Retrieved May 22, 2017, from <http://agentmodels.org>.

Fair, D. (1979). Causation and the flow of energy. *Erkenntnis*, 14(3), 219–250.

Falk, A., & Szech, N. (2013). Morals and markets. *Science*, 340(6133), 707–711.

Fincham, F. D., & Jaspars, J. M. (1983). A subjective probability approach to responsibility attribution. *British Journal of Social Psychology*, 22(2), 145–161.

Fischer, J., Mikhael, J. G., Tenenbaum, J. B., & Kanwisher, N. (2016, August). Functional neuroanatomy of intuitive physical inference. *Proceedings of the National Academy of Sciences*, 113(34), E5072–E5081. <https://doi.org/10.1073/pnas.1610344113>

Forsyth, D. R., & Kelley, K. N. (1994). Attribution in groups estimations of personal contributions to collective endeavors. *Small Group Research*, 25(3), 367–383.

# Alfred



# Alfred

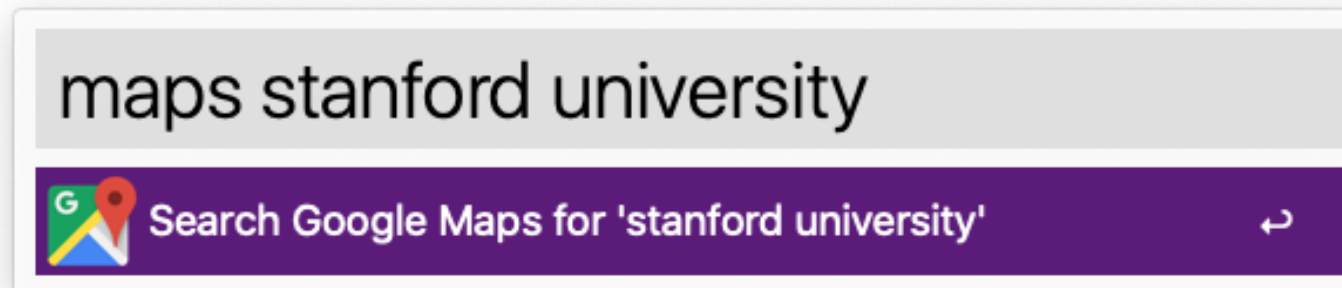
- Alfred is a powerful tool that works like spotlight but is muuuuuch better
  - it's not free ( £ 29) but worth it!
- the opportunities are almost endless (I keep discovering new stuff)



# Alfred

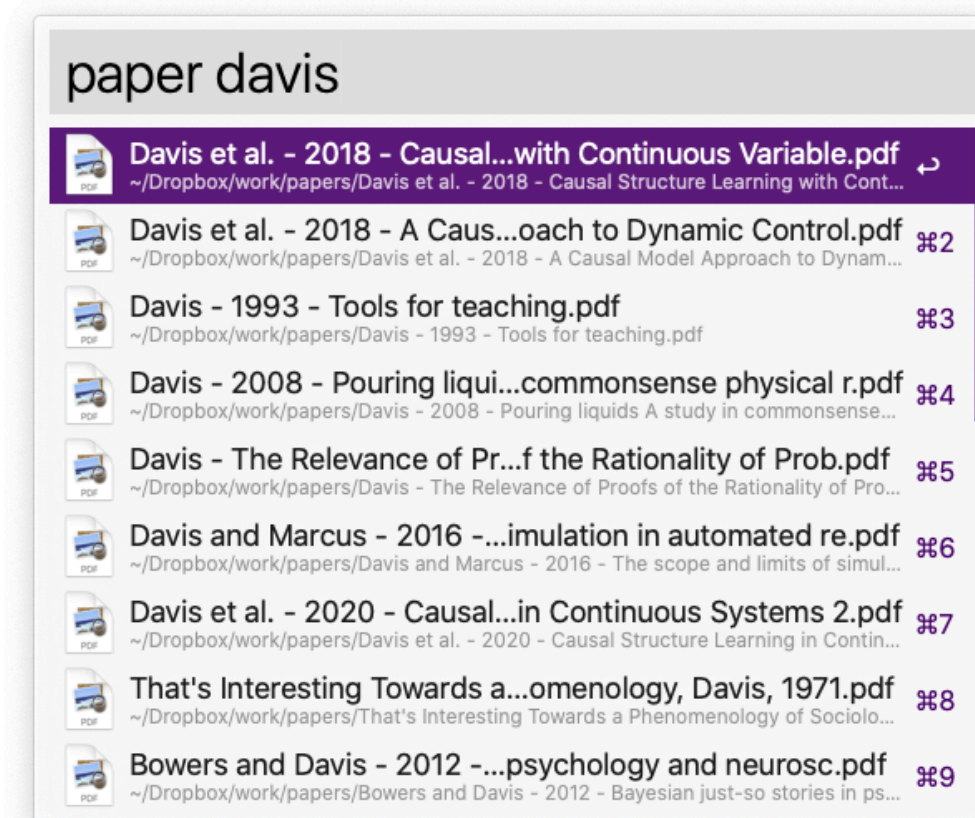
## Search the web

- You can setup customized searches for different websites (e.g. google maps)



## Search on your computer

- You can setup customized searches that look for specific files within specific folders.
- I use this for quickly finding papers.
- And you can directly preview them in Alfred, too, by just pressing `shift`.



# Alfred

## Use snippets

- Define text snippets that work in any app. Extremely useful!!!
- I defined my snippets so that they each start with `;`
- For example, I use `;c` to write `cheers, tobi`.

Name	^ A→	Keyword	Snippet
address home	✓	;ah	Tobias Gerstenberg 5 Peter Coutts Circle Stan...
address work	✓	;aw	Tobias Gerstenberg Stanford University Depar...
audit	✓	;au	thanks for reaching out! you're welcome to au...
book me	✓	;y	<a href="https://tobiasgerstenberg.youcanbook.me">https://tobiasgerstenberg.youcanbook.me</a>
cheers	✓	;c	cheers, tobi
Cheers	✓	;C	Cheers, Tobi
cicl email list	✓	;nl	<a href="https://mailman.stanford.edu/mailman/listinfo/...">https://mailman.stanford.edu/mailman/listinfo/...</a>
fax	✓	;f	650-725-5699
gmail	✓	;mg	tobiace@gmail.com
gmail long	✓	;mt	tobias.gerstenberg@gmail.com
help	✓	;he	thanks for your help!
highschool	✓	;high	thanks for reaching out! it's great to hear that...
homepage	✓	;hp	<a href="http://cicl.stanford.edu/member/tobias_gerste...">http://cicl.stanford.edu/member/tobias_gerste...</a>
insert date	✓	;d	{date:long}

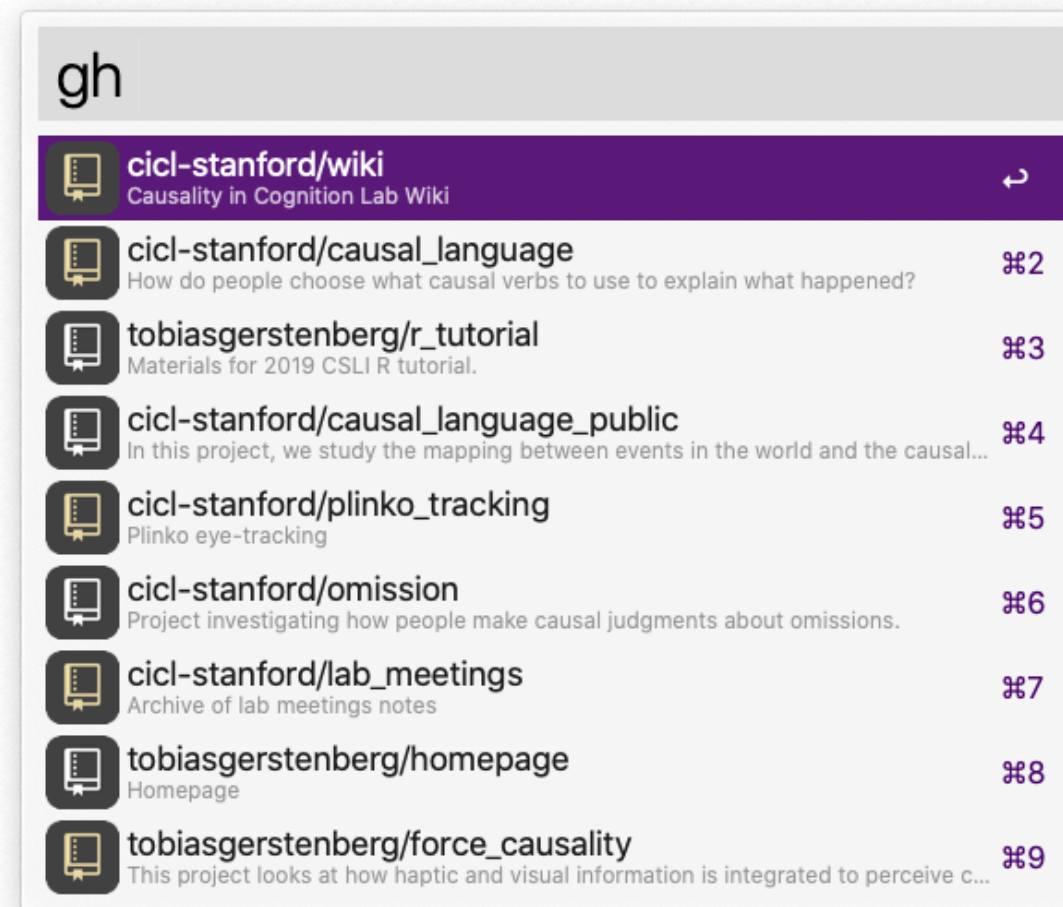
# Alfred

## Workflows

This is where the **real** power comes in!

### github

- Quickly go to github repositories.



### reference importer

- Quickly add bibtex references.

### go to current file

- Quickly go the file that's currently opened in an app.

### recent downloads

- See recently downloaded files.

# Alfred

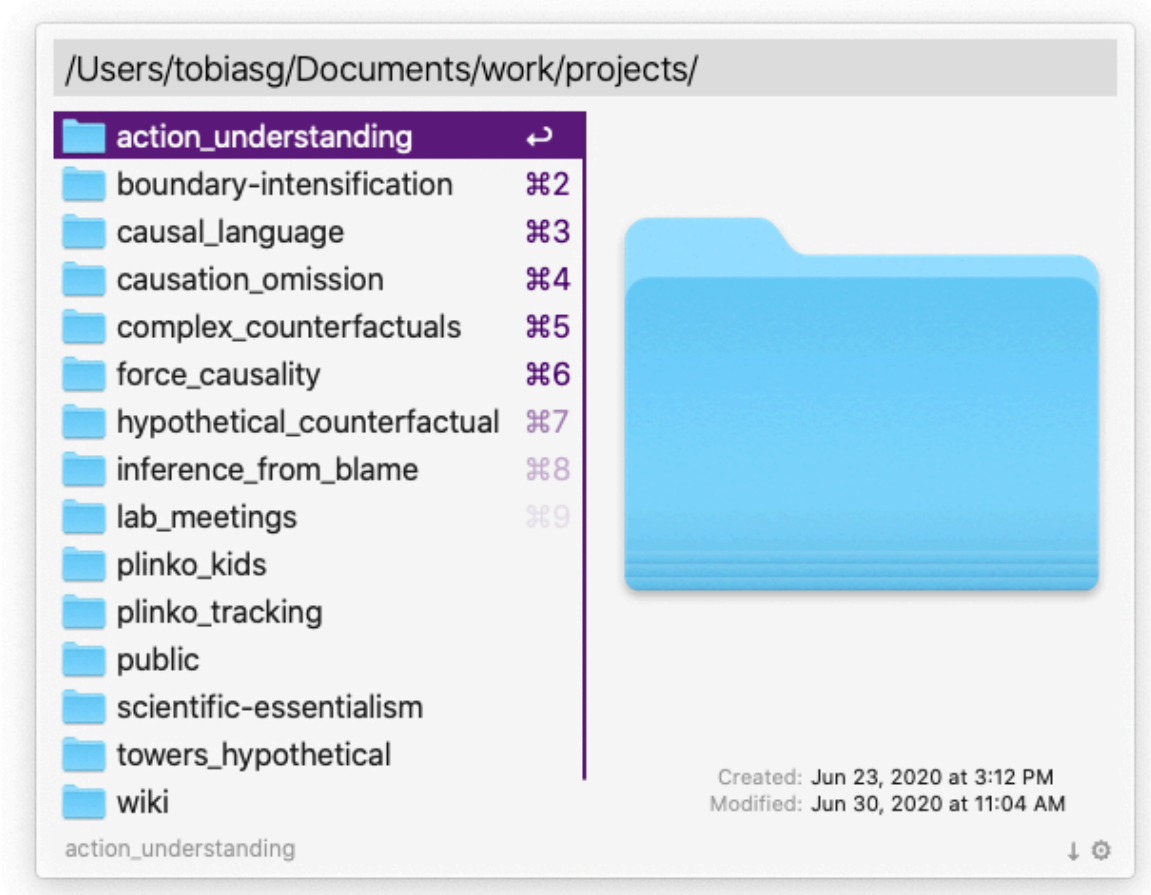
- many more amazing features ...  
(I'm a fan -- in case that wasn't clear already)

## System shortcuts

- Like putting your mac to sleep, show the trash, quit all apps, ...

## File navigation


- You can copy/move/delete multiple files.
- Alfred works as a file browser just like finder.



# Some take home messages



# Some take home messages

- adopt a mindset of continuously improving your workflow
- if you find something repetitive/annoying, chances are someone else did, too, and someone else might have come up with a solution
- be curious -- ask others how they do things
- find a good balance between optimizing your workflow and actually working  and not working :)
- remember that all work is collaborative

# R Studio time!





# Stretch break



# Feedback

# How was the pace of today's class?

much  
too  
slow

a little  
too  
slow

just  
right

a little  
too  
fast

much  
too  
fast

# How happy were you with today's class overall?



**What did you like about today's class? What could be improved next time?**

# Thank you!

