Monday, December 12, 2022

Ph.D. thesis proposal

Tool Support for Knowledge Foraging, Structuring, & Transfer During Online Sensemaking

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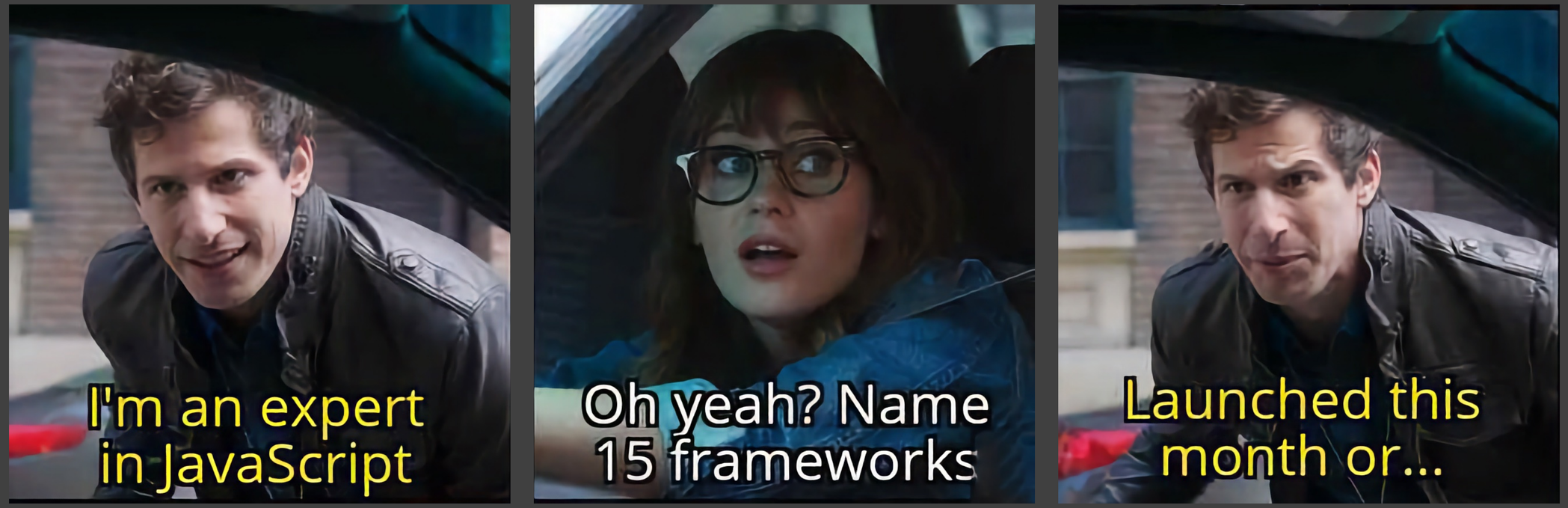
Aniket Kittur
Kenneth Holstein
Daniel M. Russell (Google)

Example: choosing a JavaScript framework



Foraging information

Vue.js Is Good, But Is It Better Than Angular Or React?

by Mantra Malhotra / May 19, 2021 / 16 Comments / 106302 Views

A few years ag
mainly arguing
React for their
in a third player

According t
stars of Vue

SIMFORM

Menu

Simform → Blog → Web App Development →

Best Frontend Frameworks of 2021 for Web Development

If you are looking
frameworks in 2

Hiren Dhaduk
January 5, 202

Quick Summary :
the software deve
choose when it c
high on user expe
the best frontend

User experience i
market today. As
talks about the si
feature. No matte
the background,
That is the princip
on- Netflix, Faceb

React vs Angular vs Vue 2021: Which to Choose for Your Web App?

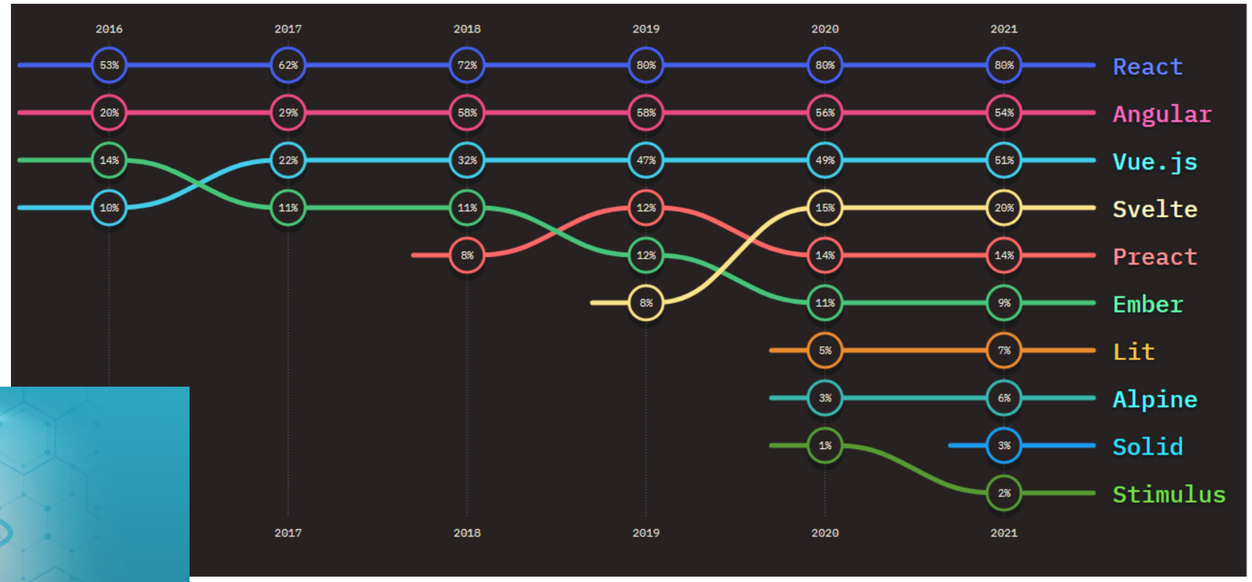
By Praveen Mishra May 6, 2021 1

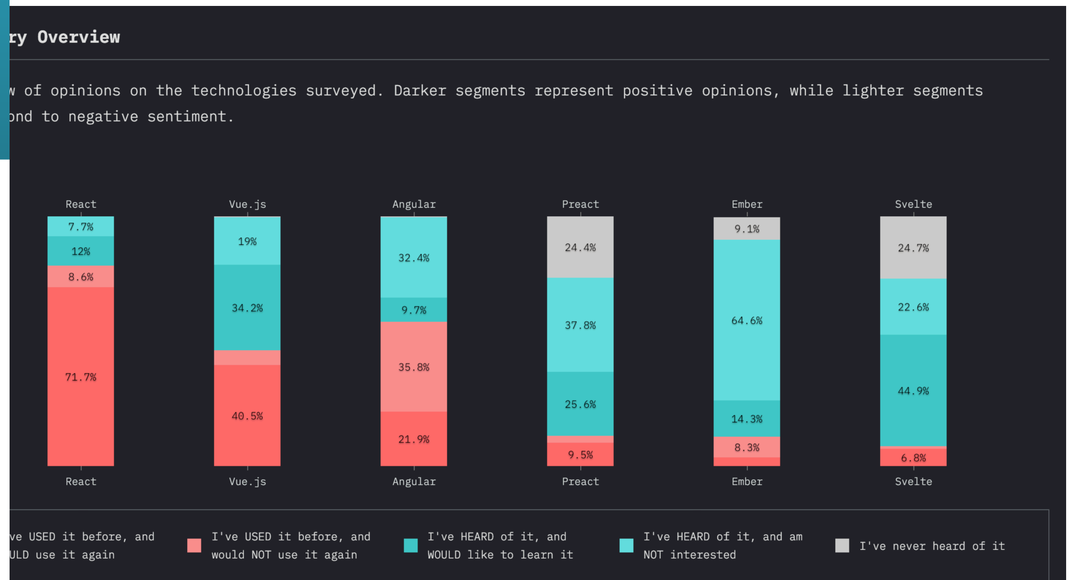
Reading Time: 8 minutes

Which JavaScript Framework/Library to choose for your business web app in 2021? In this React vs Angular vs Vue comparison, we will talk about the pros and cons of each and much more.

JavaScript, hands down, is the best language to choose for frontend development, and rightfully so! It provides a plethora of functionalities that let you create the UI of your web app exactly how you want.

Like everything, the world of JavaScript has evolved to make it easier to quickly create intuitive user interfaces. You can now choose from a long list of JS frameworks and UI Libraries for your business web app in 2021.





Evidence scattered across webpages...

React Developer Tools

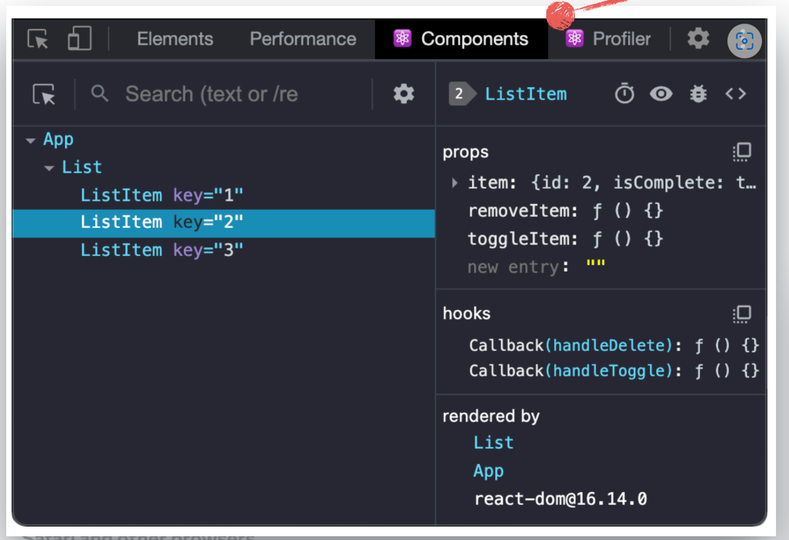
Use React Developer Tools to inspect React components, edit props and state, and identify performance problems.

You will learn

- How to install React Developer Tools

Browser extension

The easiest way to debug websites built with React is to install the React Developer Tools browser extension. It is available for several popular browsers:



Safari and other browsers

For other browsers (for example, Safari), install the `react-devtools` npm package:

```
# Yarn
yarn global add react-devtools

# Npm
npm install -g react-devtools
```

Next open the developer tools from the terminal:

Top Front-end Frameworks for 2022

Let's take a closer look at the front-end frameworks dominating the landscape. We know who the big players are, but what about newcomers? Alpine, Lit, and Solid are all showing promising usage percentages. And we definitely want to know more about Svelte.

#1 – React

React makes it painless to create interactive UIs. Design simple views for each state in your application, and React will efficiently update and render just the right components when your data changes.

React continues to dominate the front-end space. The framework stands out with its own virtual DOM, ensuring persistent app performance at scale. Likewise, the component-based structure means that development is more accessible across teams.

While the learning curve for React is moderately forgiving, the accessibility of tooling makes the process manageable. Namely, create-react-app automates the build process for an application boilerplate. And then there are React DevTools, providing an accessible debugging experience from the browser.

Thanks to the mass adoption of React, front-end developers can enjoy getting their hands on

React.js Pros	React.js Cons
Easy to get started with thanks to troves of online tutorials, courses, etc.	Documentation can feel a bit lacking for beginners. E.g. JSX
Component structure makes it easy to define an element and then reuse it as needed.	Only used for UI development.
SEO-friendly for static and dynamic projects.	Not the best choice for small projects.
Version Control provides notices on outdated code structure.	Unopinionated – your call on deciding the structure and style guide.

#2 – Angular

Bundle Size

Svelte's .gzip version has a size of 1.6 kilobytes. React.gzip, when combined with ReactDOM, has a total size of 42.2 kilobytes. The smaller bundle size of Svelte ensures faster loading speeds, better responsiveness, and lower bandwidth costs.

JavaScript library that uses multiple third-party components to design UI elements. The article explains the differences between Svelte vs React in detail.

developers use JavaScript frameworks like Svelte and React to create, design, and code functional websites. Knowing the difference between Svelte and React would help web developers decide which frameworks to use.

Svelte vs React: What is Svelte?

Developed by Rich Harris in 2016, Svelte is a free, open-source front-end compiler. Svelte compiles HTML templates to create unique code that manipulates the Document Object Model directly. Unlike traditional JavaScript frameworks like React, Svelte avoids overheads associated with the virtual DOM.

The way Svelte operates reduces the transferred file size and offers better client performance. The compiler processes the application code inserts calls to automatically update the data, and re-renders UI elements affected by that data. Svelte is written in the TypeScript language, a superset of JavaScript.

When should you use Svelte?

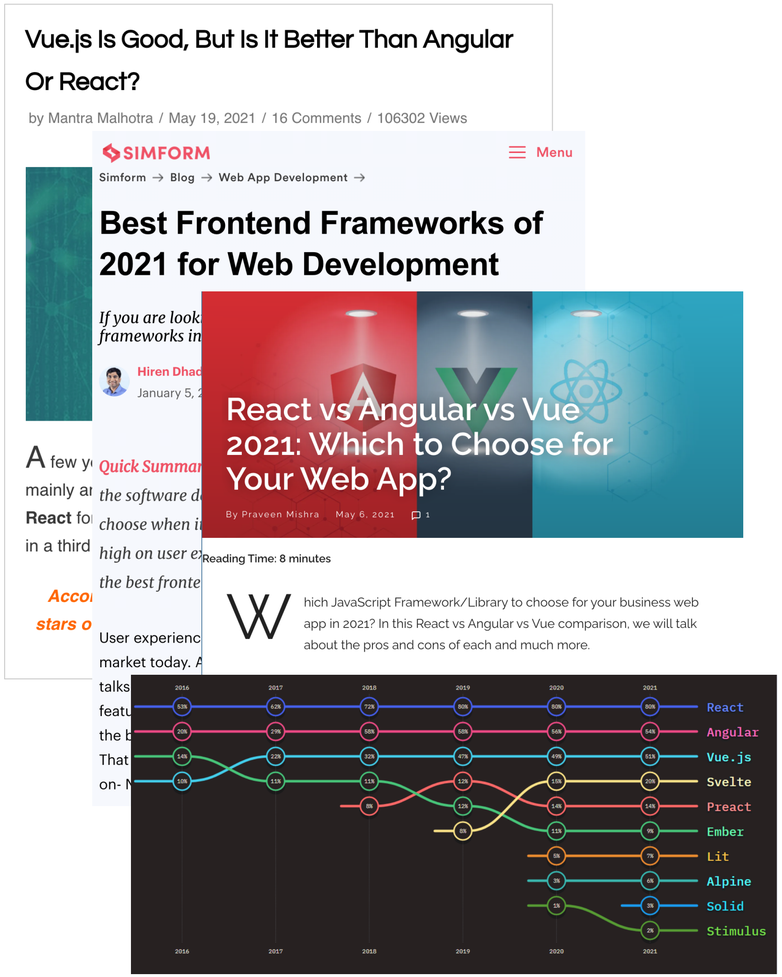
Svelte is known for simplicity, as its code closely resembles Vanilla JavaScript. Svelte allows developers to complete their objectives with fewer lines of code. Developers should use Svelte if they are targeting a very small package size for their website.

Programs written in Svelte are useful for application in low-capacity or low-power devices. Svelte tools and frameworks provide better control over state management, routing, and creating customized infrastructure. Svelte is useful for DOM manipulation, reactive frameworks, and emerging markets.

Which companies use Svelte?

Foraging → Structuring Information

This is hard!

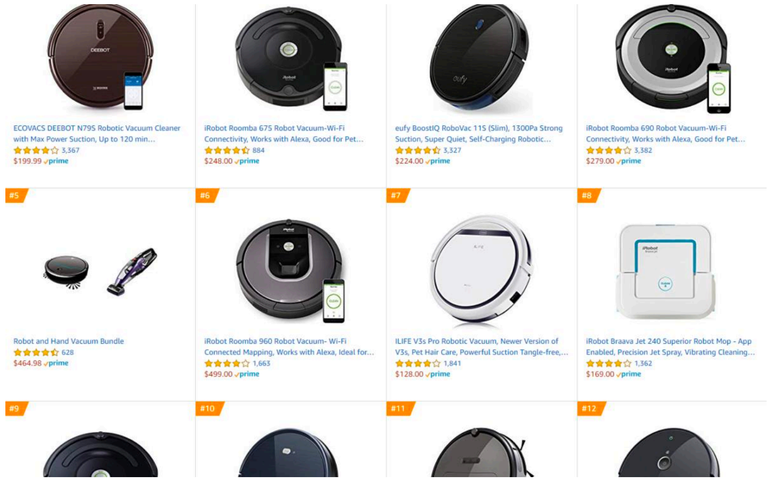


	Fast?	dev community	documentation	supported by
React	yes	Really large	https://reactjs.org/	facebook
Angular	?	Also large	Not so easy to understand https://angular.io/docs	google
Vue	yes	?	Very detailed, Very easy to understand https://vuejs.org/v2/guide/	Community, started by Evan You

Aspirational compassion table summarized from various sources that would help with decision-making

Programming

Planning a vacation



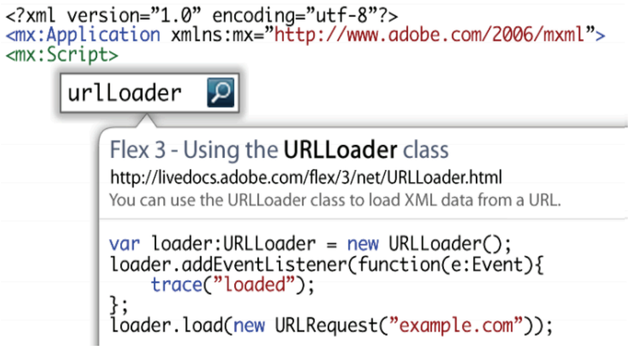
Buying a robot vacuum

Understanding
medical diagnosis & treatments

Prior research – finding information

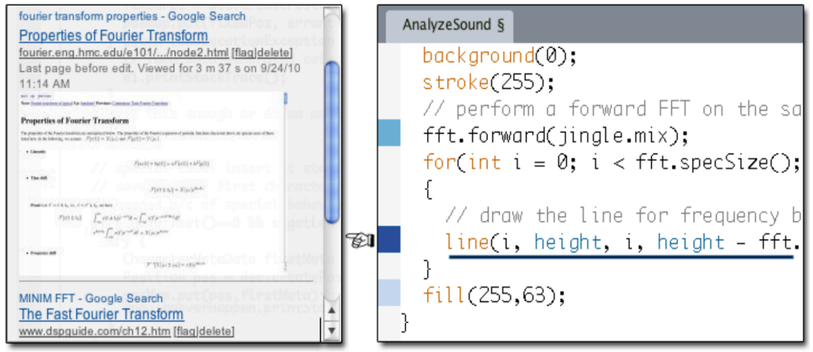
Finding APIs

Stylos et al. 2006



Finding example code

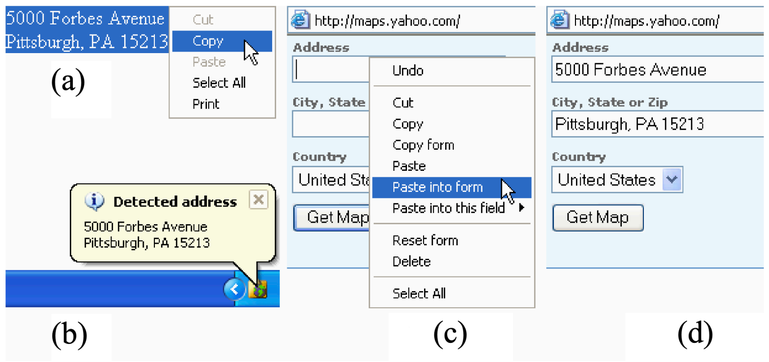
Brandt et al. 2010



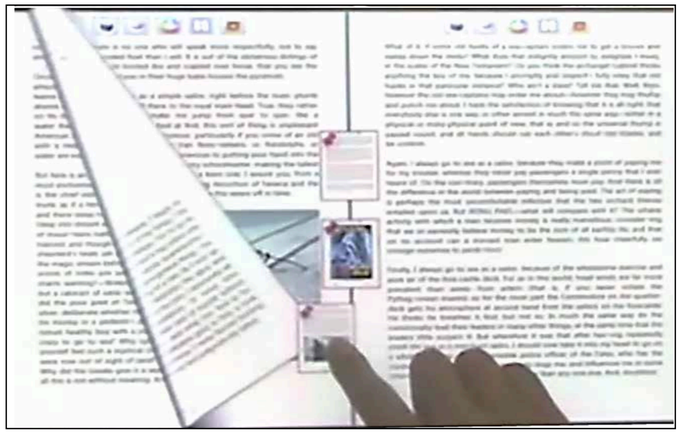
Keeping track of information source

Hartmann et al. 2011

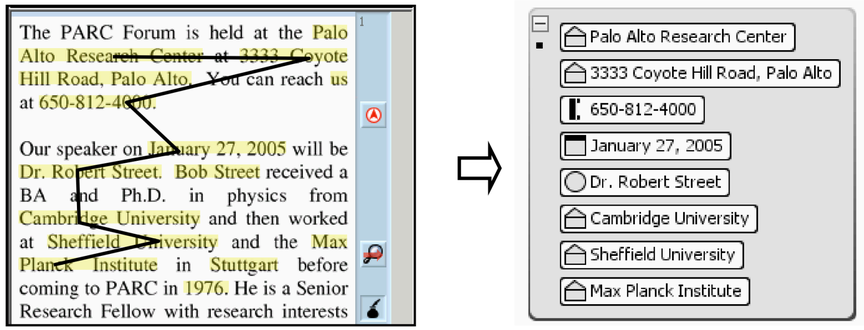
Prior research – saving information



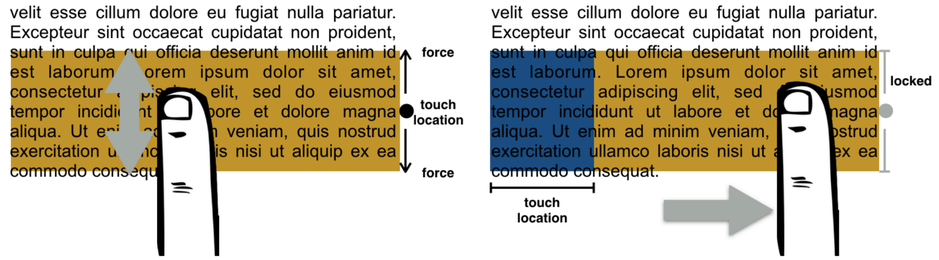
Citrine: providing intelligent copy-and-paste
Stylos et al. (UIST 2004)



GatherReader: gathering information while active reading
Hinckley et al. (CHI 2012)

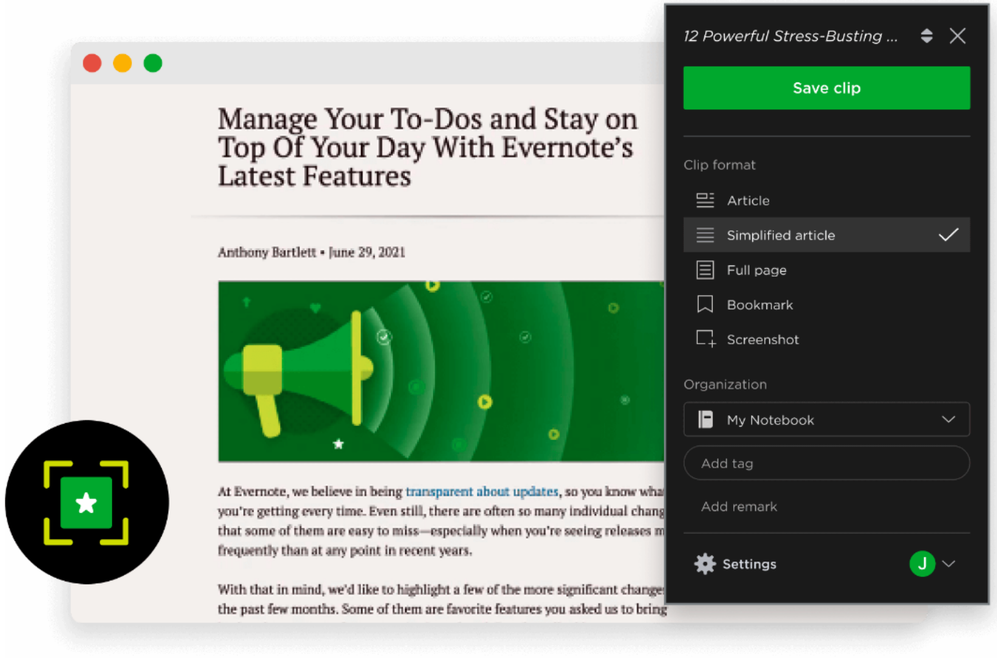


Entity quick click: rapid text copying based on automatic entity extraction
Bier et al. (CHI 2006)



Supporting Mobile Sensemaking Through Intentionally Uncertain Highlighting
Changes al. (UIST 2016)

Commercial tools



Web clippers for
saving content from browsers

Notes/spreadsheet apps for
personal information management (PIM)

Challenges

- It is **cognitive and physically demanding** for people to **collect and organize** information into structures, especially without proper tool support.

Reusing decisions?

Not that easy!

	Fast?	dev community	documentation	supported by
React	yes	Really large	https://reactjs.org/	facebook
Angular	?	Also large	Not so easy to understand https://angular.io/docs	google
Vue	yes	?	Very detailed, Very easy to understand https://vuejs.org/v2/guide/	Community, started by Evan You

Appropriate to reuse?

- People intuitively focus on **correctness** , however, it’s often subjective depending on the specific situation.
- There are other facets that are equally important, such as **context relevance** or the **completeness** of research.
- When unsure about these factors, people would rather carry out research by themselves than reuse.

Flanagin & Metzger 2000, Hoorn & Wijngaarden 2010, Markus 2001, Dorisch & Bellotti 1992, Paul & Morris 2009, Fisher et al. 2012

Challenges

- It is **cognitive and physically demanding** for people to **collect and organize** information into structures, especially without proper tool support.

Initial person

Challenges

- It is **cognitive and physically demanding** for people to **collect and organize** information into structures, especially without proper tool support.

- It is difficult for subsequent people to judge whether it is **appropriate to reuse** learning outcomes and decisions made by an initial person.

Initial person

Subsequent people

Challenges

- It is **cognitive and physically demanding** for people to **collect and organize** information into structures, especially without proper tool support.

- It is difficult for subsequent people to judge whether it is **appropriate to reuse** learning outcomes and decisions made by an initial person.

Initial person

Subsequent people

I study people's sensemaking and decision-making processes, and

I build **user interfaces, interactions, and computational scaffolds** that enable people to collect and organize knowledge to make and justify decisions,

while keeping track of that knowledge and making it useful for subsequent people with similar needs.


Initial person


Subsequent people

I build **user interfaces, interactions, and computational scaffolds** that enable people to collect and organize knowledge to make and justify decisions,

while keeping track of that knowledge and making it useful for subsequent people with similar needs.

Pirolli & Card 2005, Davenport et al. 1996, Markus 2001

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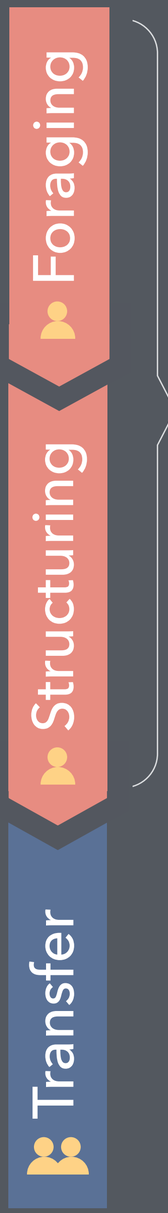

Unakite (UIST 2019)
Honorable Mention (top-6)

Crystalline (CHI 2022)

Wigglite (UIST 2022)

Pirolli & Card 2005, Davenport et al. 1996, Markus 2001

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Strata (CSCW 2021)
Best paper (top 1%)

Pirolli & Card 2005, Davenport et al. 1996, Markus 2001

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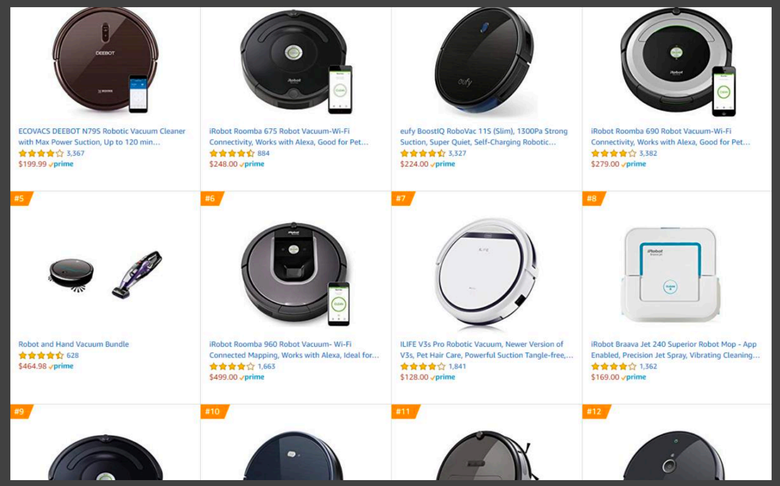
Programming



Consumer purchasing

Foraging

Structuring

Transfer

Unakite (UIST 2019)

Honorable Mention (top-6)

Crystalline (CHI 2022)

Wigglite (UIST 2022)

Proposed Work (2023)

Strata (CSCW 2021)

Best paper (top 1%)

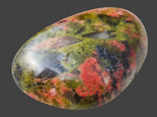
Pirolli & Card 2005, Davenport et al. 1996, Markus 2001

UIST 2019

Unakite: Scaffolding Developers' Decision-Making Using the Web

Honorable Mention (top-6)

Michael Xieyang Liu, Jane Hsieh, Nathan Hahn,
Angelina Zhou, Emily Deng, Shaun Burley,
Cynthia Taylor, Aniket Kittur, Brad A. Myers



***U**sers **n**eed **a**ccelerators for **k**nowledge for **i**mplementations in **t**echnology **e**nvironments*

Foraging

Structuring

Transfer

Trade-offs


REQUIRE·JS
npm
TS
REQUIRE·JS
D3
BABEL
JS
REQUIRE·JS
REQUIRE·JS
npm
TS
D3

Formative Study 1: **Developer Interviews**

15 developers (5 professionals, 10 students)

Goal: understand how developers currently collect and manage information about trade-offs

Finding 1: Making decisions is **frequent and difficult** in programming.

13 developers reported being frequently swamped in difficult decision making tasks (N=15).

> *trade-offs among optimization methods when training neural nets (e.g., "stochastic gradient descent", "augmented Lagrangian", etc.)*
>
> *– P9*

> *balance between cost and performance when picking cryptographic algorithms to protect users' sensitive information*
>
> *– P13*

Finding 2: Developers need **tool support** for making decisions

8 participants used existing tools to organize information (N=15). However, there are difficulties in:

- **Collecting content**

  "… copy-pasting is just too much work, and I lose all the styling" – P7

- **Maintaining provenance**

  "...whenever I save something, I always forget to also save the URL [of the source]" – P15

- **Synthesizing the new with existing content**

  "Evernote dumps everything I clip into a list of notes. There's no way for me to organize them" – P9

- **Tedious context switches**

  "I always find myself constantly switching back and forth between the notes tab and the other tabs" – P13

Finding 3: While making decisions, developers curate **mental tables** comparing different **options** with respect to different **criteria**

	Fast?	dev community	documentation	supported by
React	yes	Really large	https://reactjs.org/	facebook
Angular	?	Also large	Not so easy to understand https://angular.io/docs	google
Vue	yes	?	Very detailed, Very easy to understand https://vuejs.org/v2/guide/	Community, started by Evan You

P13's notes in a Google Doc on picking a JavaScript library

Unakite

A chrome extension that helps developer **collect** and **organize** information while searching and browsing

Design Goals (based on formative studies + prior work)

[D1] Scaffolding: helping developers form systematic models when approaching decision making problems with tradeoffs.

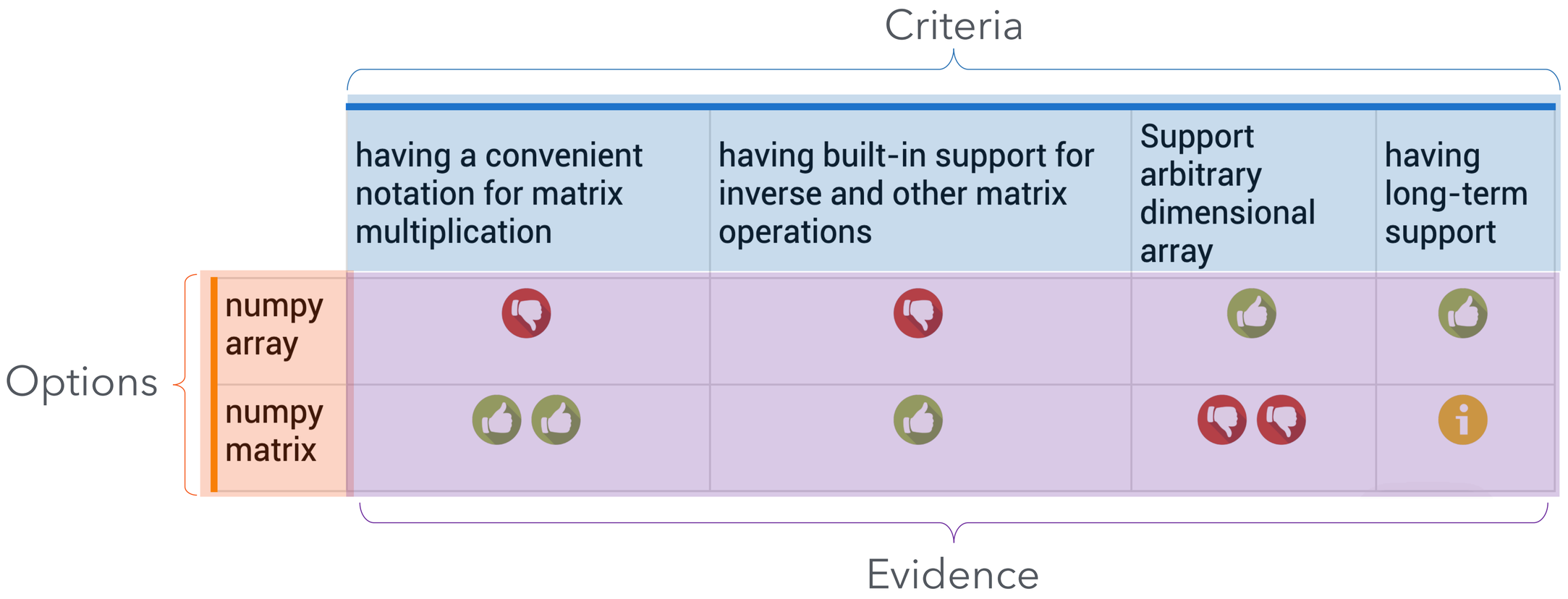
[D2] Lightweight interactions: reducing the cost of collecting and organizing content so that the entry barriers to use the tool are low.

[D3] Summarization: helping developers synthesize and summarize different pieces of content together and manage them.

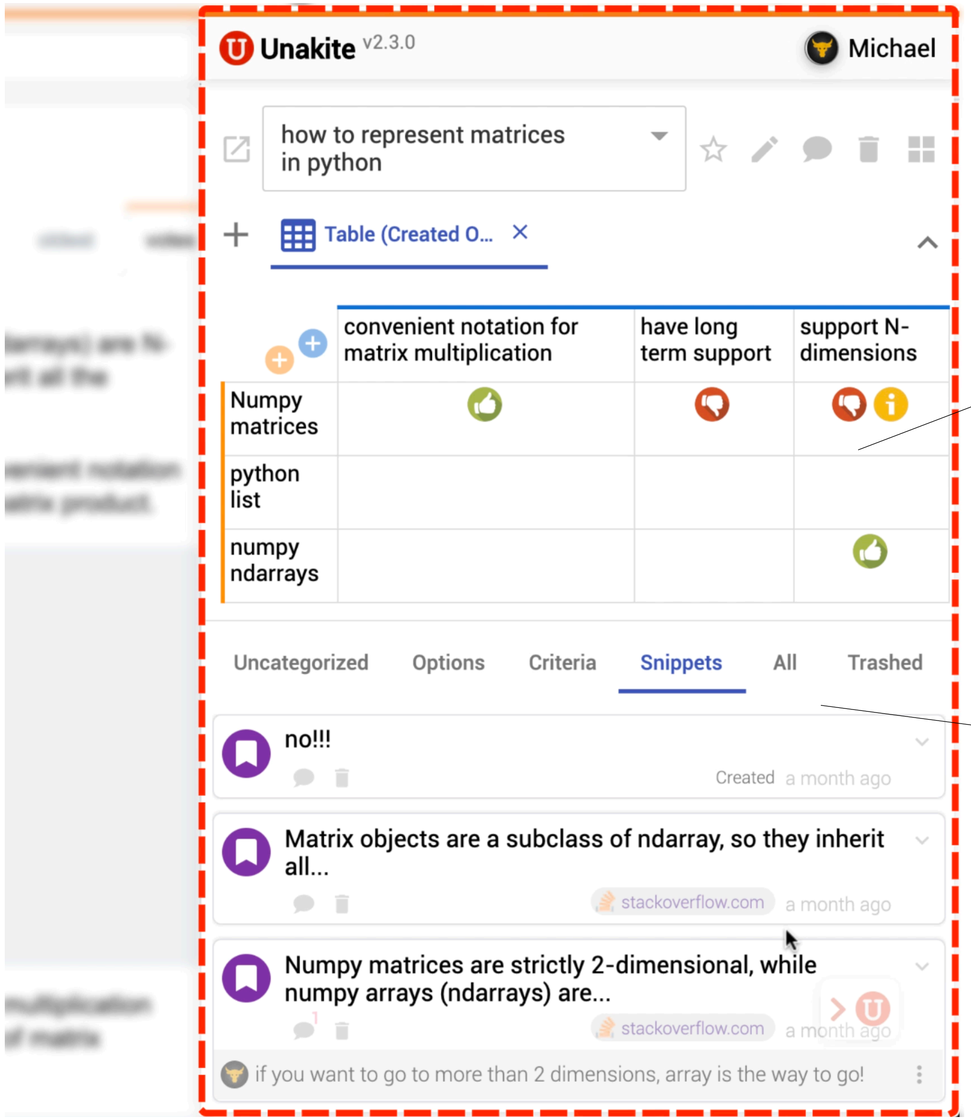
[D4] Contextualization: enabling developers to recreate the context from which information snippets were collected and copied.

[D1] Scaffolding

The “Option-Criterion-Evidence” framework



[D2] Lightweight interactions



Comparison table

Snippet repository

[D3] Summarization

Comparison Table: a high-level summary of the decision-making space

	having a convenient notation for matrix multiplication	having built-in support for inverse and other matrix operations	Support arbitrary dimensional array	having long-term support
numpy array				
numpy matrix				

[D3] Summarization

Ratings as evidence

	having a convenient notation for matrix multiplication	having built-in support for inverse and other matrix operations	Support arbitrary dimensional array	having long-term support
numpy array	👎	👎	👍	👍
numpy matrix	👍 👍	👍	👎 👎	ℹ

positive

negative

informational

Zhang et al. 2017

Evidence

	having a convenient notation for matrix multiplication	having built-in support for inverse and other matrix operations	Support arbitrary dimensional array	having long-term support
numpy array	👎	👎	👍	👍
numpy matrix	👍 👍 I can basically do a*b	👍	👎 👎	ℹ

Uncategorized | Options | Criteria | Snippets | All | Trashed

Python 3.5 NumPy supports infix (@) operator for matrix multiplication

stackoverflow.com 7 months ago

I tried the infix operator and it worked like a charm!

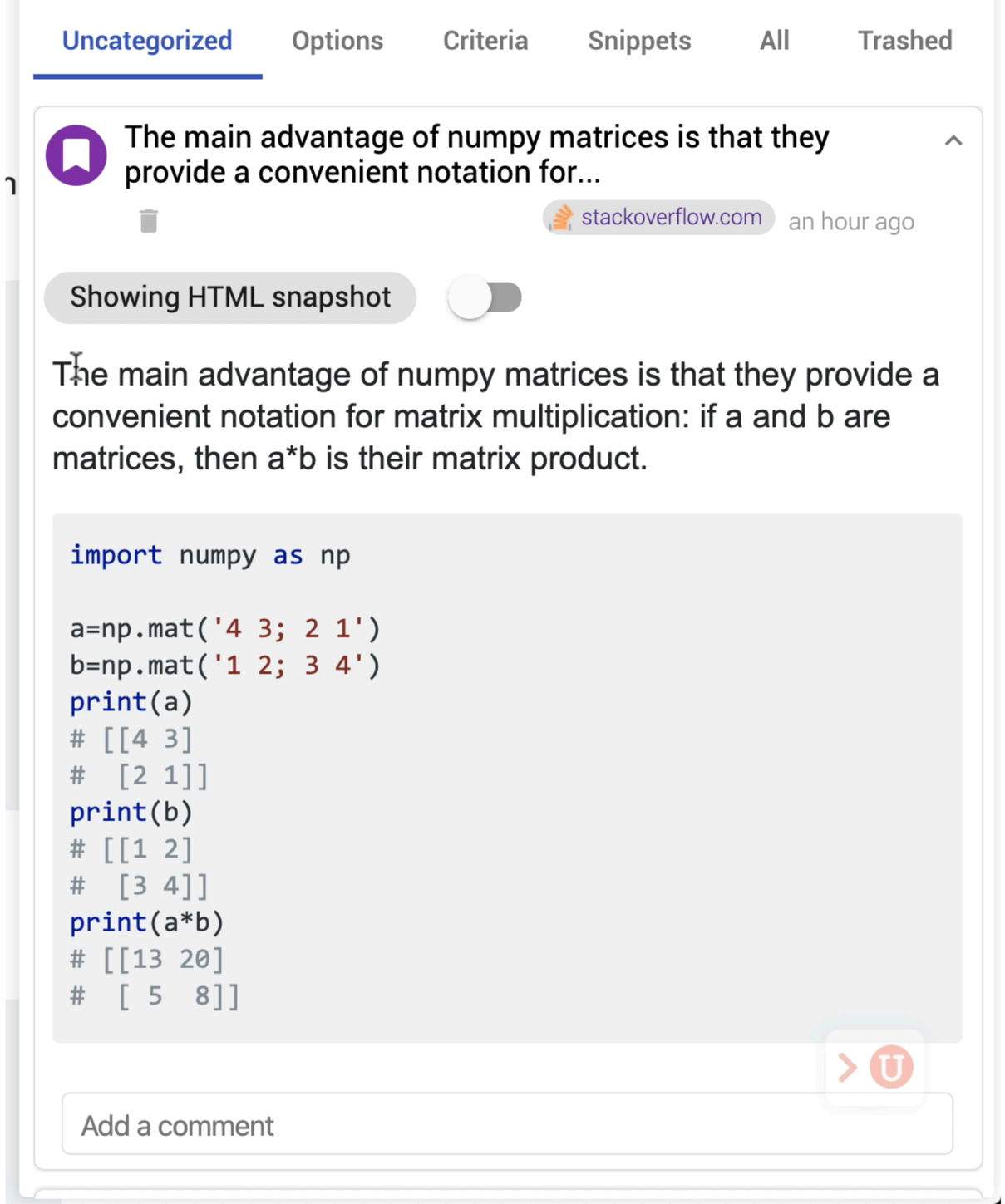
matrix will be deprecated in the future

docs.scipy.org 7 months ago

I thought numpy matrix can't do high dimensional vector manipulations

Created 7 months ago

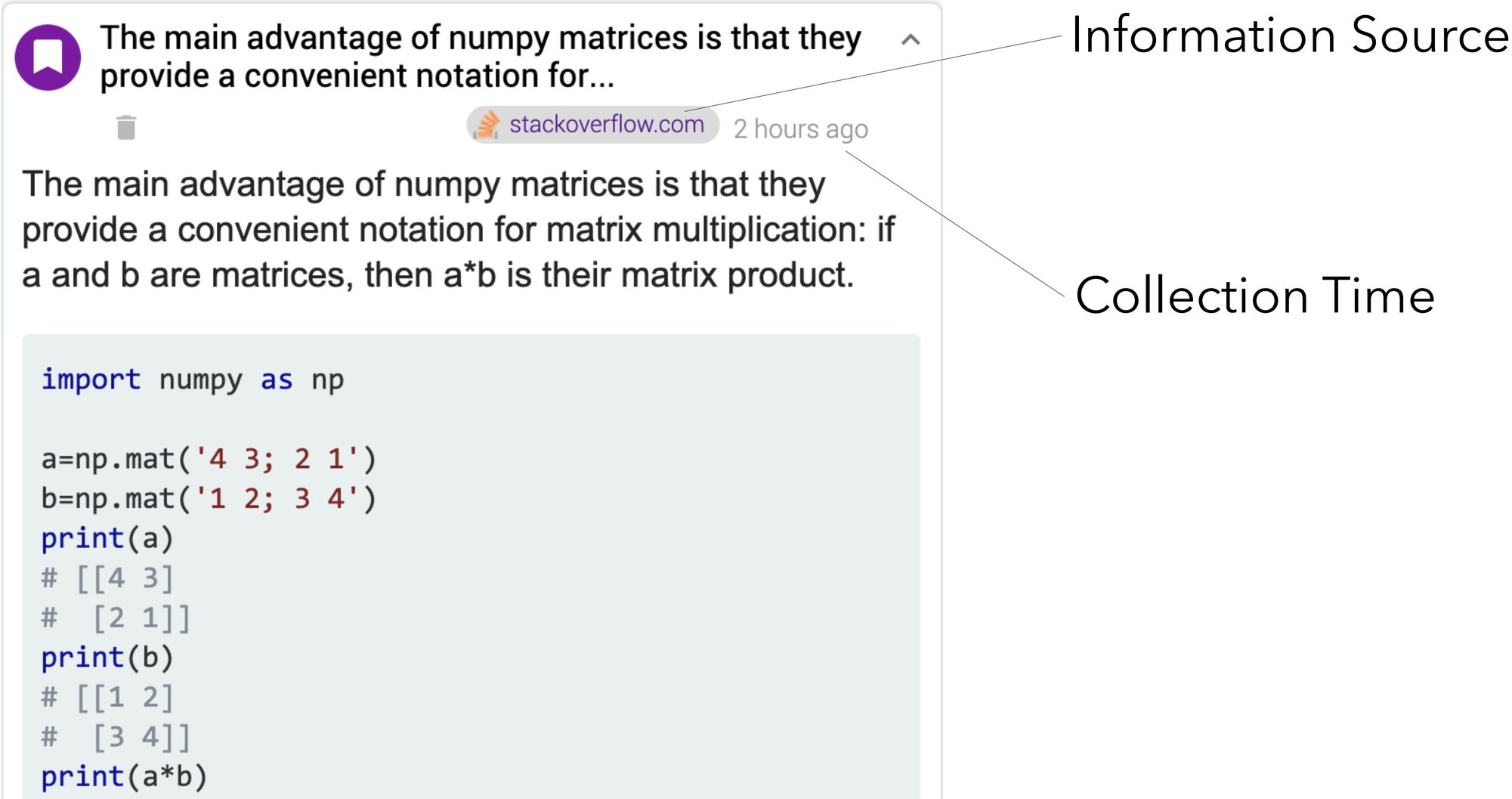
Clicking on the rating icons in the comparison table reveals its corresponding evidence snippet



Snippet

- Original HTML with styling
- Easy to recognize

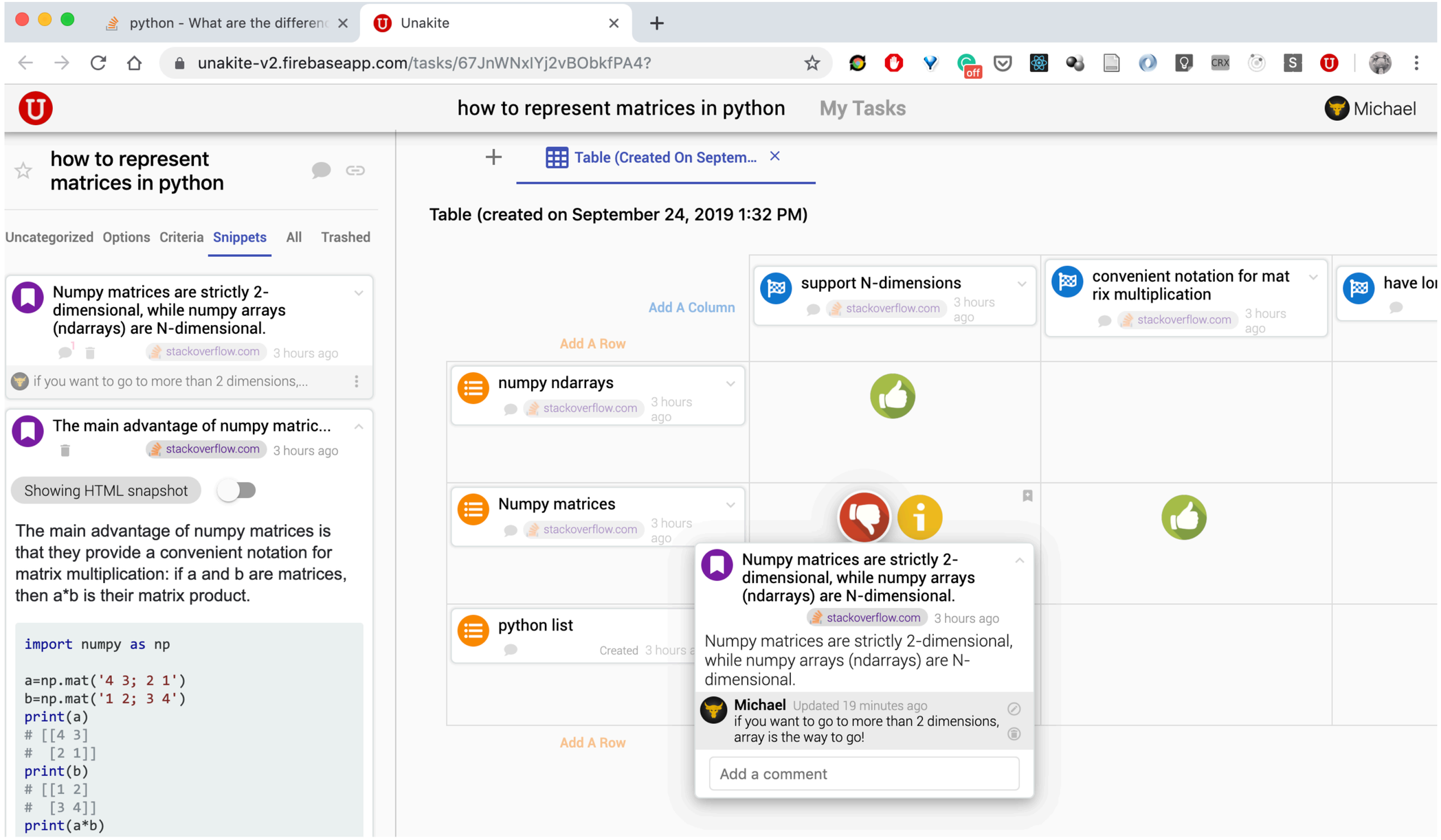
Snippet Metadata



Information Source

Collection Time

Unakite web app



Study 1: **Authoring**

- Goal: Evaluate the **usability** and **effectiveness** of Unakite.
- Tasks: Collect information from Stack Overflow pages and organize them into comparison tables.
- Between-subjects design: The control group used Google Doc to make tables, while the experimental group used Unakite.

Study 1: **Authoring**

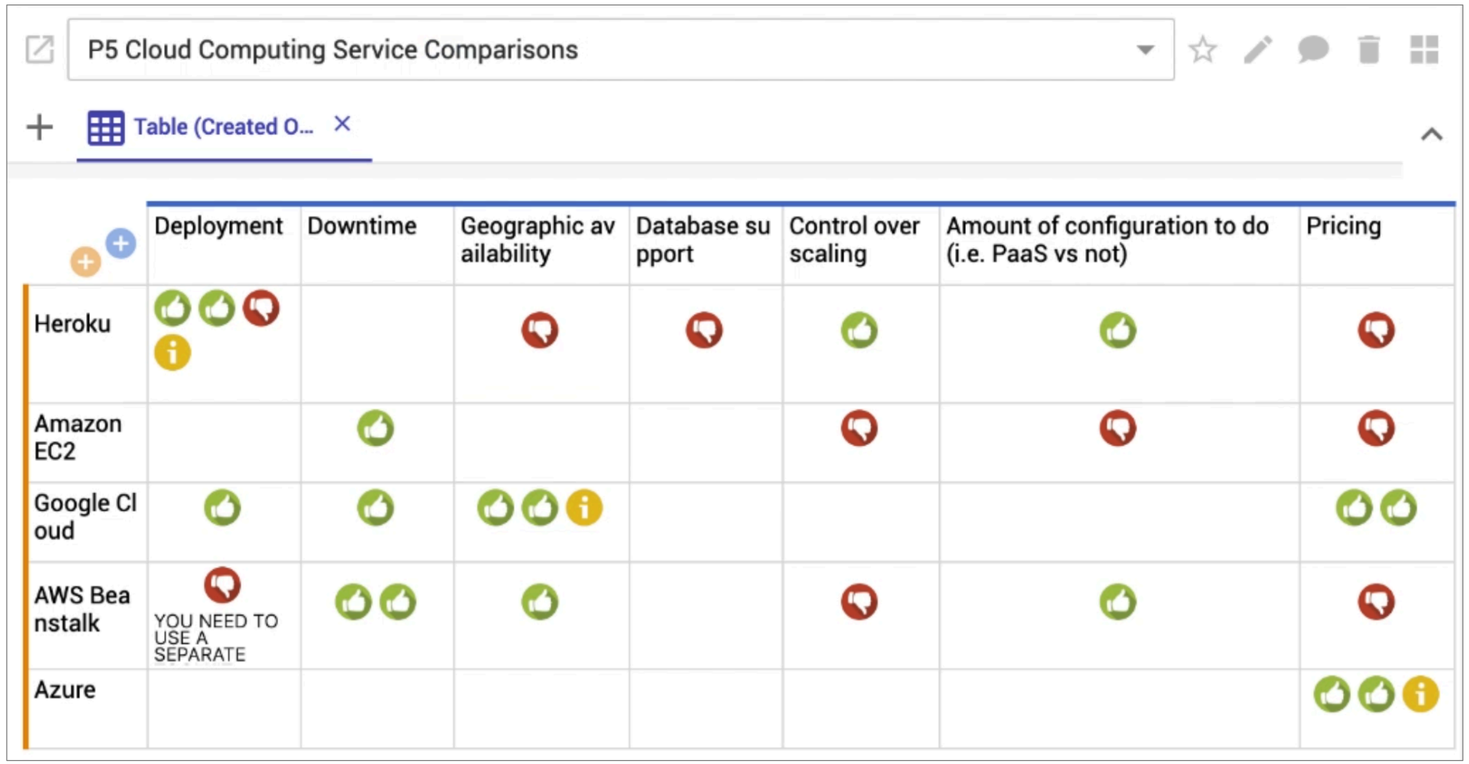
- Recruited 20 participants (13 w/ professional experience, 7 students), each completed two tasks in the same condition.
- After the initial two tasks, all participants then used Unakite for a programming task they were trying to solve in real-life.

Study 1: Results - **Unakite is usable!**

- All participants are able to use the various Unakite feature.
- On average, participants collected 3 options, 4 criteria, 16 snippets, and made 12 ratings.

	Availability of Learning Resources	Popularity	Ease of Integration (with Other Libraries)	Core Features	Usability
React	👍	👍	ℹ	ℹ	👍 👎
Angular	👍	👍	👍 👎	👍 👎	👍
Vue		👎	ℹ	ℹ	👍 👎
EmberJS	👍 👎	👎	ℹ	👍 👎	👍 👎

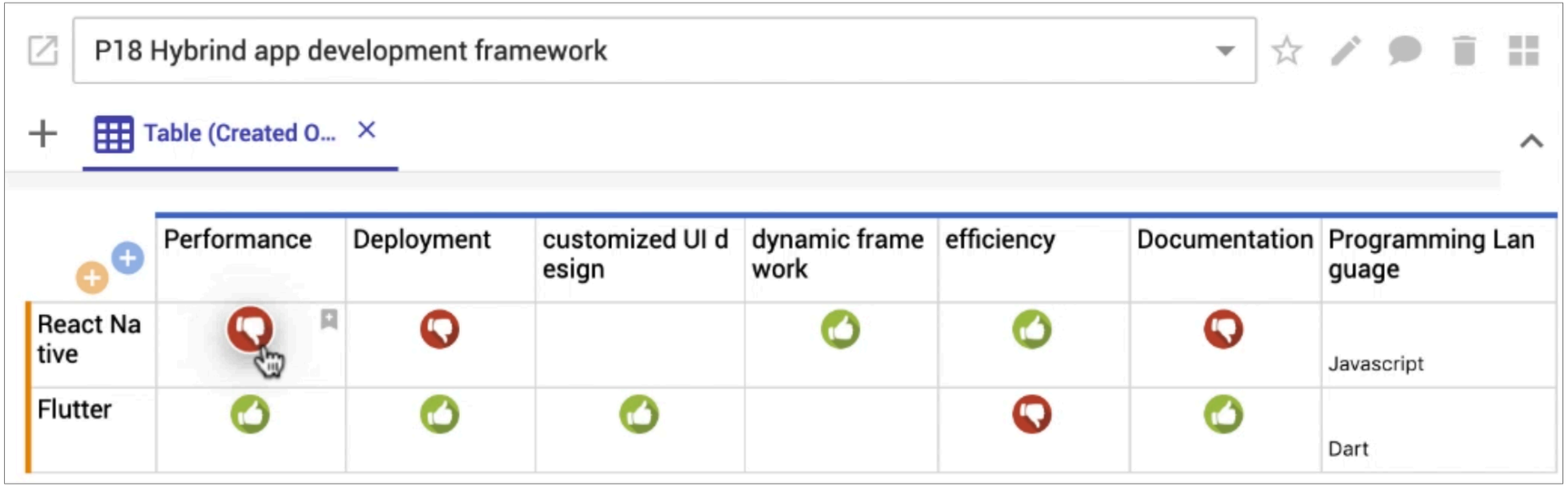
Participant P13's comparison table capturing the trade-offs in choosing JavaScript front-end frameworks.



	Deployment	Downtime	Geographic availability	Database support	Control over scaling	Amount of configuration to do (i.e. PaaS vs not)	Pricing
Heroku							
Amazon EC2							
Google Cloud							
AWS Beanstalk	YOU NEED TO USE A SEPARATE						
Azure							

Trade-offs in choosing cloud computing service comparisons. (P5)

Trade-offs in choosing hybrid app development framework. (P18)



	Performance	Deployment	customized UI design	dynamic framework	efficiency	Documentation	Programming Language
React Native							Javascript
Flutter							Dart

Study 1: Results - **Unakite is more efficient!**

- Overhead cost: the percentage of the time spent on directly using tool features
  - Google Doc: copy-pasting, formatting, maintaining table, etc.
  - Unakite: selecting (snapshot), drag & drop, etc.

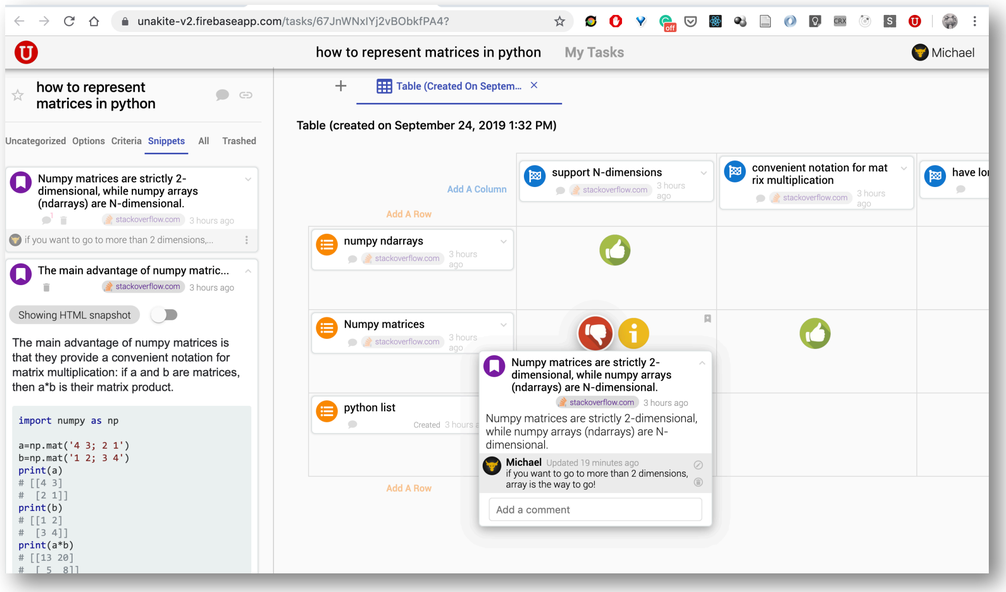
Unakite (25%) v.s. Google Doc (44%)

($p < 0.01$)

Study 2: **Understanding**

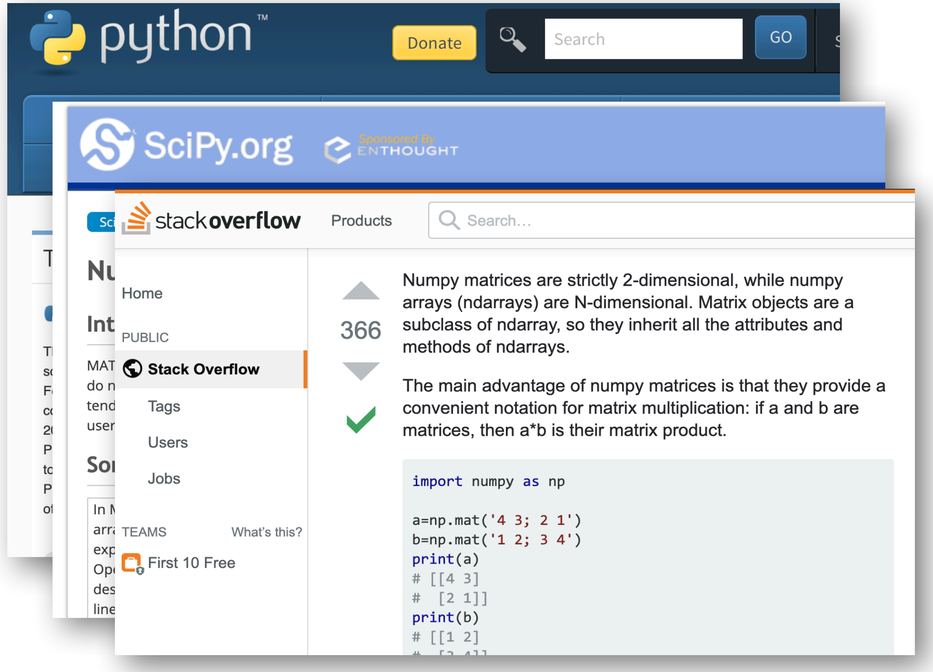
- Goal: Evaluate developers' ability to **understand** the trade-offs and decisions with Unakite
- Tasks: Explain code decisions made by a previous developer
- 16 participants (9 w/ professional experience, 7 students), within-subjects design, each completed one task in each condition

Study 2: **Understanding**



Unakite condition:

explore pre-made comparison table

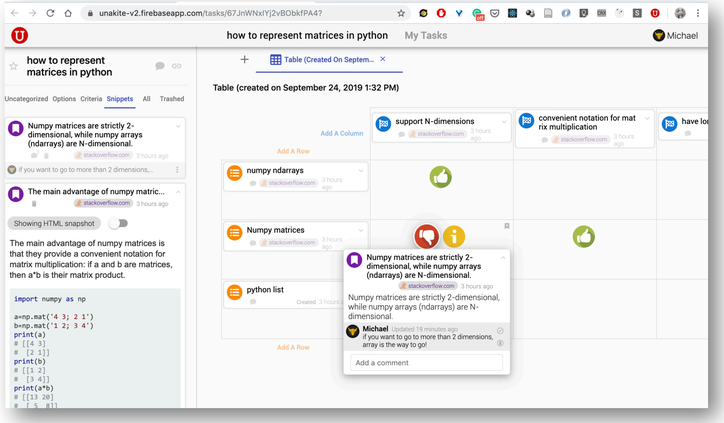


Control condition:

read *the same* set of web resources

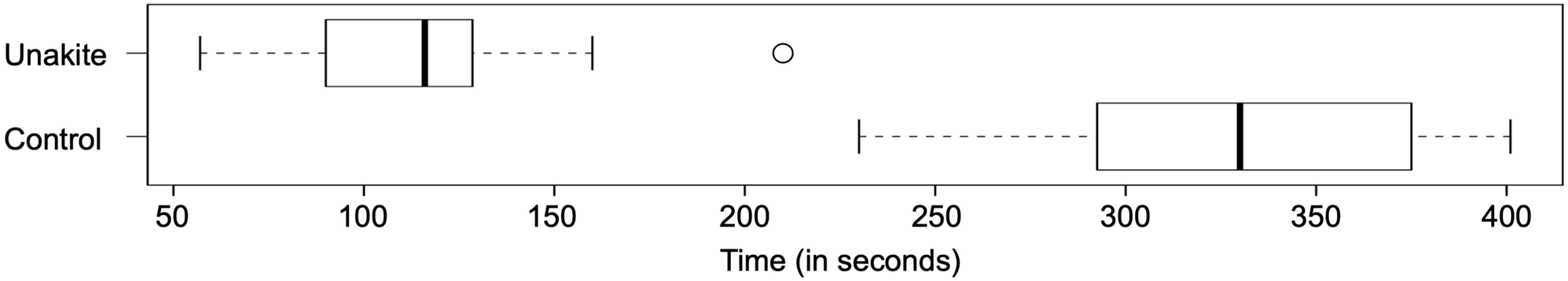
Study 2: Result -

Understanding decisions with Unakite is faster!



115 seconds (about 2 min)

332 seconds (about 5 min 30 sec)



($p < 0.01$)

CSCW 2021

Strata: A Framework and System for Evaluating and Reusing Summarized Knowledge

Best paper (top 1%)

Michael Xieyang Liu, Aniket Kittur, Brad A. Myers

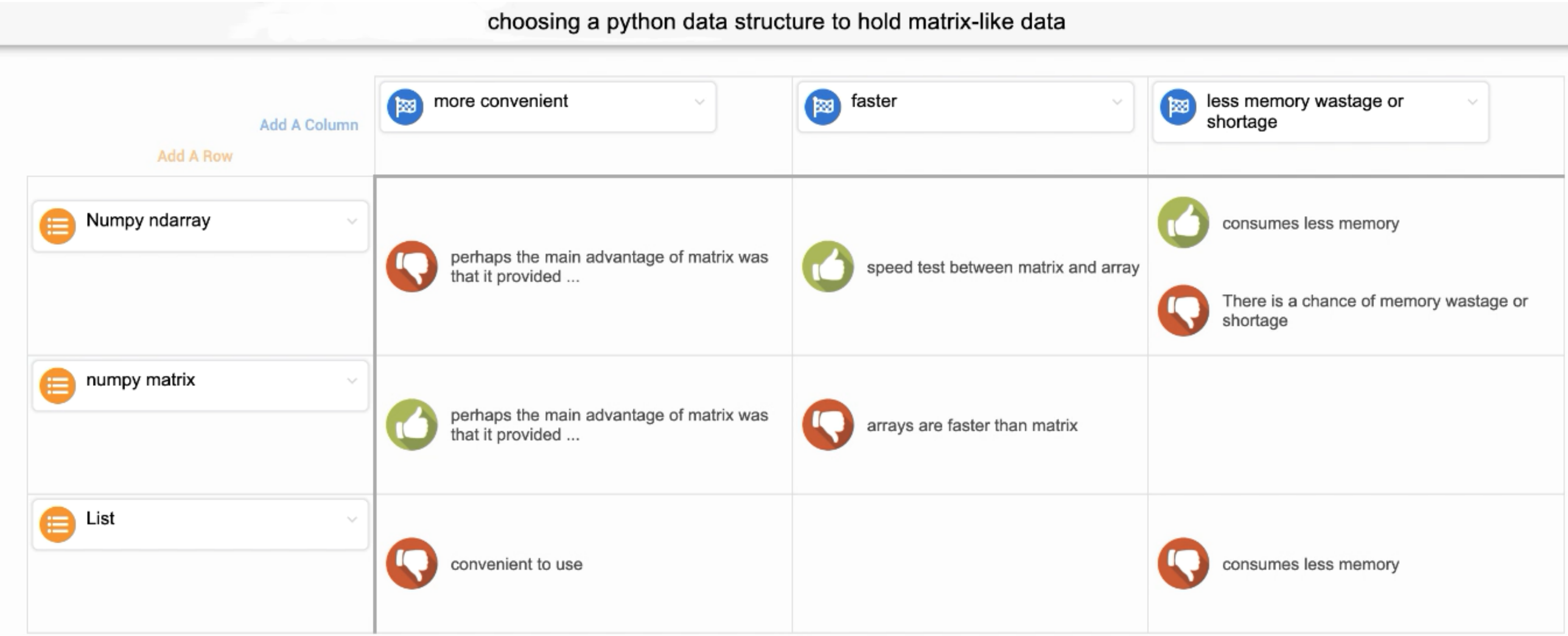
***S**idebar **t**owards **r**euse and to **a**ssess **t**rustworthiness and **a**pplicability*

Foraging

Structuring

Transfer

Key challenge: **appropriate to reuse?**



Our approach: **framework + system**

+

choosing a python data structure to hold matrix-like data

	more convenient	faster	less memory wastage or shortage
Numpy ndarray	perhaps the main advantage of matrix was that it provided ...	speed test between matrix and array	consumes less memory There is a chance of memory wastage or shortage
numpy matrix	perhaps the main advantage of matrix was that it provided ...	arrays are faster than matrix	
List	convenient to use		consumes less memory

Original Unakite table

Framework

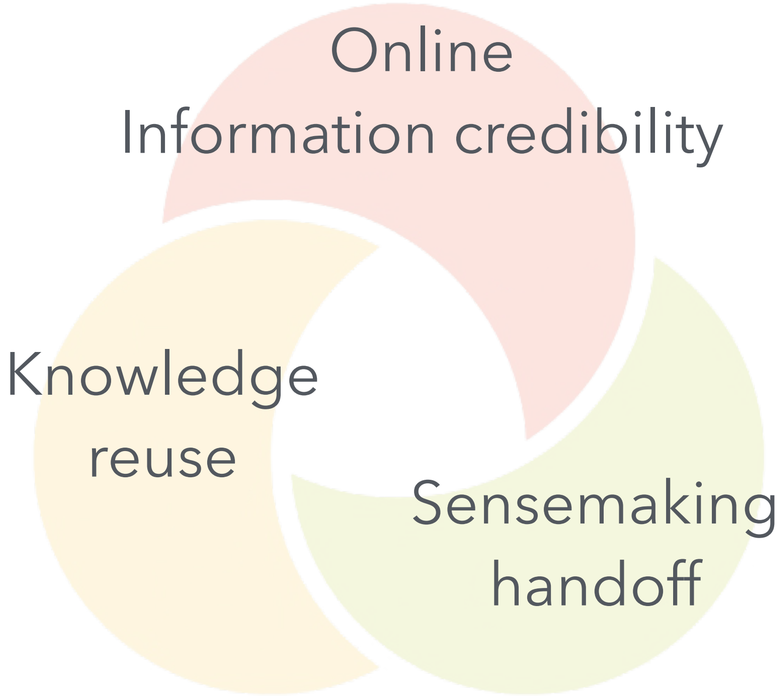
Strata system

Generating **framework** that guides knowledge reuse

Exploratory Interviews

N = 15,
with developers

Literature Review



Framework

Context

- Goals of the original decision
- Contextualization of information
- Situational awareness

Trustworthiness

- Source credibility and diversity
- Information up-to-dateness
- Information popularity
- Information consistency
- Author credibility

Thoroughness

- Research process and effort
- Alternatives or competitors
- Usable artifacts

Context | **Trustworthiness** | **Thoroughness**

Goals of the original decision [23, 92, 100, 101, 111, 126]

"This looks like it's trying to pick a speech recognition API, but what I want is actually text to speech."

Contextualization of information [43, 83, 85, 118]

"What does this 'very efficient' mean, is it 'memory' or 'time' efficient?"

Situational awareness [17, 33, 92, 93, 100, 109, 111]

"I'm using Python 2.7 at the moment, which is fairly old, does this example also use this version?"

Context | **Trustworthiness** | Thoroughness

Source credibility and diversity [35, 39, 43, 87, 108, 118]

Information up-to-dateness [15, 26, 87]

Information popularity [86, 108]

Information consistency [86, 87]

Author credibility [35, 65, 108, 113, 116]

"If it's from Stack Overflow, I'm usually fine with it. But if it's from some random blog posts written by some random guy, I would think twice."

"Is this speed comparison [between React, Angular, and Vue] up-to-date now that Angular 9 was just released?"

Context | Trustworthiness | **Thoroughness**

Research process and effort [100, 101, 109, 131]

"How much effort was put into making this decision?" | *"What did the author focus on?"*

Alternatives or competitors [35, 87]

"I heard anecdotally that Svelte gives you much better performance than all these big (JavaScript) frameworks [React, Angular, and Vue]. I should take a look at that before I decide."

Usable artifacts [27, 97, 102]

"[Are there] any code snippets that I can immediately plug into mine and test?"

choosing a python data structure to hold matrix-like data

Add A Column

Add A Row

	more convenient	faster	less memory wastage or shortage
Numpy ndarray	perhaps the main advantage of matrix was that it provided ...	speed test between matrix and array	consumes less memory There is a chance of memory wastage or shortage
numpy matrix	perhaps the main advantage of matrix was that it provided ...	arrays are faster than matrix	
List	convenient to use		consumes less memory

Strata system – extracting signals for reuse

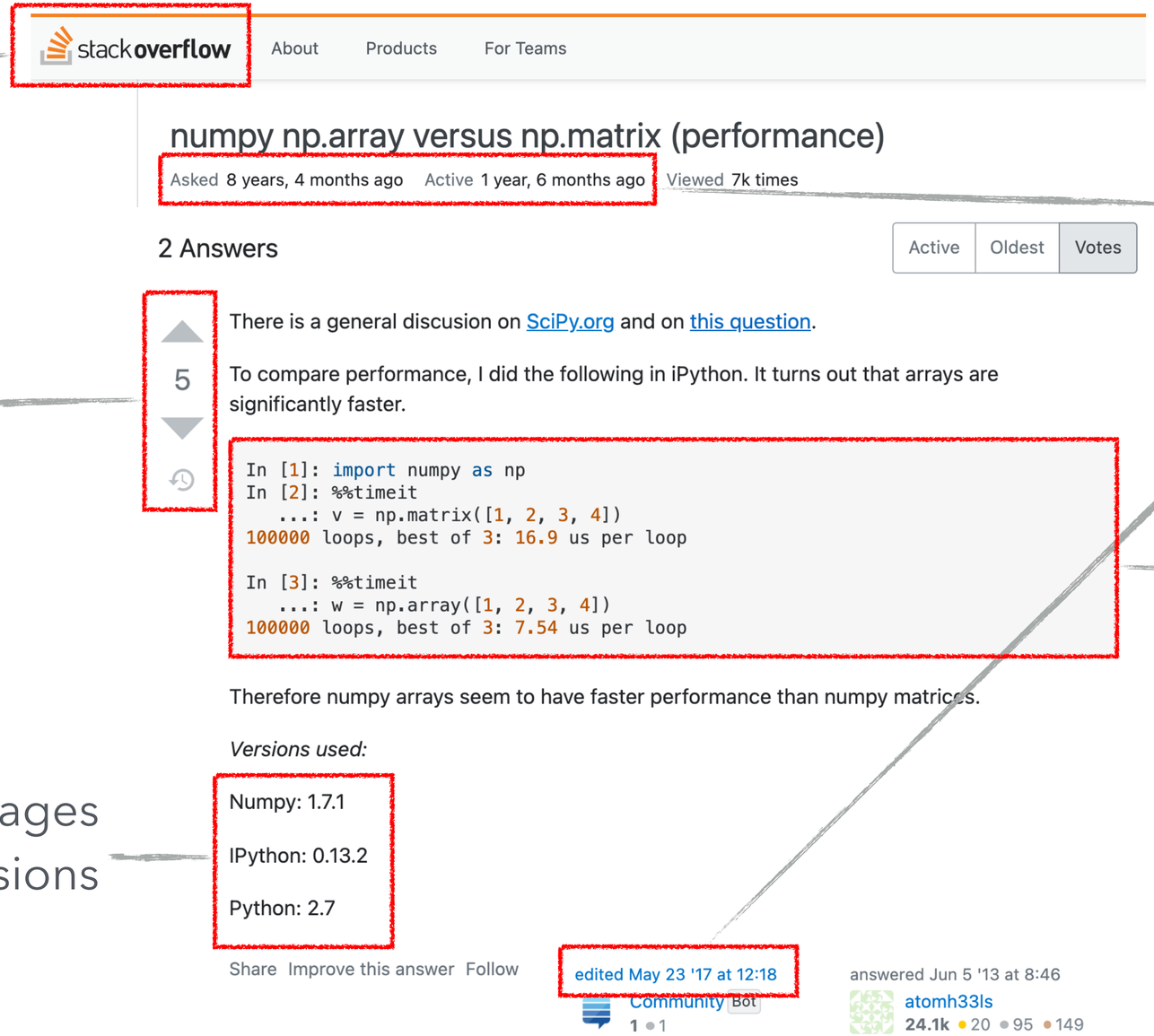
Source domain

Timestamps

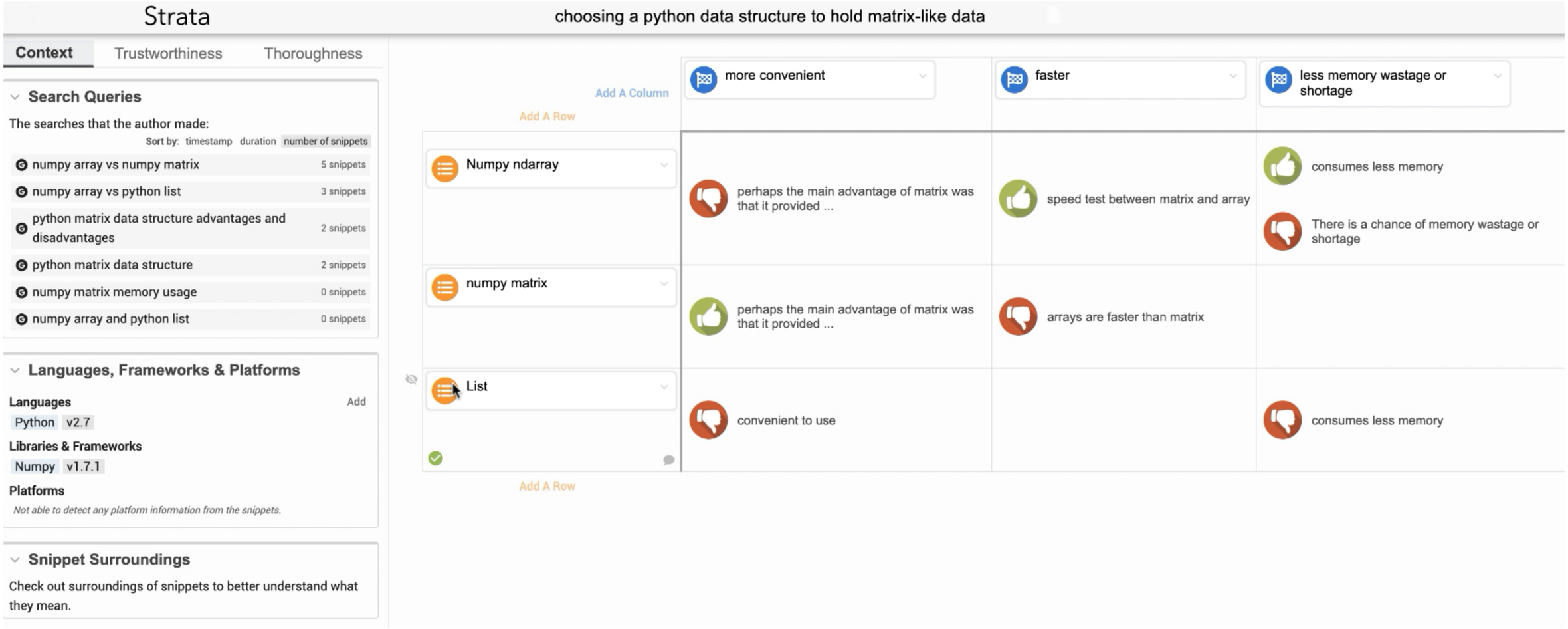
# of up-votes

Example code

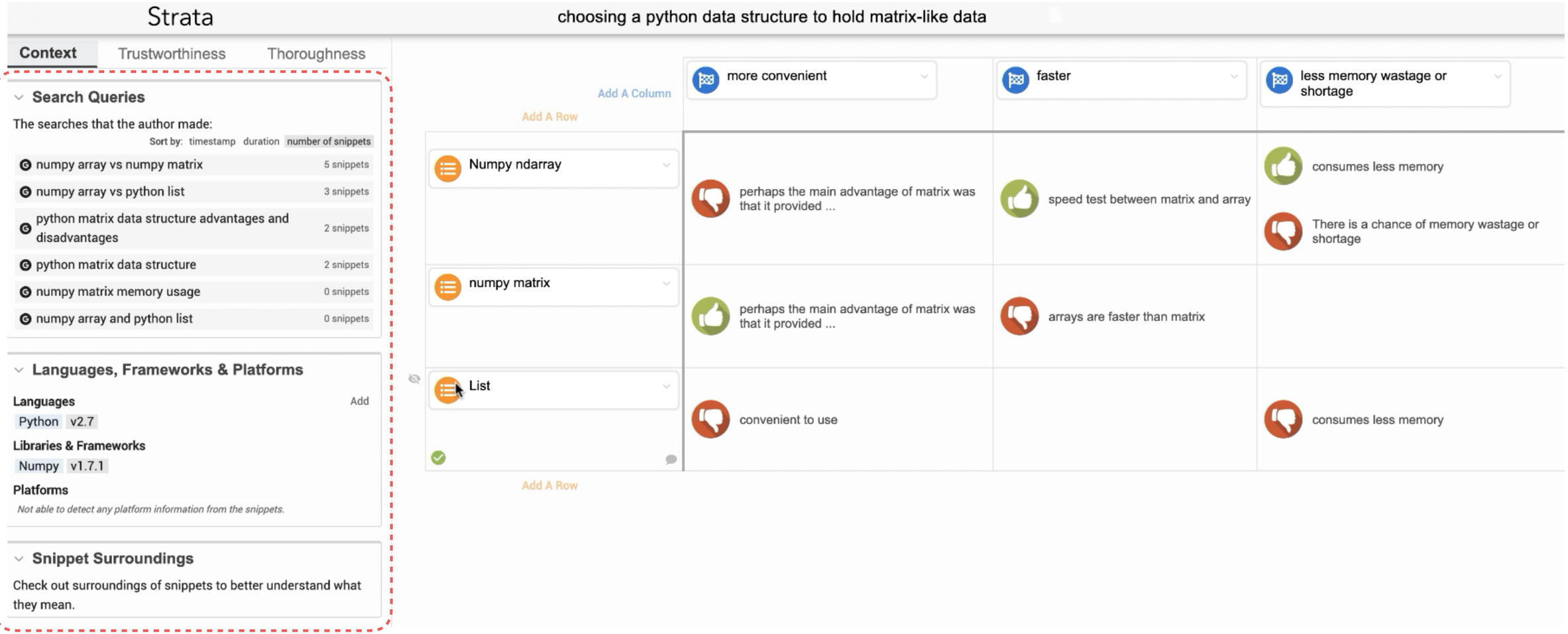
Libraries, languages & versions



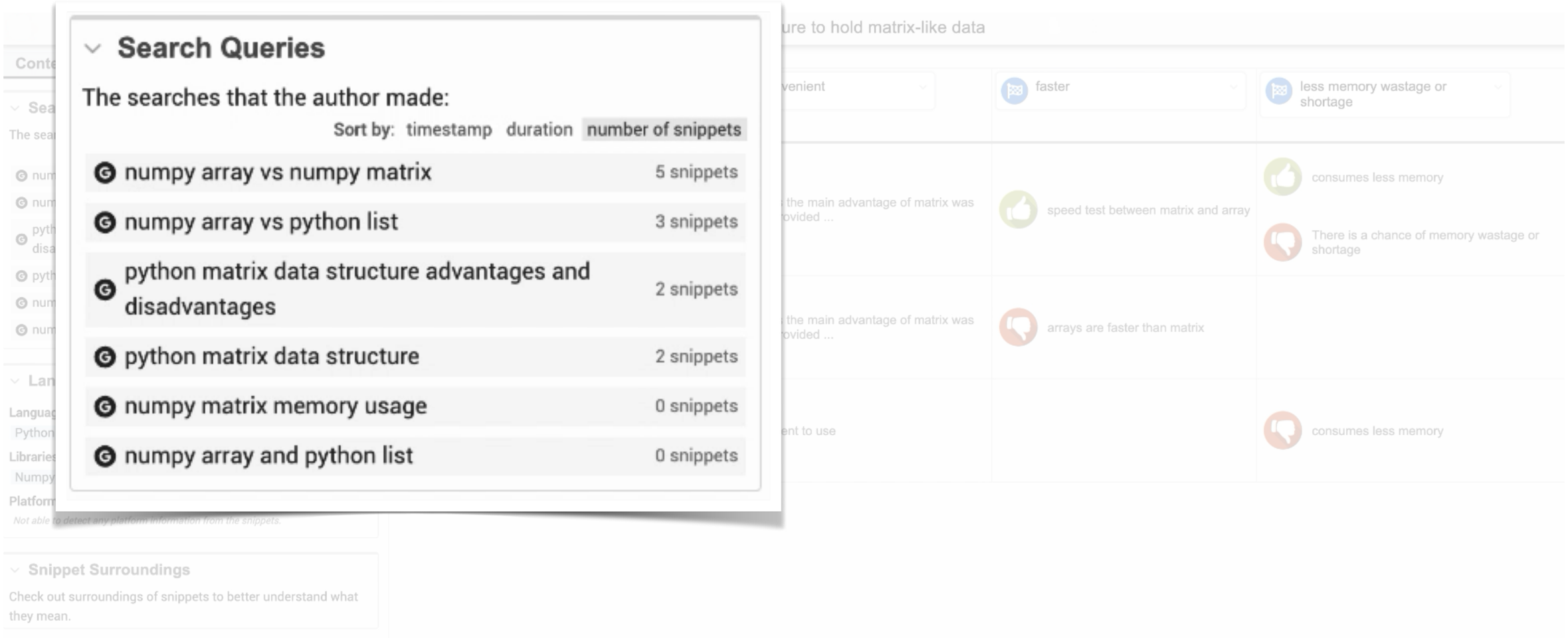
Strata system – augmenting Unakite tables



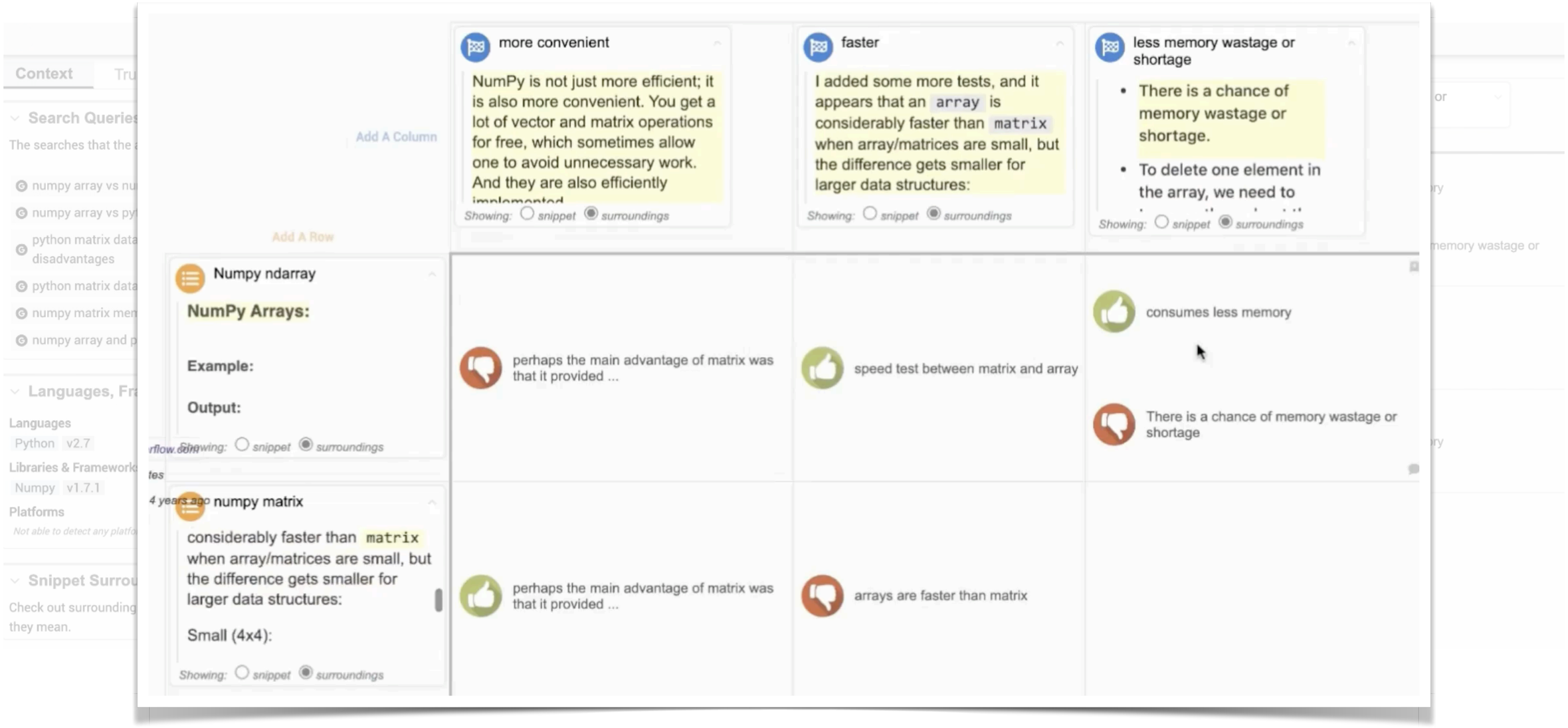
Context panel



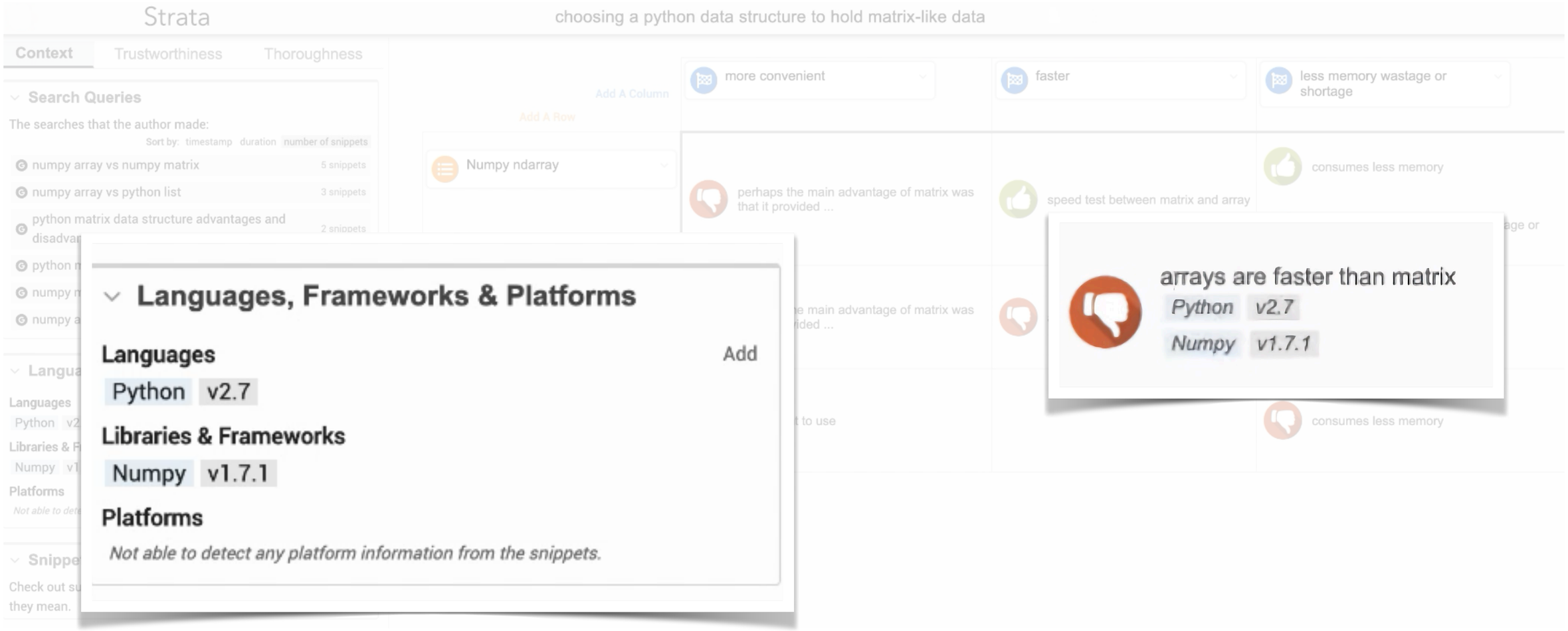
Context panel



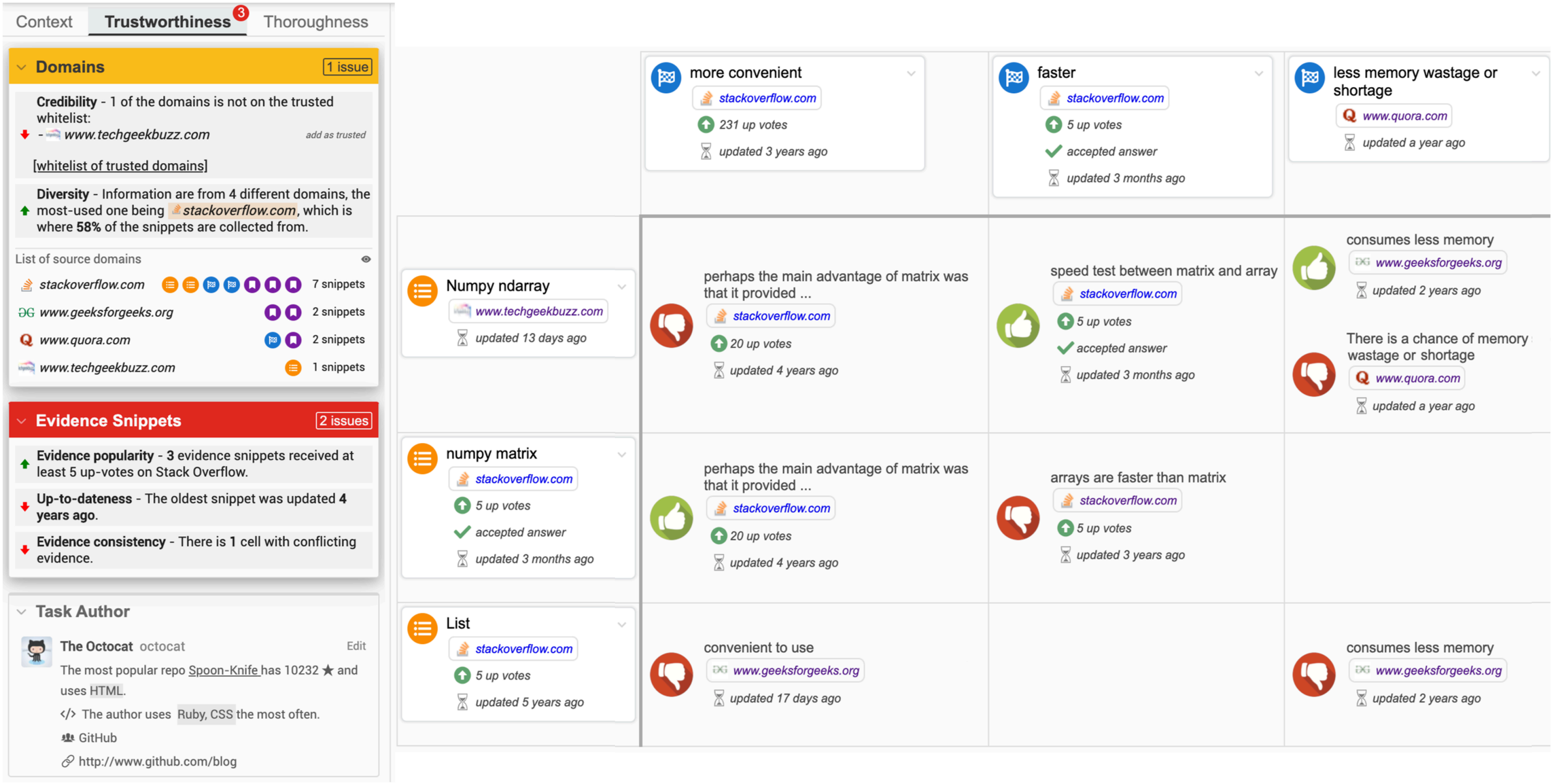
Context panel



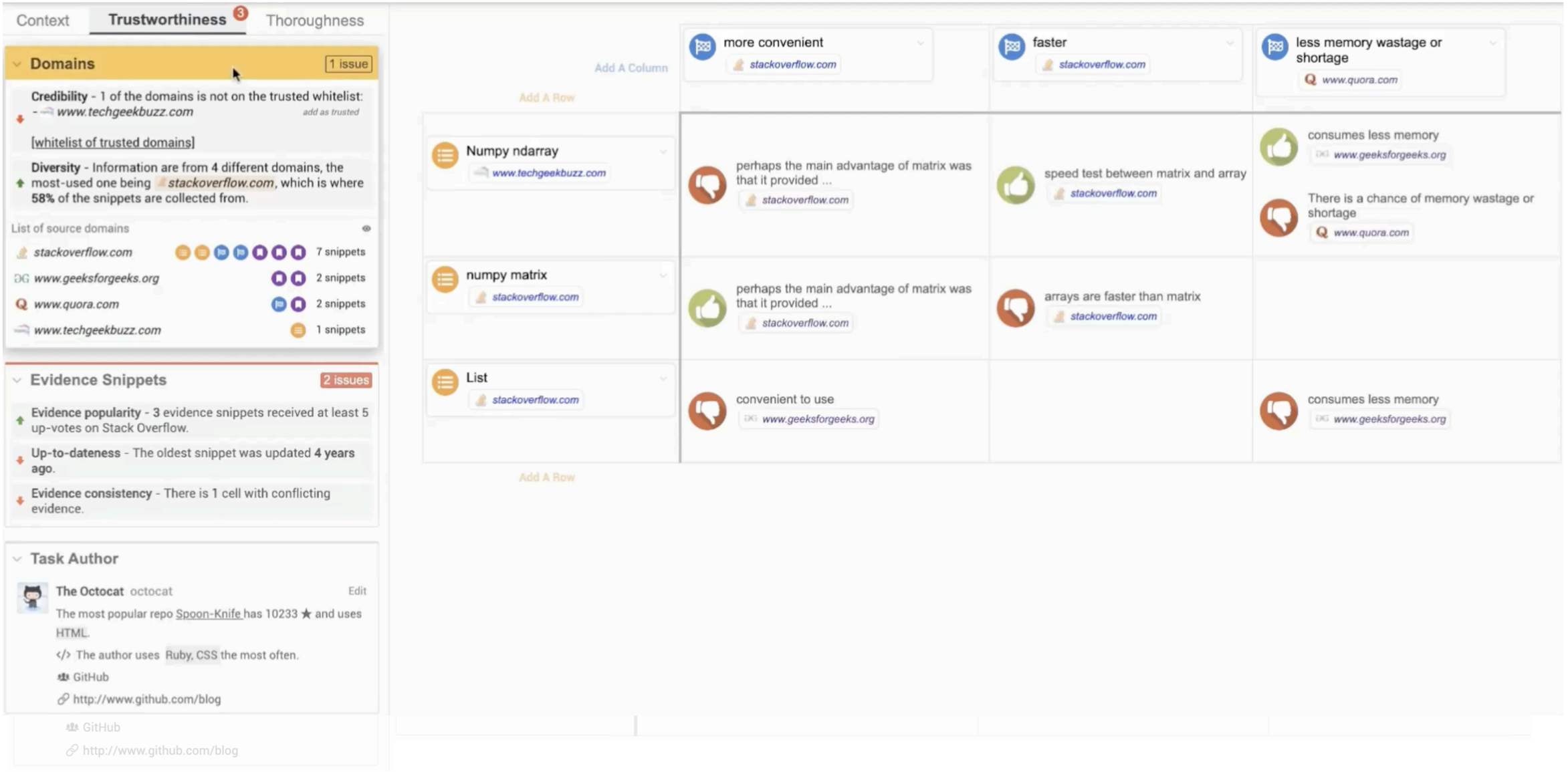
Context panel



Trustworthiness panel



Trustworthiness panel



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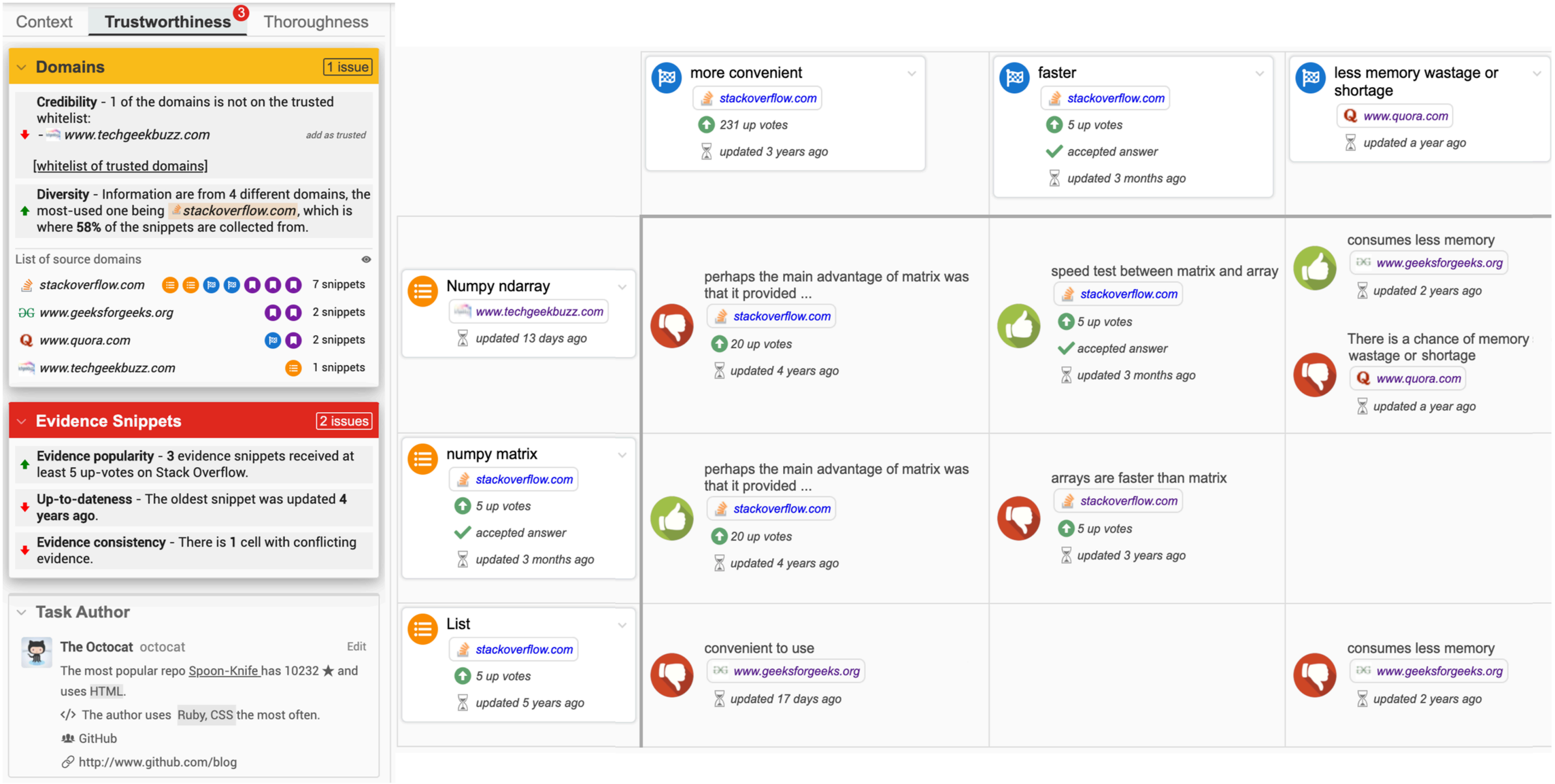
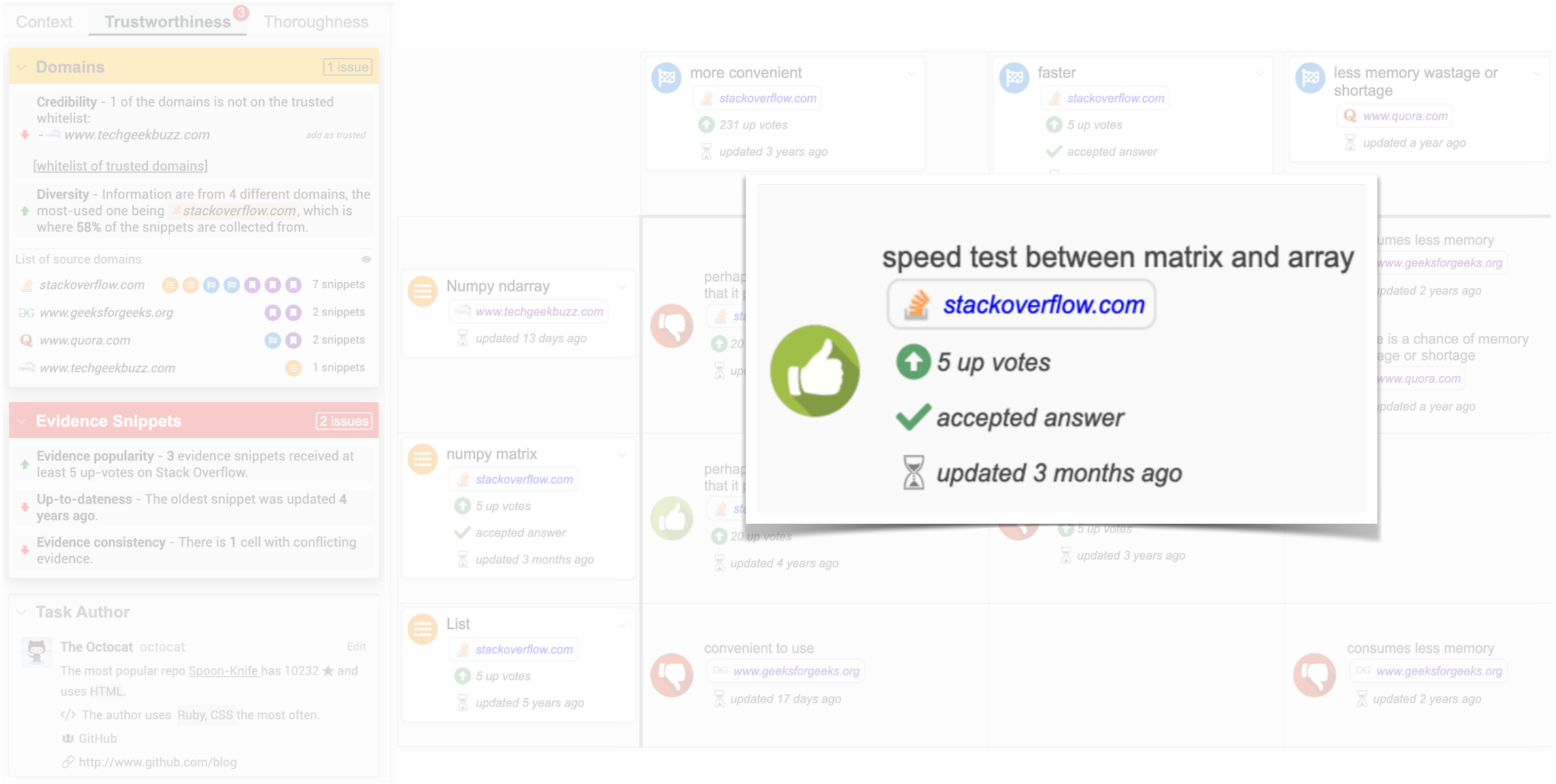
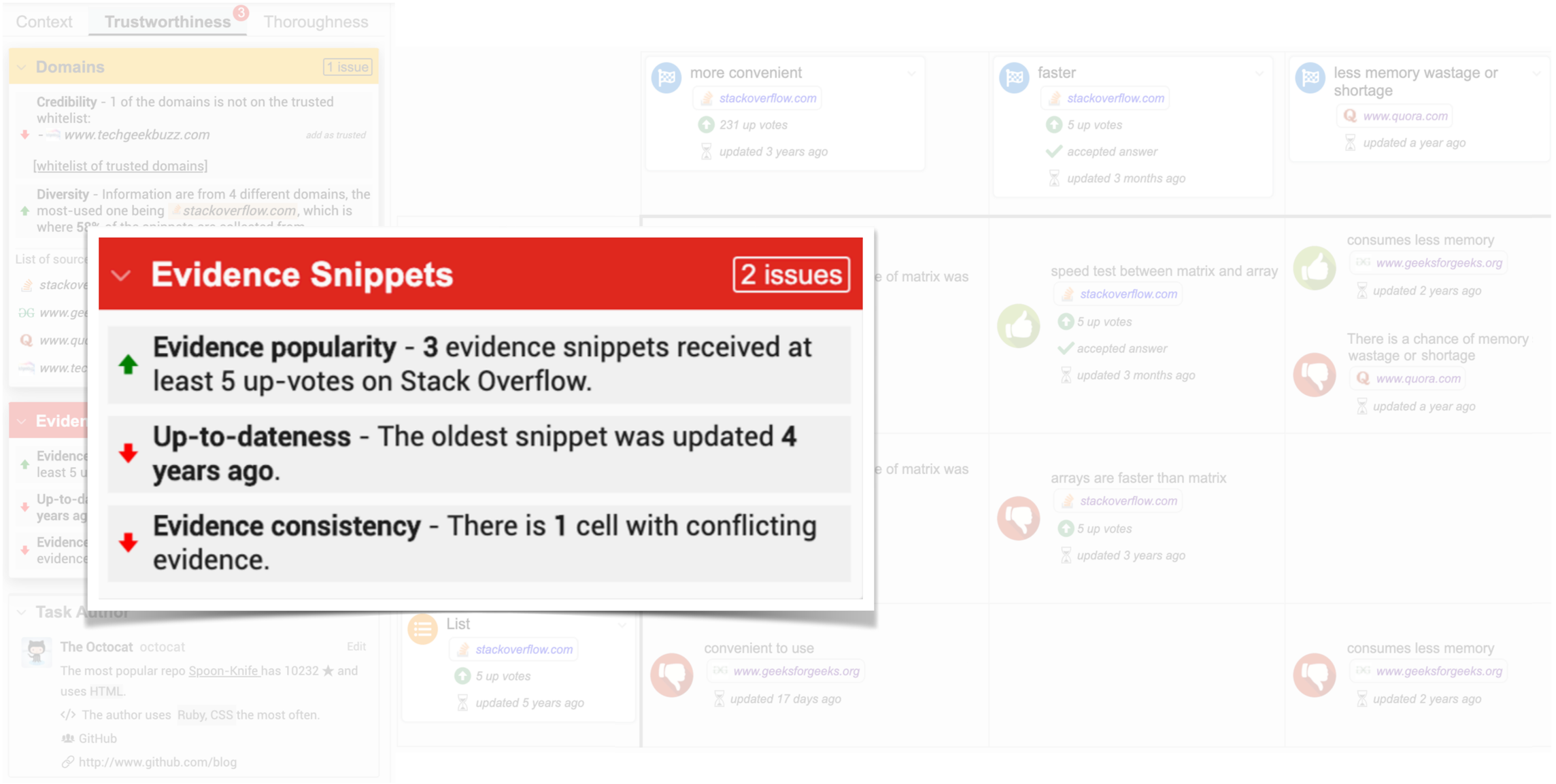


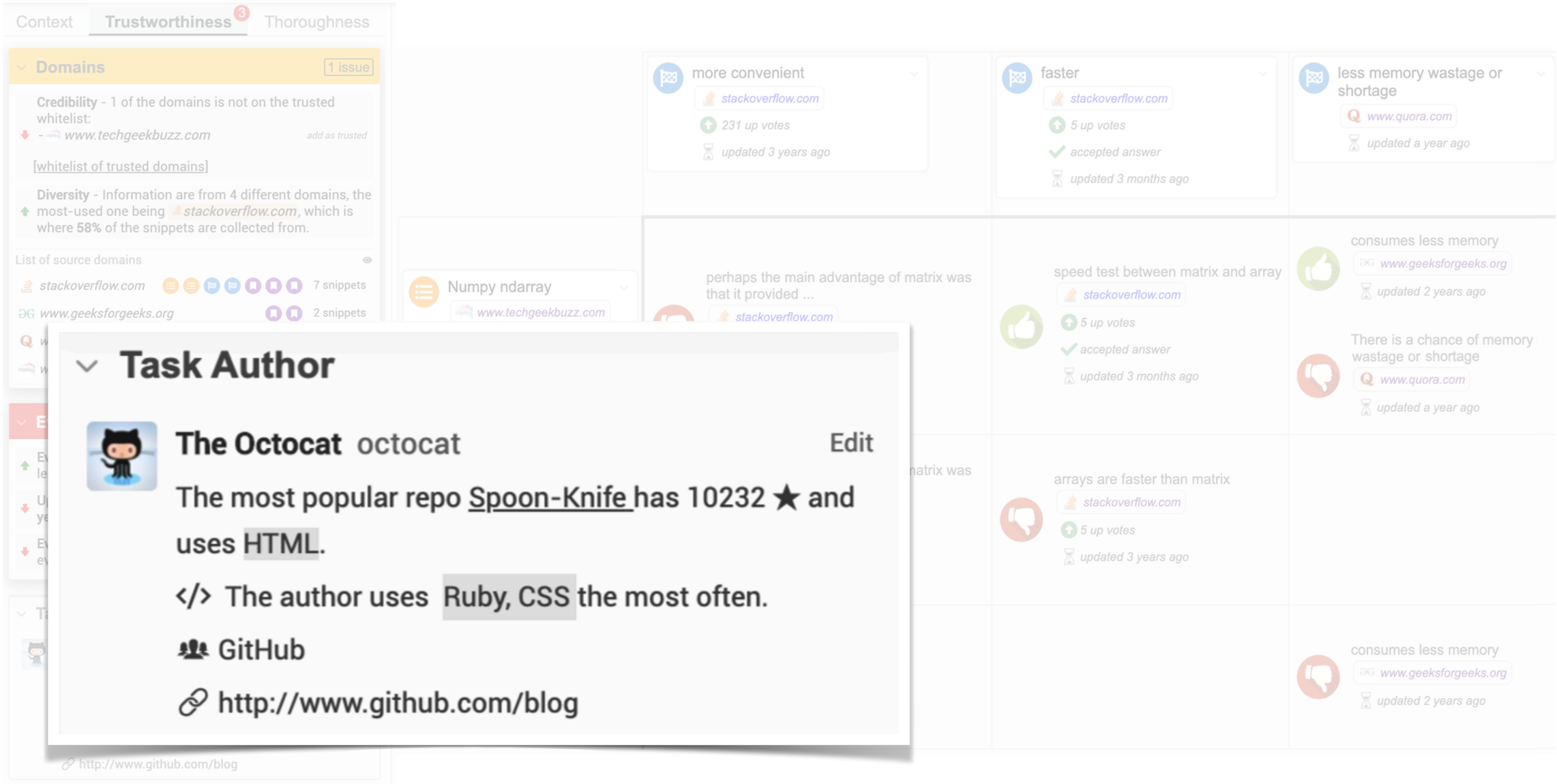
Trustworthiness panel



Trustworthiness panel



Trustworthiness panel



Thoroughness panel

Context | Trustworthiness | **Thoroughness**

Research Process

0 issue

Time spent - The author spent a total of about **an hour** on the task. The task was updated **18 days ago**.

Information collected - The author went through **10** pages, and collected **12** snippets, of which **3** are options, **3** are criteria, and **6** are evidence snippets.

Timeline

- **python matrix data structure** — 5 minutes
  - Python Matrix — 2 minutes
    - Numpy ndarray
  - matrix - How to represent matrices in python - Stack Overflow — a minute
    - List
  - python - Matrix data structure - Stack Overflow — a minute
  - Python Matrix and Introduction to NumPy - Programiz — a minute
- **python matrix data structure advantages and disadvantages** — 9 minutes
  - What are the advantages and dis-advantages of array? - Quora — 9 minutes
    - There is a chance of memory wastage or shortage
    - less memory wastage or shortage
- **numpy array and python list** — (0 pages) a few seconds
- **numpy array vs python list** — 12 minutes
  - Python Lists VS Numpy Arrays - GeeksforGeeks — 2 minutes
    - convenient to use
    - consumes less memory
  - What are the advantages of NumPy over regular Python lists ... — 10 minutes
    - more convenient
- **numpy array vs numpy matrix** — 13 minutes
  - python - numpy np.array versus np.matrix (performance) - Stack Overflow — a minute
    - numpy matrix
    - speed test between matrix and array
    - faster
  - What are the differences between numpy arrays and matrices ... — 10 minutes
    - perhaps the main advantage of matrix was that it provided a convenient notation for matrix multiplication
  - python - numpy np.array versus np.matrix (performance) - Stack Overflow — 2 minutes
    - arrays are faster than matrix
- **numpy matrix memory usage** — (0 pages) a few seconds

	more convenient (stackoverflow.com)	faster (stackoverflow.com)	less memory wastage or shortage (www.quora.com)
Numpy ndarray (www.techgeekbuzz.com)	perhaps the main advantage of matrix was that it provided ... (stackoverflow.com)	speed test between matrix and array (stackoverflow.com)	consumes less memory (www.geeksforgeeks.org); There is a chance of memory wastage or shortage (www.quora.com)
numpy matrix (stackoverflow.com)	perhaps the main advantage of matrix was that it provided ... (stackoverflow.com)	arrays are faster than matrix (stackoverflow.com)	
List (stackoverflow.com)	convenient to use (www.geeksforgeeks.org)		consumes less memory (www.geeksforgeeks.org)

Thoroughness Panel continued

Commonly Searched for Alternatives

Developers who searched for options that are in the table **also searched for these other alternatives**:

Pandas Dataframe | Set | Dictionary | Tuple | Numpy Array | String | Series

Code Examples

The author **copied and used** the following code:

```
In [1]: import numpy as np
In [2]: %%timeit
   ...: v = np.matrix([1, 2, 3, 4])
100000 loops, best of 3: 16.9 us per loop

In [3]: %%timeit
   ...: w = np.array([1, 2, 3, 4])
100000 loops, best of 3: 7.54 us per loop
```

Other code examples from snippets:

```
In [11]: a = [[1,2,3,4],[5,6,7,8]]

In [12]: aa = np.array(a)

In [13]: ma = np.matrix(a)
```

Numpy ndarray

Commonly searched for alternatives: *numpy matrix* | *pandas dataframe* | *python list*

numpy matrix

Commonly searched for alternatives: *pandas dataframe* | *numpy ndarray* | *python lists* | *set* | *tuple*

List

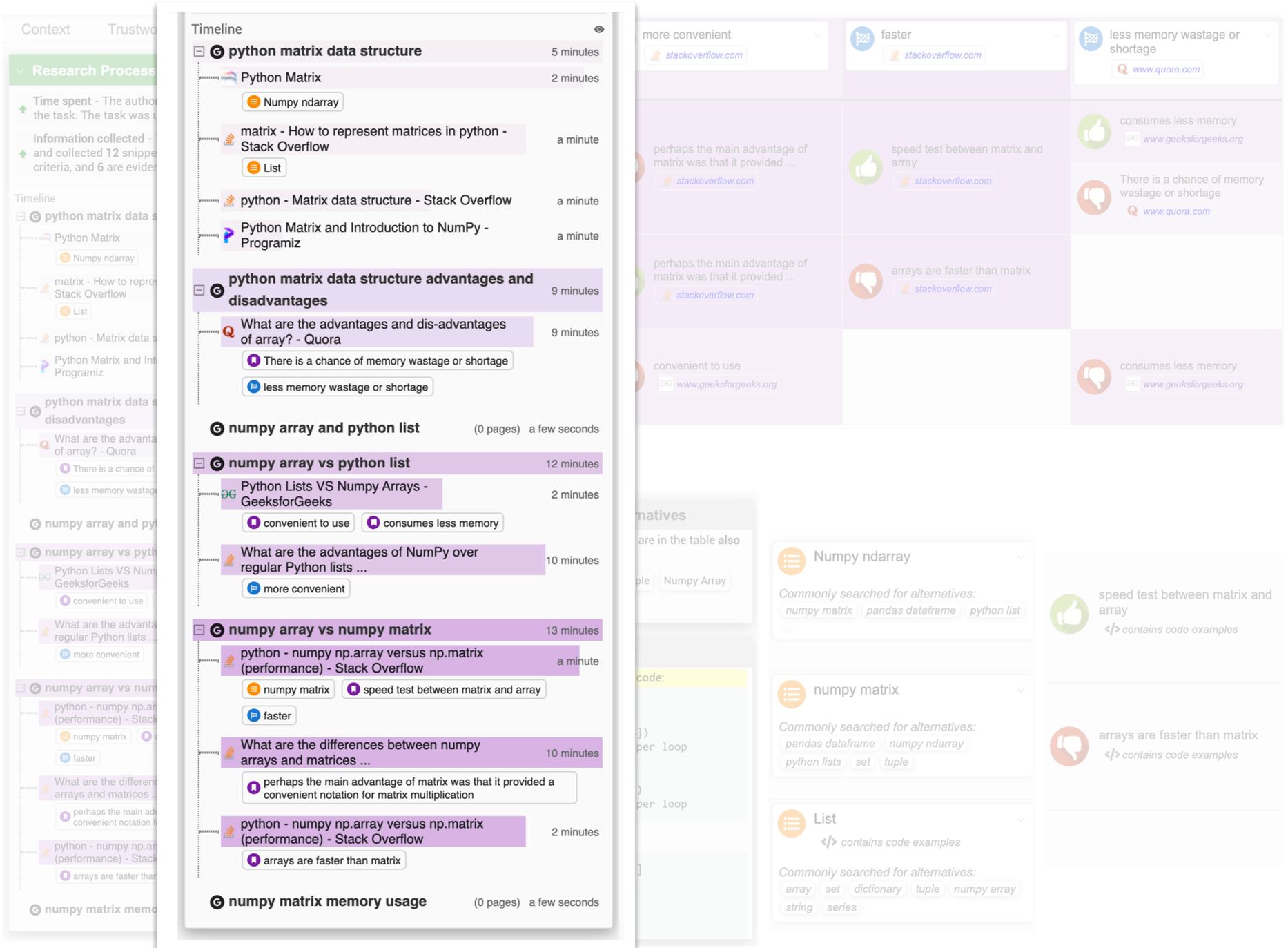
contains code examples

Commonly searched for alternatives: *array* | *set* | *dictionary* | *tuple* | *numpy array* | *string* | *series*

speed test between matrix and array — *contains code examples*

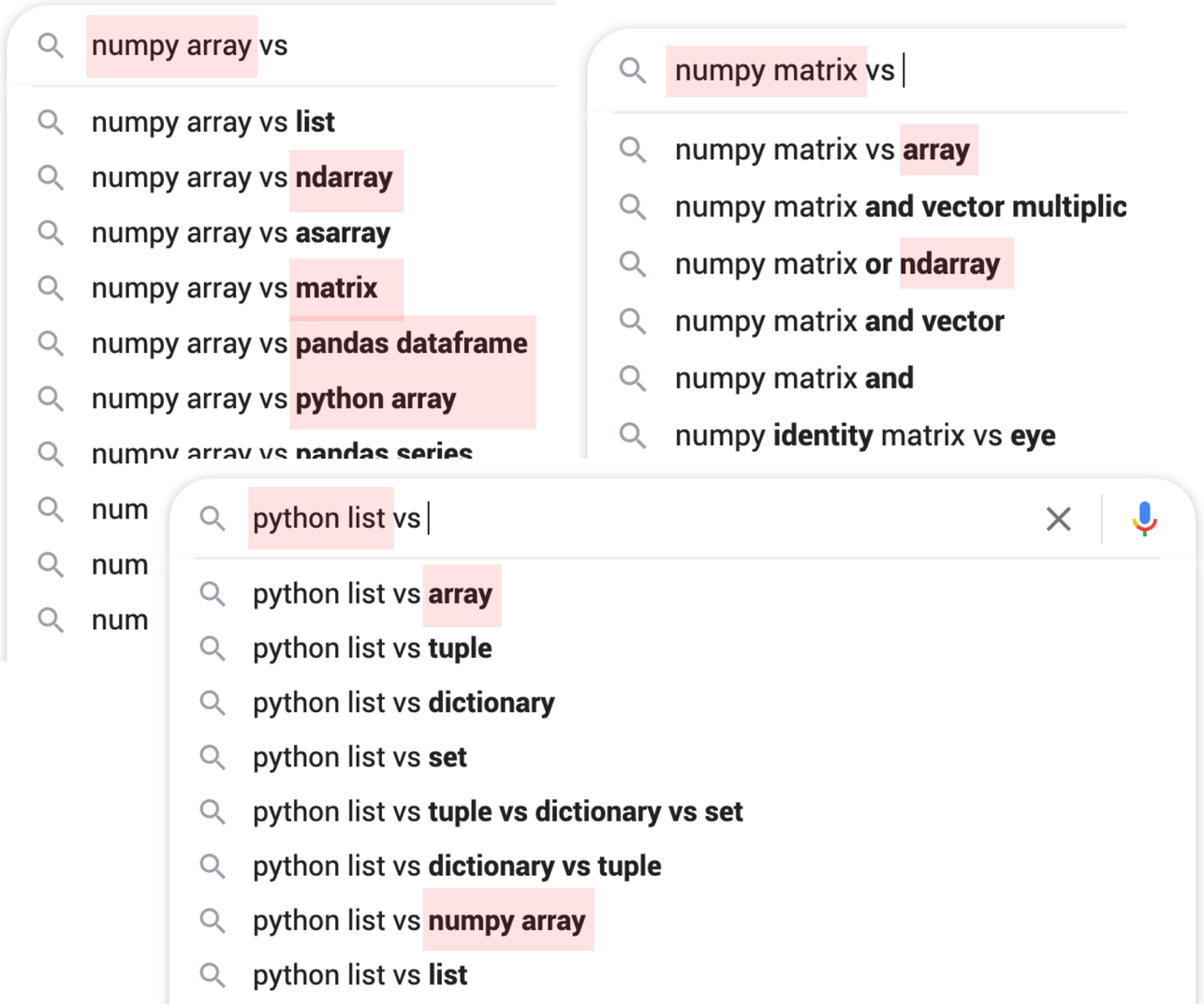
arrays are faster than matrix — *contains code examples*

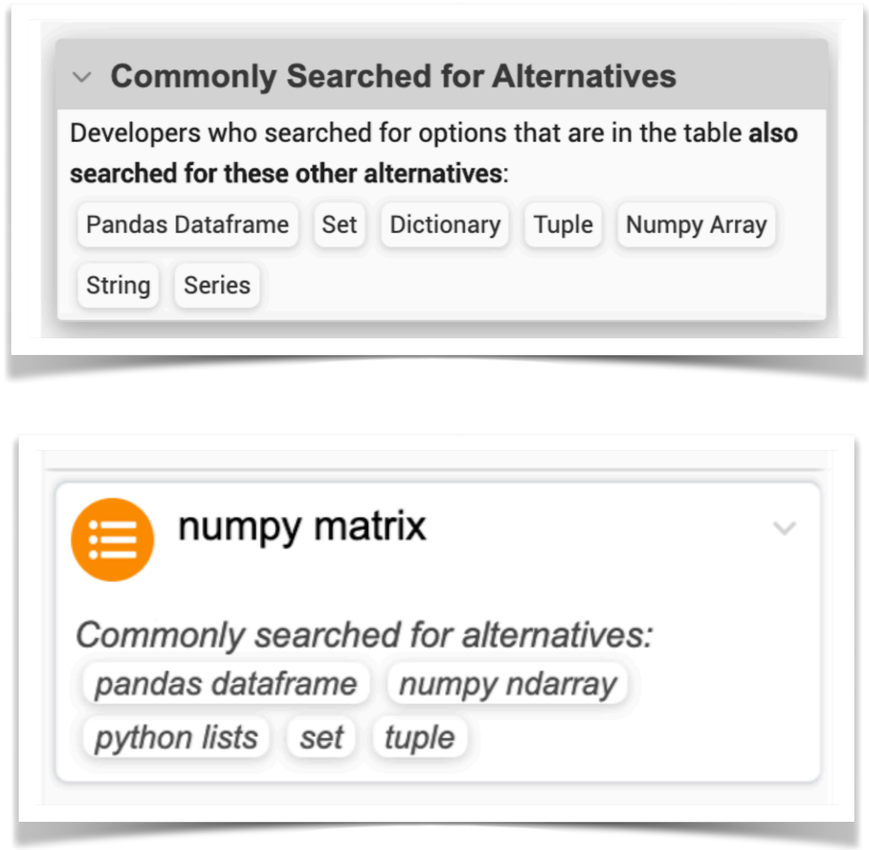
Thoroughness panel



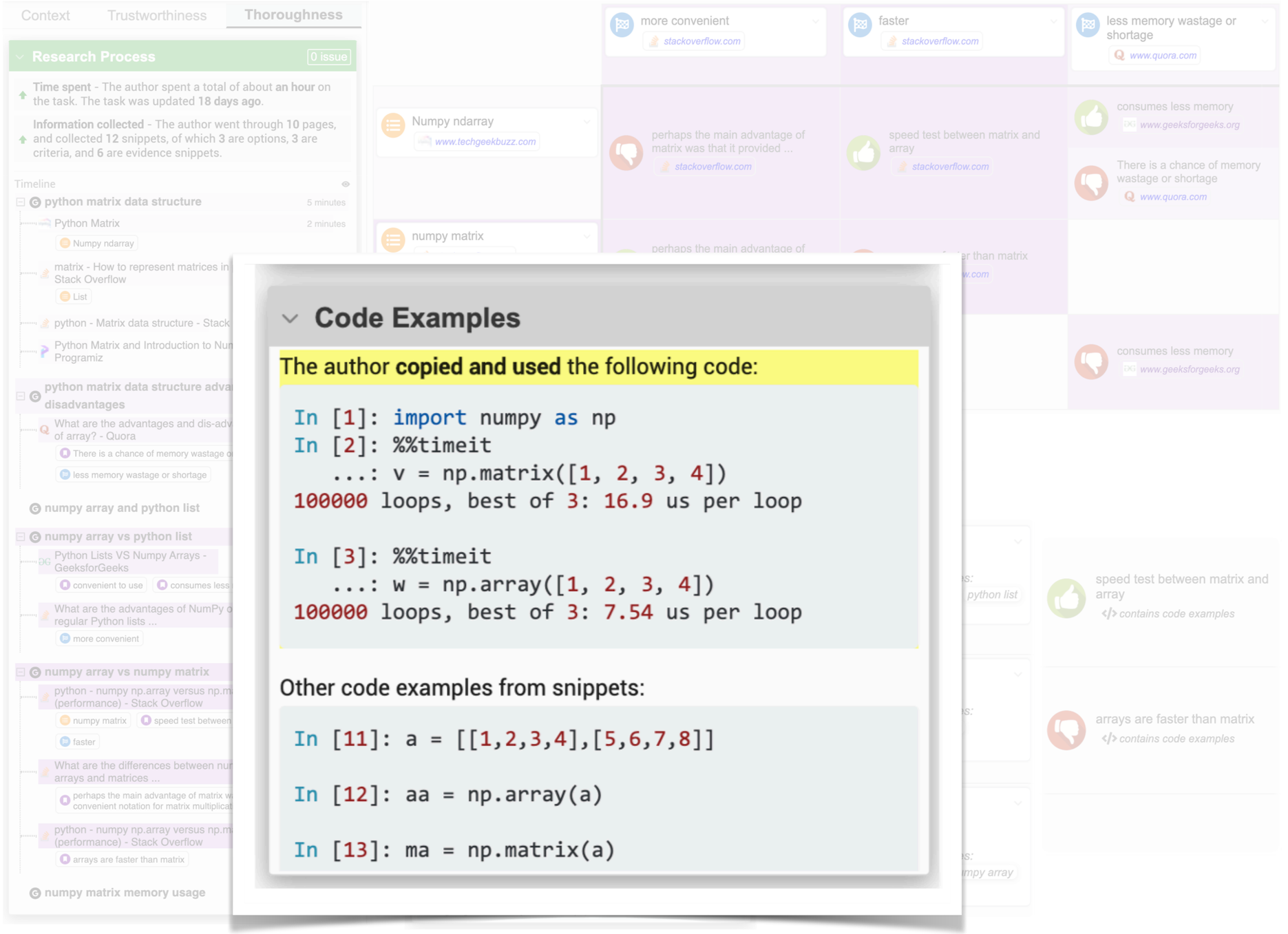
Finding alternatives using Google autocomplete

"[option name] vs ____"





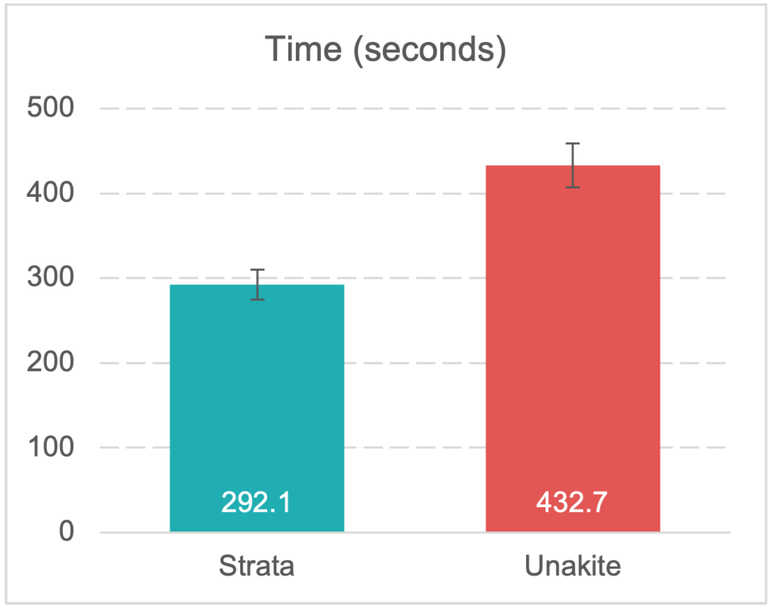
Thoroughness panel



Lab study – judging whether to reuse decisions

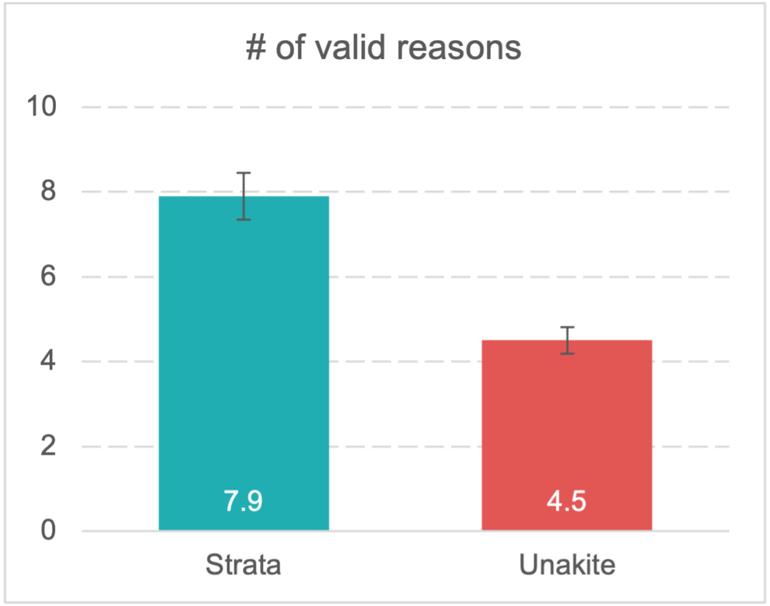
N=20, between-subjects, Unakite as baseline

32.5% reduction in time spent



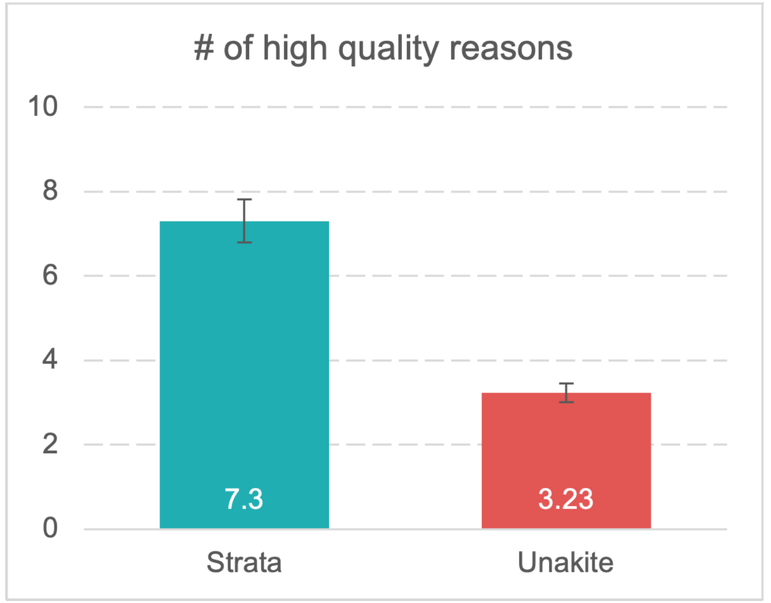
$p < 0.05$

75.6% more valid reasons



$p < 0.05$

126% more high quality reasons



$p < 0.05$

Lab study – judging whether to reuse decisions

- Framework as guidance

  “serve(d) as a guidance for things that I should pay attention to” -- P8

- Reminder of appropriateness properties

  “I realize that I’m more of a grab-and-go kinda person and I don’t usually remember to check how many up-votes a Stack Overflow answer gets or when it was last updated” -- P17

Lab study – judging whether to reuse decisions

- Using Strata when authoring decisions

  “going through the three main aspects is like going through our usual quality checklist, which makes sure that we’re not missing anything” -- P6

  “if my previous browsing sessions are captured by this, then I won’t need to make myself available again and again if somebody else suddenly has a question that only I know the answer to, since I made it in the first place—this table thing will almost be self-explanatory” -- P13

CHI 2022

Crystalline: Lowering the Cost for Developers to Collect and Organize Information for Decision Making

Michael Xieyang Liu, Aniket Kittur, Brad A. Myers

***C**lipping **r**esulting in **y**our **s**tructure as **t**ables **a**nd **l**ists **l**inked to **i**mplicit **n**otetaking **e**asily*

Foraging

Structuring

Transfer

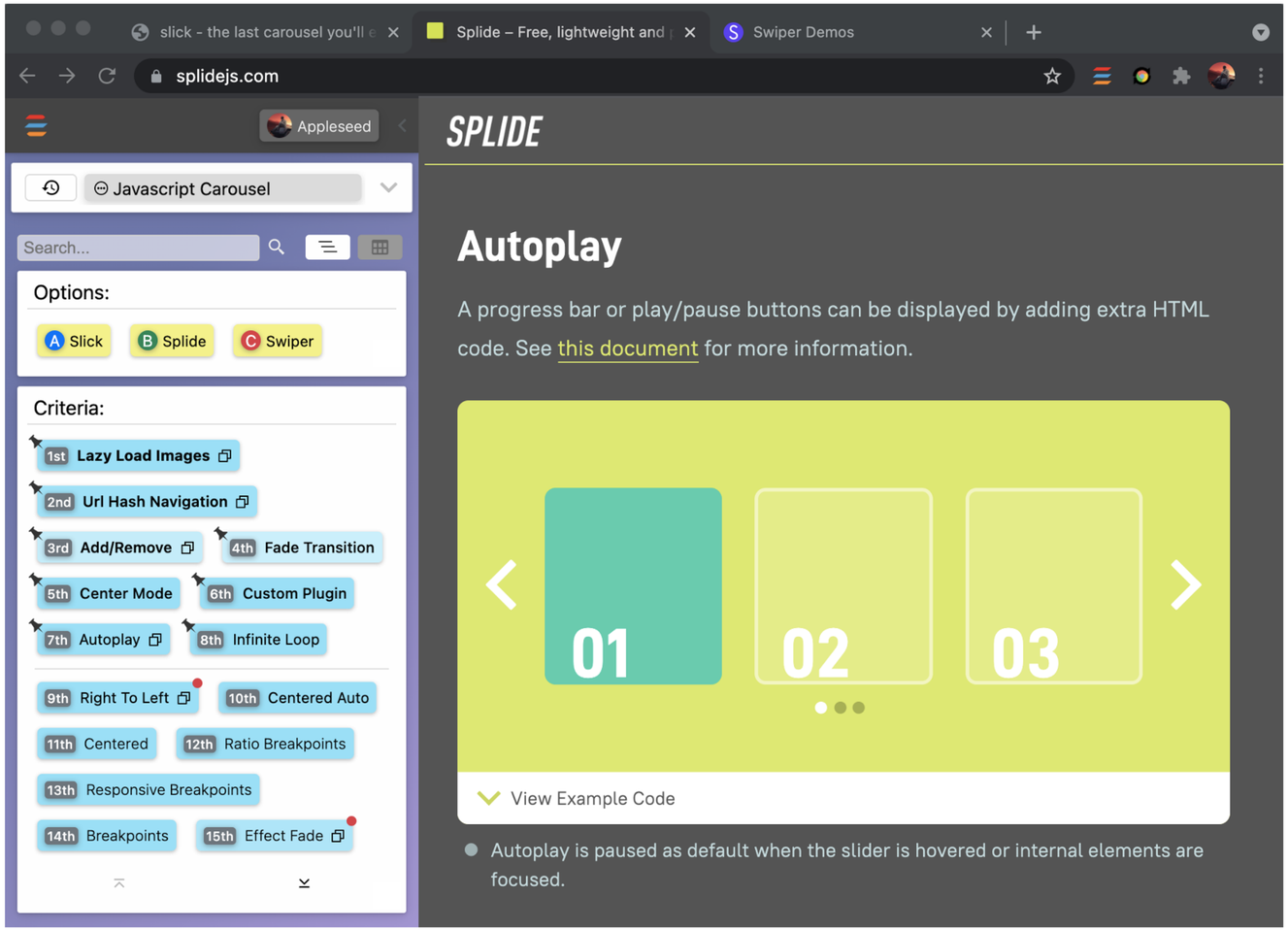
Can we do it **automatically**?

By leveraging:

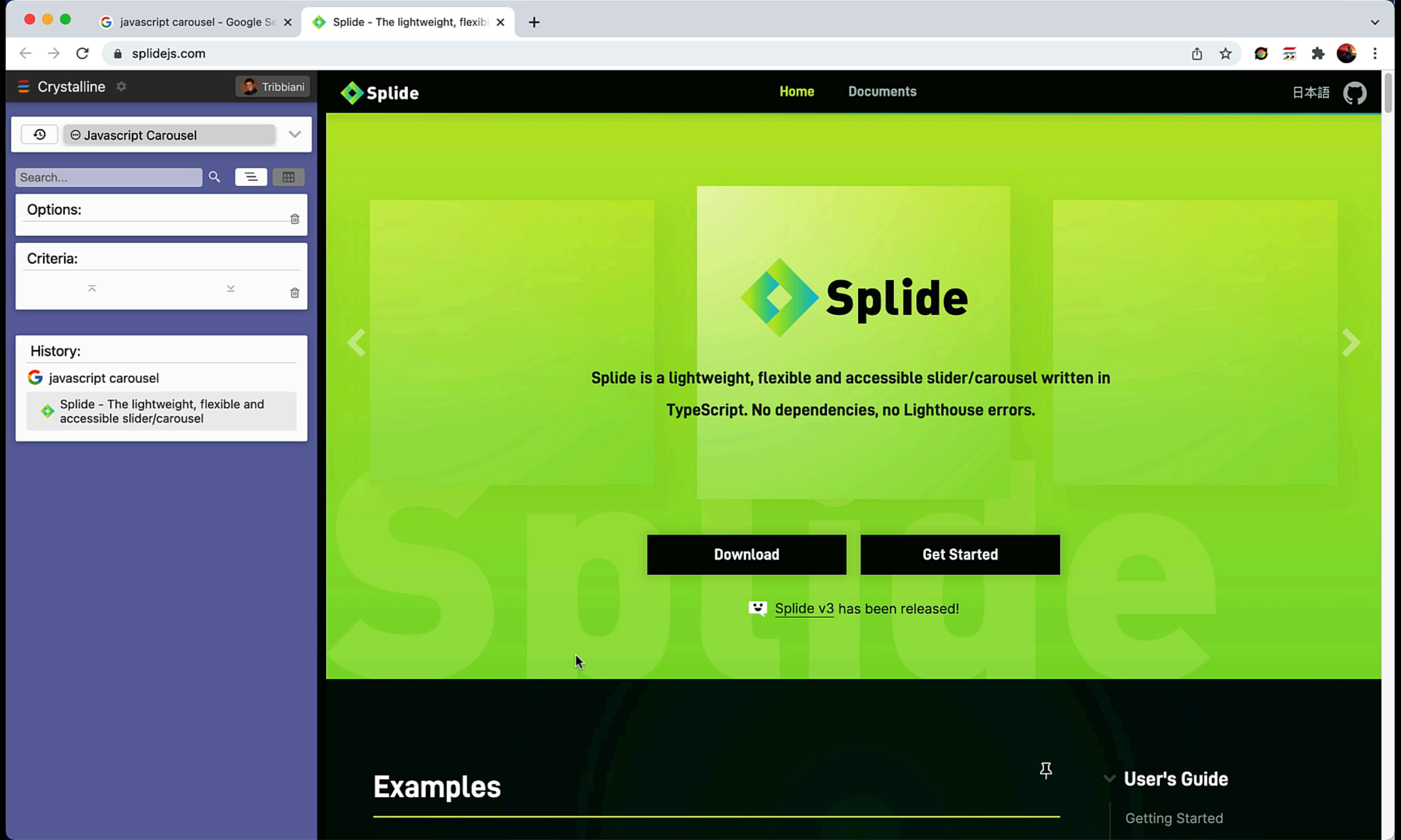
Machine understanding of web content and structure

Implicit signals from people's browsing behavior

Design goals for **automatic collection & organization**



- Minimize the cost to collect information
- Actively filter, organize, and prioritize information
- Reduce the cost of incorrect automation support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javascript carousel
Splide - The lightweight, flexible and accessible slider/carousel
Splide
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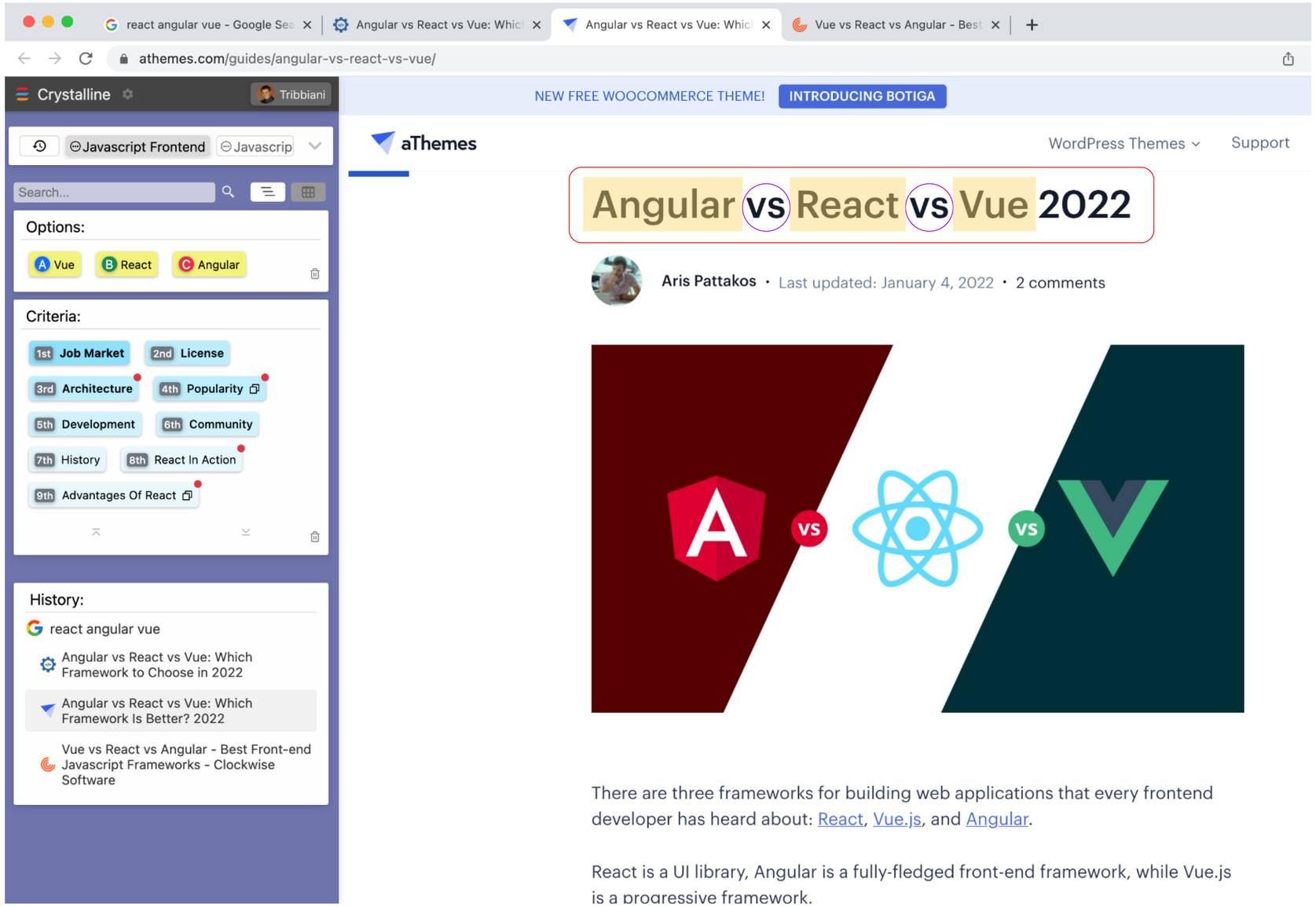
Documents
日本語
Splide
Splide is a lightweight, flexible and accessible slider/carousel written in
TypeScript. No dependencies, no Lighthouse errors.
Download
Get Started
Splide v3 has been released!
Examples
User's Guide
Getting Started

NLP Heuristics to extract options and criteria



Words and phrases between “vs”

NLP Heuristics to extract options and criteria

Part 2: Community and development

Now that you are familiar with the history and recent trends for each of these frameworks, we will look at the community to assess the development of these frameworks. We have already seen that for all of the frameworks, incremental releases have been shipped regularly over the past year, which indicates that development is going on in full swing.

	Angular	React	Vue
# Watchers	3.1k	6.7k	6.3k
# Stars	78.4k	180k	218k
# Forks	20.6k	36.5k	35.7k
# Contributors	1,500+	1,500+	400+

Size and load times ⏬

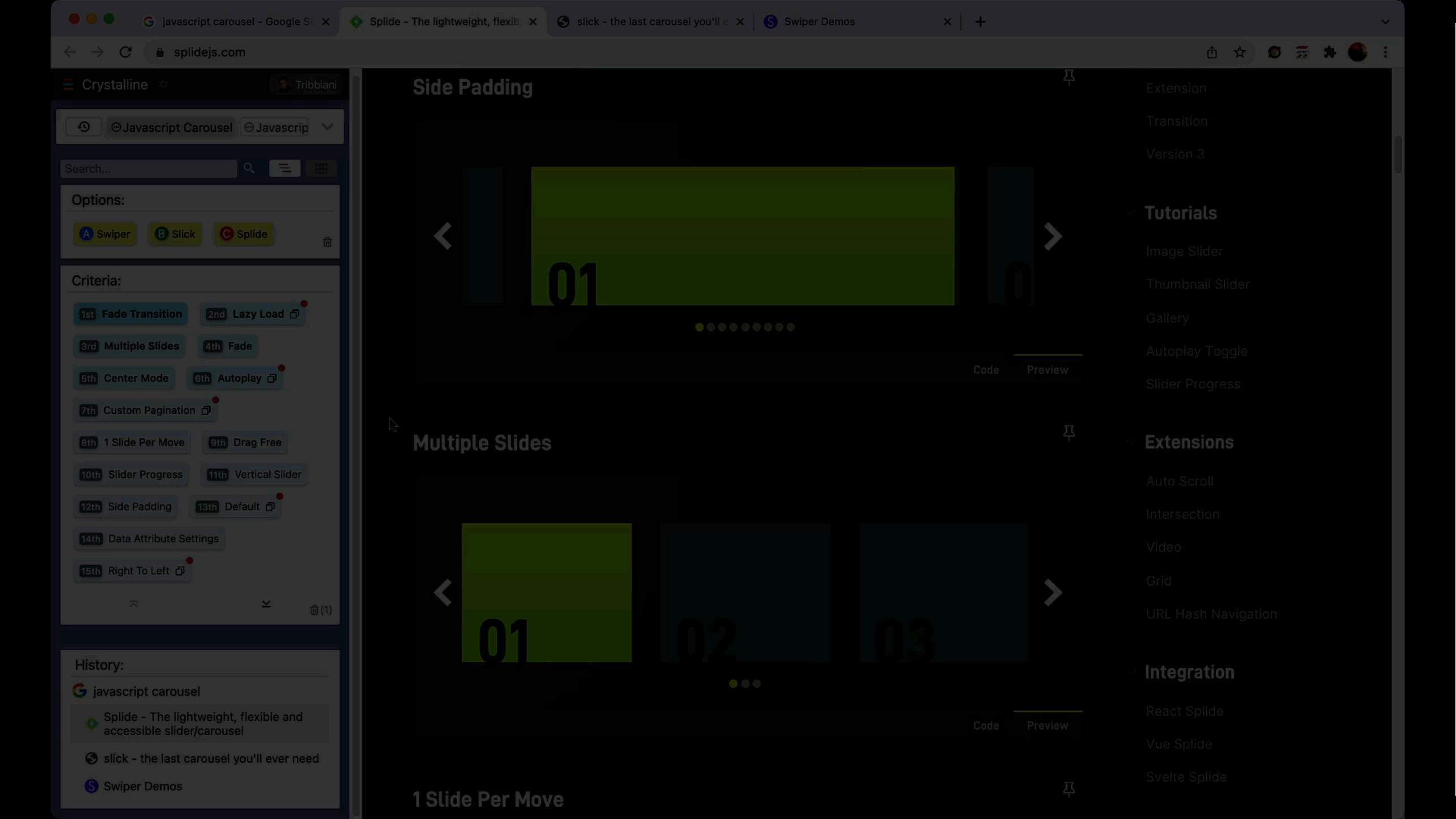
The sizes of the libraries won't be as big of a factor since caching and minification are pretty standard nowadays. Although there can be a significant difference between the sizes of the frameworks (e.g. Angular is the largest), they are still small as compared to the average webpage size (about 2MB according to the most recent data). Additionally, if you use a popular CDN to load these libraries, it is highly probable that a user has the library already loaded in their local system.

...

Components 🏗

Components are integral parts of all three frameworks, no matter if we're talking Vue, React, or Angular. A component generally gets an input, and changes behavior based on it. This behavior change generally manifests as a change in the UI of some part of

Entities in page titles, section headers, and table headers, etc.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Swiper Demos
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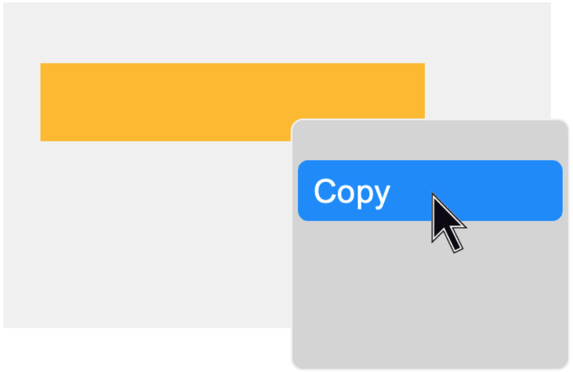
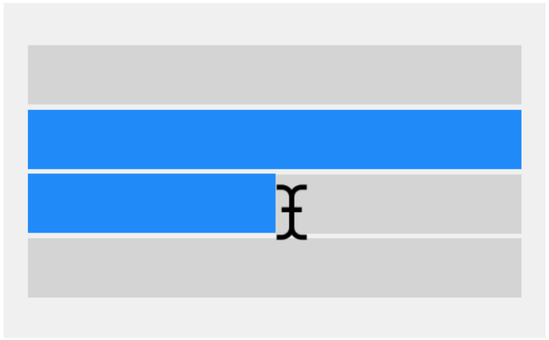
Crystalline
Tribbiani
Javascript Carousel
Javascrip
Search...
Options:
Swiper
Slick
Splide
Criteria:
1st Fade Transition
2nd Lazy Load
3rd Multiple Slides
4th Fade
5th Center Mode
6th Autoplay
7th Custom Pagination
8th 1 Slide Per Move
9th Drag Free
10th Slider Progress
11th Vertical Slider
12th Side Padding
13th Default
14th Data Attribute Settings
15th Right To Left
(1)
History:
javascript carousel
Splide - The lightweight, flexible and accessible slider/carousel
slick - the last carousel you'll ever need
Swiper Demos
Side Padding
01
Code
Preview
Multiple Slides
01
02
03
Code
Preview
1 Slide Per Move
Extension
Transition
Version 3
Tutorials
Image Slider
Thumbnail Slider
Gallery
Autoplay Toggle
Slider Progress
Extensions
Auto Scroll
Intersection
Video
Grid
URL Hash Navigation
Integration
React Splide
Vue Splide
Svelte Splide

Implicit behavior signals while browsing

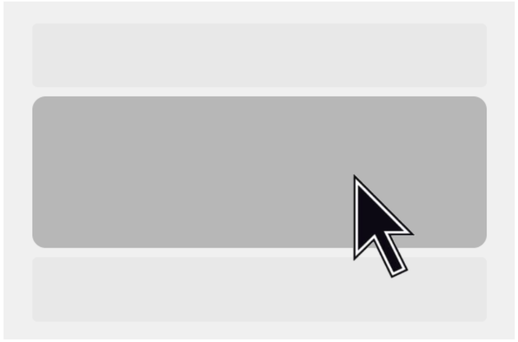


Copying content

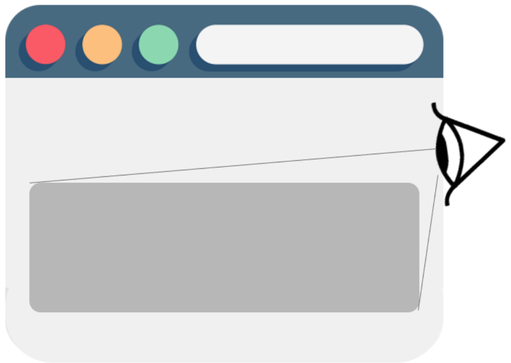


Text highlighting

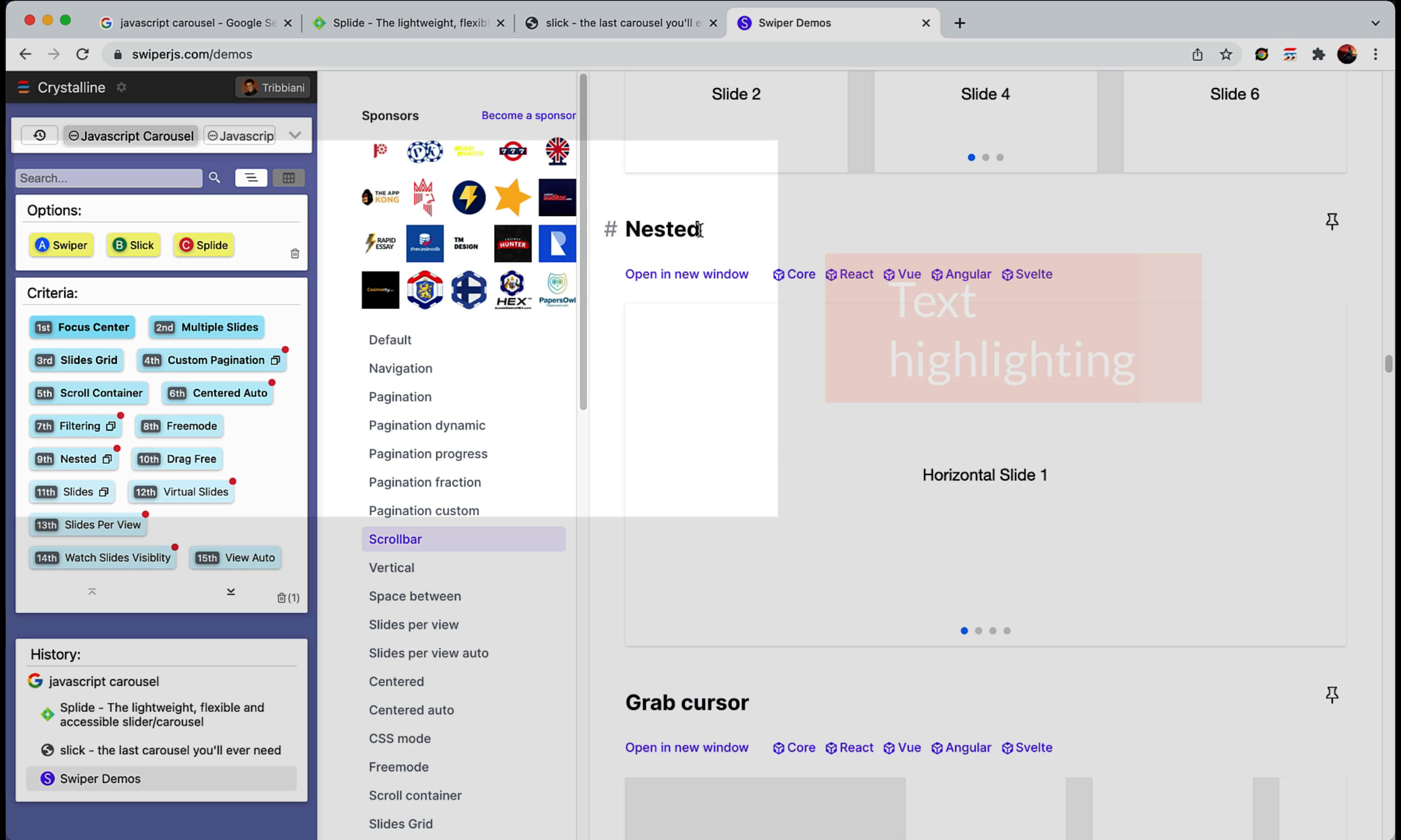
Clicking



Cursor hovering



Content dwelling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swiperjs.com/demos
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2nd Multiple Slides
3rd Slides Grid
4th Custom Pagination
5th Scroll Container
6th Centered Auto
7th Filtering
8th Freemode
9th Nested
10th Drag Free
11th Slides
12th Virtual Slides
13th Slides Per View
14th Watch Slides Visiblity
15th View Auto
(1)
History:
javascript carousel
Splide - The lightweight, flexible and accessible slider/carousel
slick - the last carousel you'll ever need
Swiper Demos
Sponsors
Become a sponsor
Default
Navigation
Pagination
Pagination dynamic
Pagination progress
Pagination fraction
Pagination custom
Scrollbar
Vertical
Space between
Slides per view
Slides per view auto
Centered
Centered auto
CSS mode
Freemode
Scroll container
Slides Grid
Slide 2
Slide 4
Slide 6
Nested
Open in new window
Core
React
Vue
Angular
Svelte
Text highlighting
Horizontal Slide 1
Grab cursor
Open in new window
Core
React
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Crystalline | Tribbiani

Javascript Carousel | Javascrip

Search...

Options:

A Swiper | B Slick | C Splide

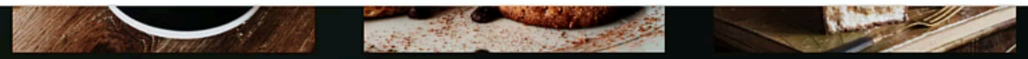
Criteria:

1st Grab Cursor | 2nd Fade Transition | 3rd Nested | 4th Add/Remove | 5th Slides Grid | 6th Custom Pagination | 7th Scroll Container | 8th Thumbnails | 9th Centered Auto | 10th Filtering | 11th Lazy Load | 12th Freemode | 13th Drag Free | 14th Slides | 15th Virtual Slides

(4)

History:

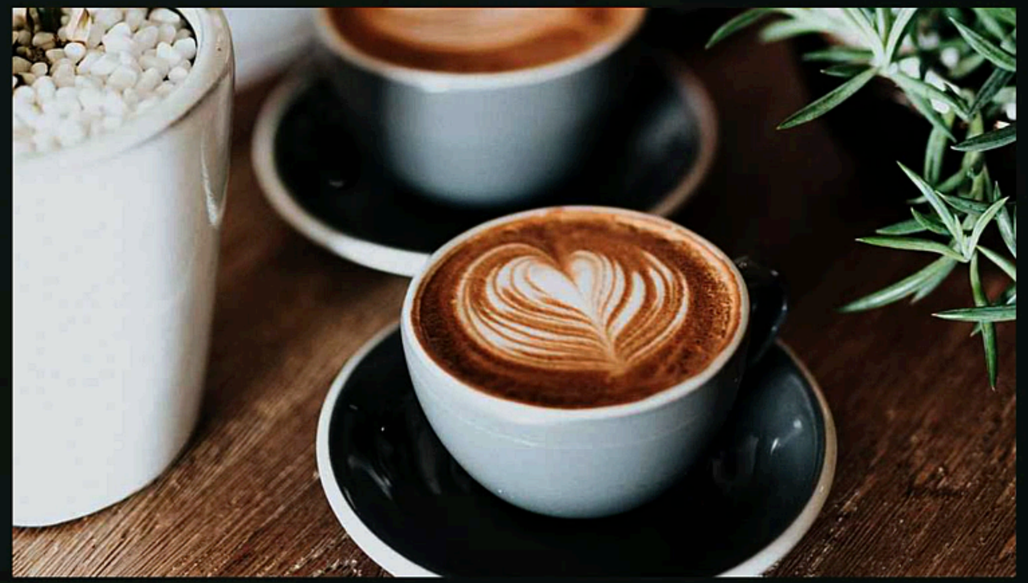
- javascript carousel
- Splide - The lightweight, flexible and accessible slider/carousel
- slick - the last carousel you'll ever need
- Swiper Demos



Code | Preview

Thumbnails

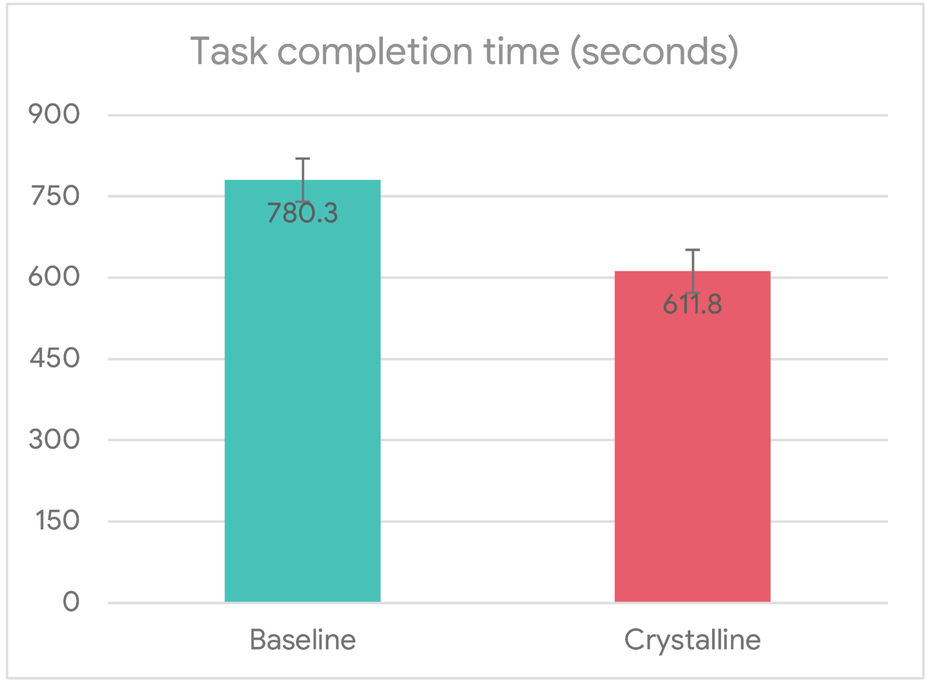
Splide sliders can be synchronized with one another. By utilizing this, you can make a gallery with thumbnails navigation.



Lab study – collecting + organizing information

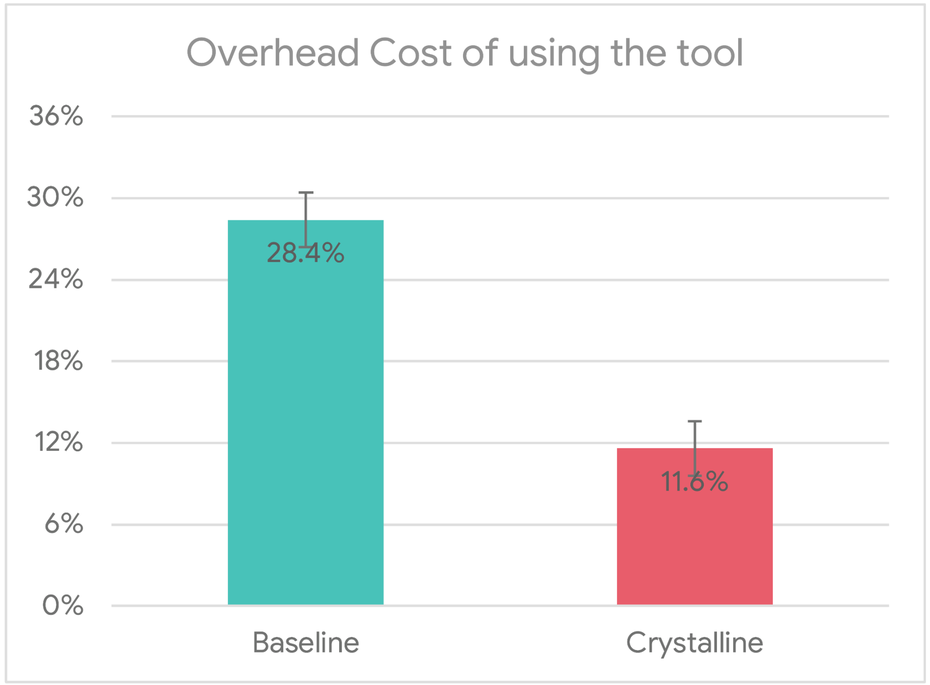
N=12, within-subjects, Unakite as baseline

20% faster



$p < 0.05$

60% less overhead cost



$p < 0.05$

Explanation for lowered overhead cost

	Manually select information and capture	Rename an option / criteria	Delete an option / criteria	Manually put information snippets into the table	Remove a snippet from the table	Merge criteria into groups	Split criteria groups	Pin or reorder criteria	**Overall**
Task A	27.0 (6.42)	1.67 (1.97)	0.67 (1.03)	16.5 (5.43)	0.50 (0.84)	N/A	N/A	6.00 (2.19)	52.3 (13.7)
Task B	26.2 (5.56)	1.83 (1.60)	1.50 (1.38)	14.5 (5.28)	0.33 (0.82)	N/A	N/A	6.00 (1.79)	50.3 (14.3)
Average	26.6 (5.74)	1.75 (1.71)	1.08 (1.24)	15.5 (5.21)	0.42 (0.79)	N/A	N/A	6.00 (1.91)	51.3 (13.4)

(a) Unakite condition

	Manually select information and capture	Rename an option / criteria	Delete an option / criteria	Manually put information snippets into the table	Remove a snippet from the table	Merge criteria into groups	Split criteria groups	Pin or reorder criteria	**Overall**
Task A	0.83 (0.75)	2.17 (1.17)	0.50 (0.84)	0.17 (0.41)	0.33 (0.52)	2.33 (0.82)	0.83 (0.75)	5.33 (1.97)	12.5 (3.02)
Task B	1.00 (1.26)	1.67 (0.82)	0.50 (0.55)	0.33 (0.52)	0.33 (0.52)	1.83 (0.75)	0.67 (0.82)	5.50 (2.74)	11.8 (3.31)
Average	0.92 (1.00)	1.92 (1.00)	0.50 (0.67)	0.25 (0.45)	0.33 (0.49)	2.08 (0.79)	0.75 (0.75)	5.42 (2.27)	12.2 (3.04)

(b) Crystalline condition

Table 2: Statistics for the average number of interactions performed by users to perform the tasks in the user study. Standard deviations are included in the parentheses.

Explanation for lowered overhead cost

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(b) Crystalline condition

Table 2: Statistics for the average number of interactions performed by users to perform the tasks in the user study. Standard deviations are included in the parentheses.

Active (manual)
capturing and organizing

Passive
monitoring and error-fixing

Quality of the resulting comparison tables

	Manually select information and capture	Rename an option / criteria	Delete an option / criteria	Manually put information snippets into the table	Remove a snippet from the table	Merge criteria into groups	Split criteria groups	Pin or reorder criteria	**Overall**
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(b) Crystalline condition

Table 2: Statistics for the average number of interactions performed by users to perform the tasks in the user study. Standard deviations are included in the parentheses.

Qualitative feedback

- Reduced overhead and workload

  “It feels as if I was sitting in the passenger seat and not having to do all the steering and maneuvering.” -- P8

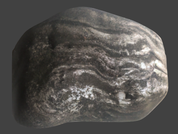
- Working with machine mistakes

  “it felt like a mind reader. I know it’s not perfect, but I also don’t expect it to be, and would actually prefer occasionally peeking into what it’s been doing and fixing whatever that’s not correct than just grabbing everything by myself all the time.” -- P7

UIST 2022

Wigglite: Lightweight Interaction Techniques for Information Collection and Triage

Michael Xieyang Liu, Andrew Kuznetsov, Yongsung Kim,
Joseph Chee Chang, Aniket Kittur, Brad A. Myers.



W*iggling for* ***i****nformation* ***g****athering and* ***g****enerating* ***l****ightweight* ***i****mpressions for* ***t****riage and* ***e****ncoding*

Foraging

Structuring

Transfer

Home > Photography > Digital Cameras > Mirrorless Cameras > Sony Alpha A7 IV

Sony a7 IV Mirrorless Camera

BH #SOA74 • MFR #ILCE-7M4/B | ★★★★½ 378 reviews | 179 Questions, 231 Answers

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Key Features

- 33MP Full-Fr
- 4K 60p Videc

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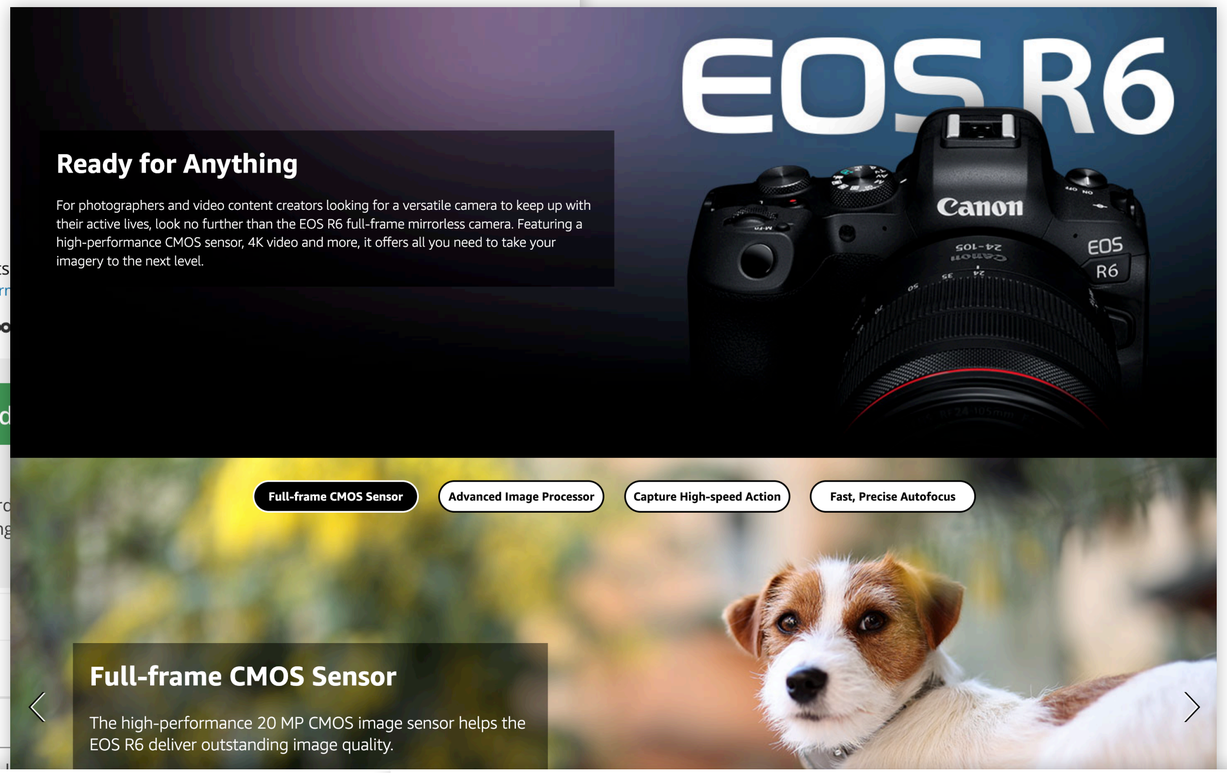
An all-around

The 7 Best Mirrorless Cameras - Fall 2022 Reviews

Updated Sep 30, 2022 at 10:34 am
By Adriana Wiszniewska

Mirrorless cameras are a compelling choice for many new buyers, as they tend to b feature responsive, precise autofocus systems, fast continuous shooting speeds, ar preview the effect of exposure adjustments in real time. They've come a long way i DSLR in popularity, with a wide range of models that cater to every budget and exp



For stills photographers, the Nikon Z6 II (above) is a fine choice that's compatible with Nikon's increasingly impressive range of Z-mount lenses. (Image credit: Future)

5. Nikon Z6 II ★★★★½

Best for photography-focused Nikon fans

SPECIFICATIONS

Sensor size: Full-frame **Resolution:** 24.5MP
Viewfinder: 3,690K dots
Monitor: 3.2-inch tilt-angle touchscreen, 2,100K dots
Autofocus: 273-point hybrid AF
Maximum continuous shooting rate: 14fps
Movies: 4K at 30p
User level: Intermediate/expert

The best mir | Top 10 Mirror | The 7 Best M | Canon EOS R | Amazon.com | Mirrorless | E | Amazon.com | Nikon Z5 Mir | Amazon.com | Sony a7 IV M | Picking a dig

amazon.com/Canon-Full-Frame-Mirrorless-Processor-Mechnical/dp/B08BVT9CK2?th=1

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Body Only	24-105mm IS STM Kit	24-105mm USM Kit
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Configuration: **Base**

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Brand	Canon
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Skill Level	Professional

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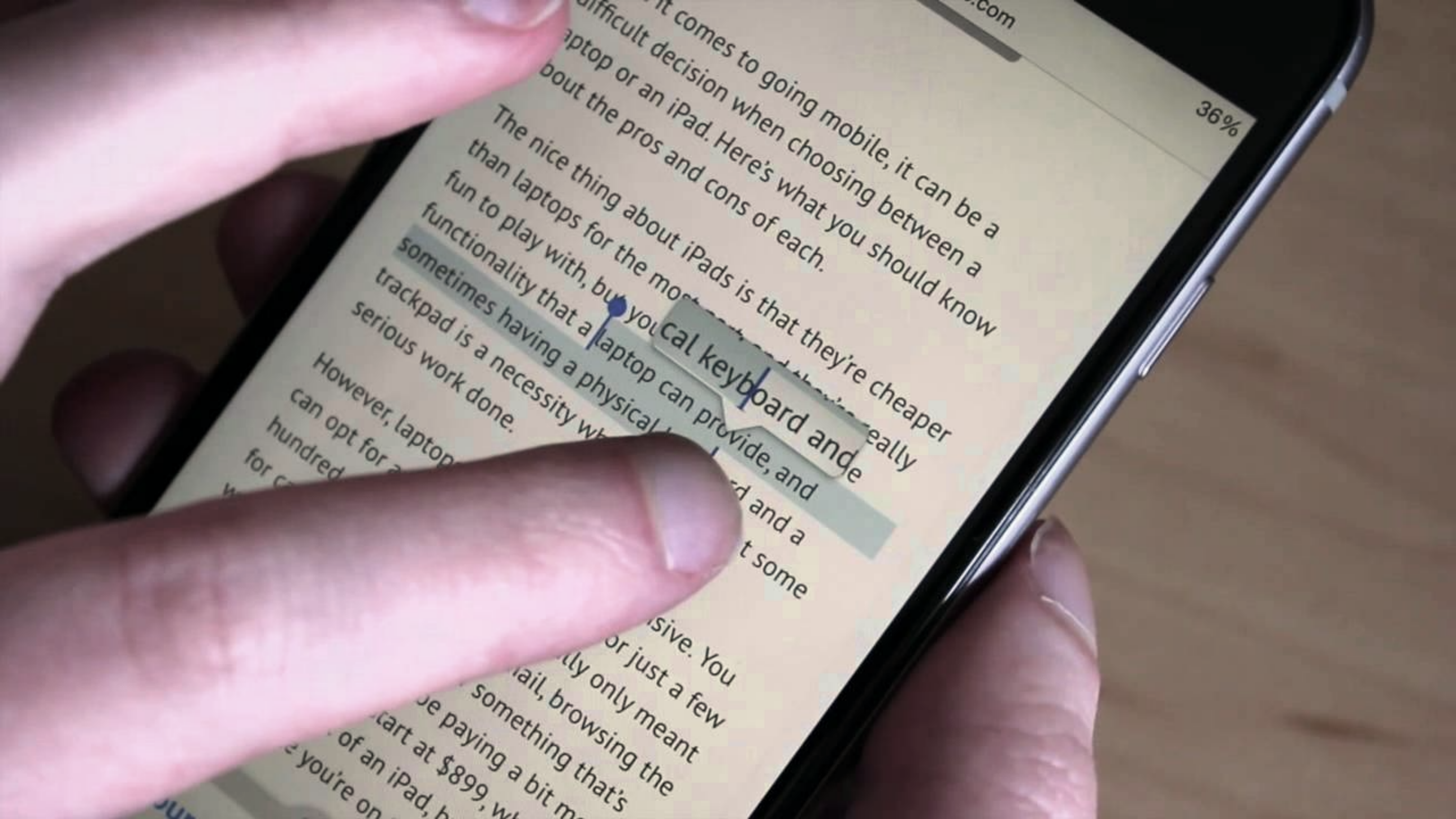
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it comes to going mobile, it can be a
difficult decision when choosing between a
aptop or an iPad. Here's what you should know
bout the pros and cons of each.
The nice thing about iPads is that they're cheaper
than laptops for the mo eally
fun to play with, bu you e
functionality that a laptop can provide, and
sometimes having a physical d and a
trackpad is a necessity wh
serious work done.
However, laptop t some
can opt for a
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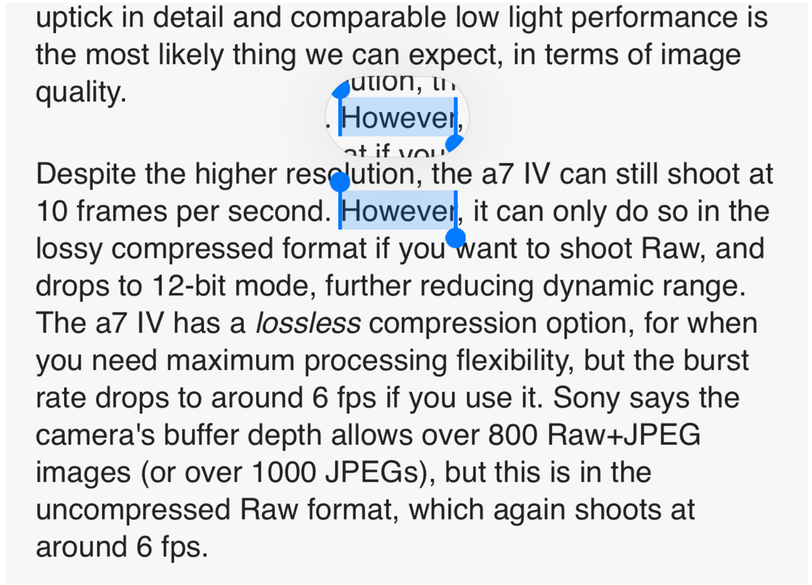
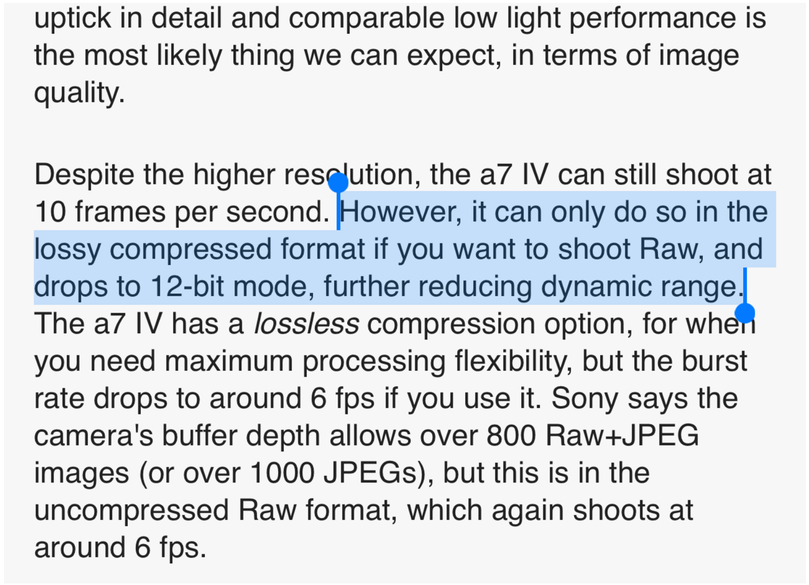
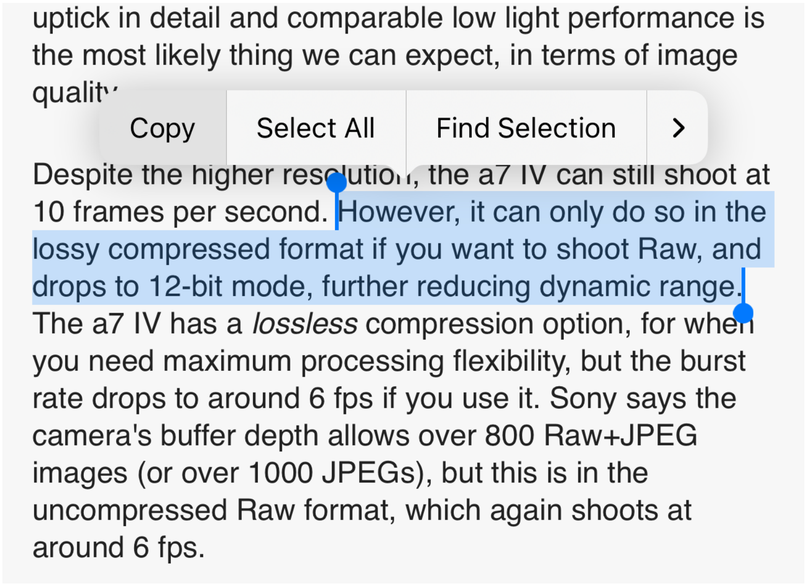
of an iPad, b
you're on



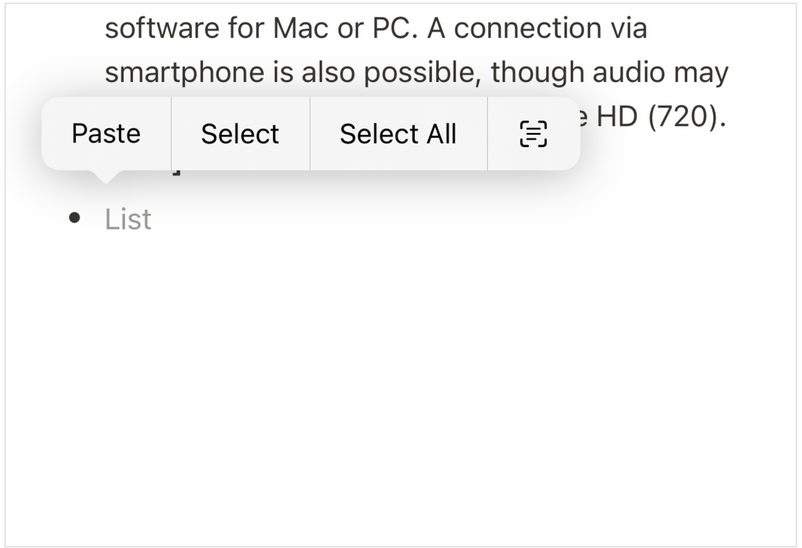
1. Initiate selection mode



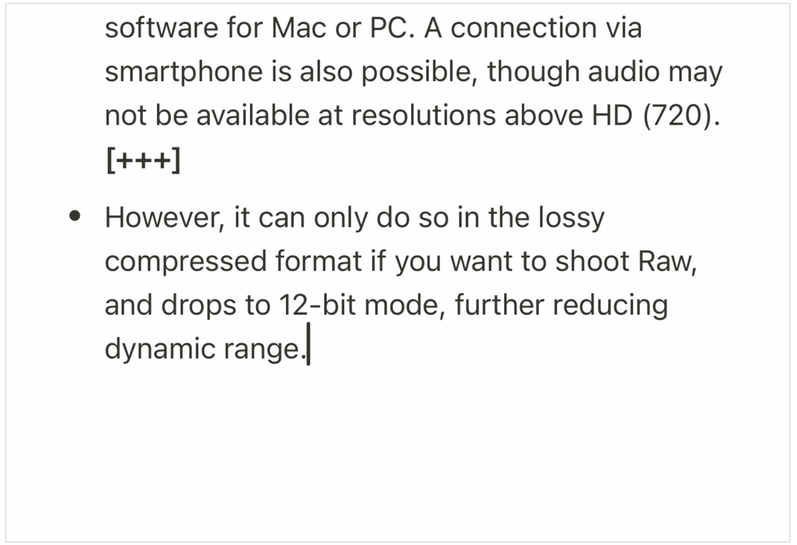
2. Specify selection range



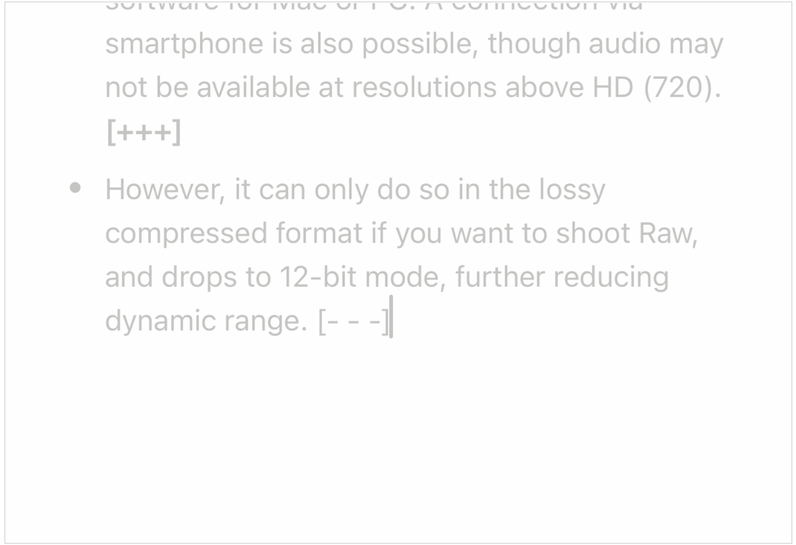
3. Copy the selected text



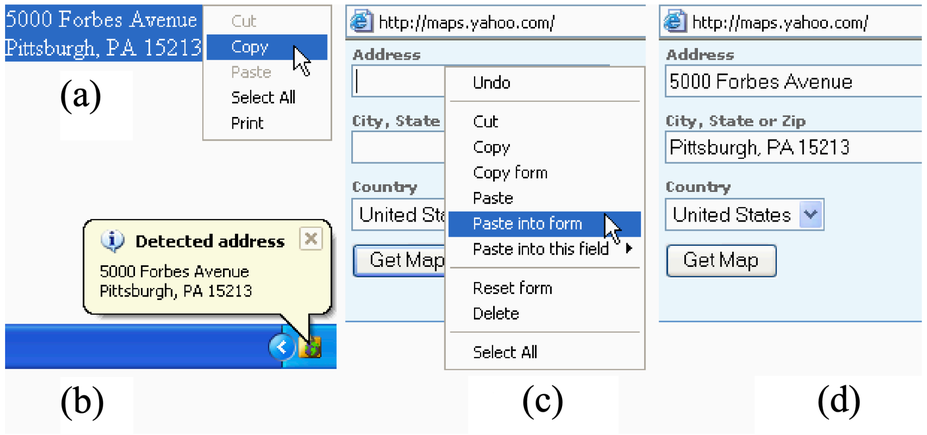
4. Context switch to the note-taking app



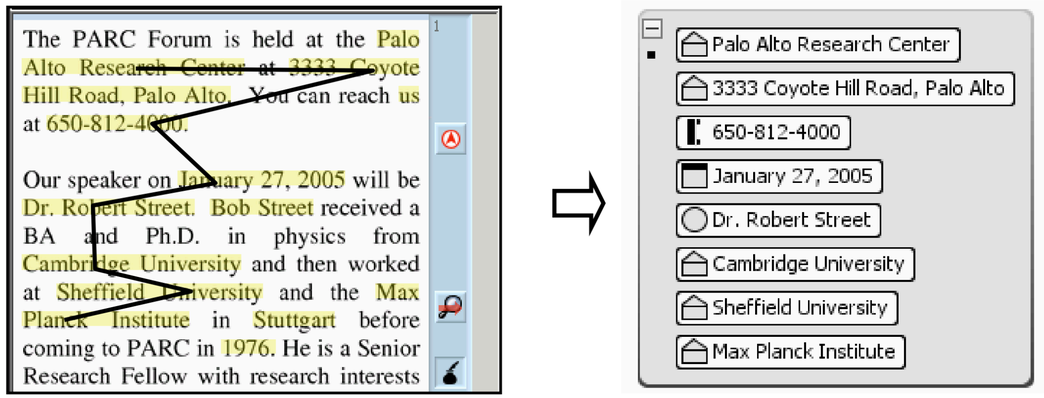
5. Paste the information in



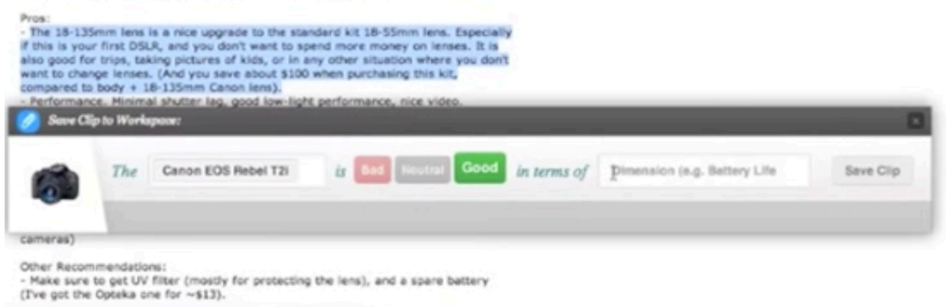
6. Triage the information with mental judgement



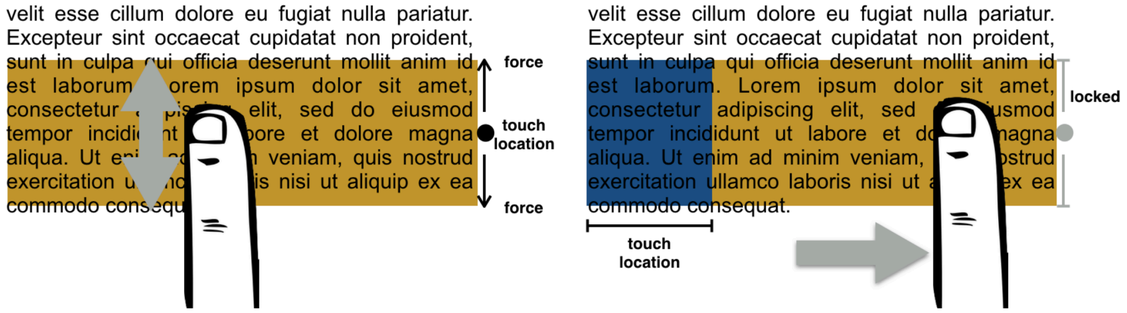
Stylos, J., Myers, B. A., & Faulring, A.
Citrine: providing intelligent copy-and-paste
UIST 2004



Bier, E. A., Ishak, E. W., & Chi, E.
Entity quick click: rapid text copying based on automatic entity extraction
CHI 2006



Kittur, A., Peters, A. M., Diriye, A., Telang, T., & Bove, M. R.
Costs and benefits of structured information foraging
CHI 2013



Chang, J. C., Hahn, N., & Kittur, A.
Supporting Mobile Sensemaking Through Intentionally Uncertain Highlighting
UIST 2016

or so away from being able to jump between tabs. They're also touch sensitive, so you may not need to click or nudge anything at all.

This layout makes the menus much quicker to navigate, as do sub-section headings within each tab. The arrangement differs from previous Sony cameras but the underlying relationships between settings remain the same, so it shouldn't take too long to familiarize yourself with the new system if you're an existing Sony user.

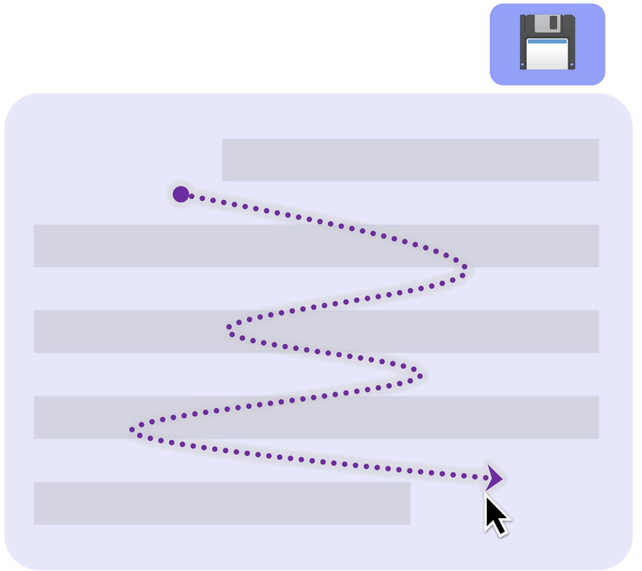
Constant smartphone connection

Sony has offered Bluetooth on its cameras for many years but has used it solely for transferring location data from smartphones. The a7 IV adds a constant-connection option of the type offered by most of its rivals. This means you only have to pair the camera with your smartphone once, after which they will automatically re-establish a Bluetooth Low Energy connection, making it much quicker and simpler to transfer images to your phone.

Closable shutter

The a7 IV gains the ability to close its mechanical shutter when the camera is turned off, helping to prevent dust build-up on the sensor. Shutter blades tend to be very lightweight, which also means they can be pretty fragile, so this should be seen as dust prevention, rather than a physical protection measure.

Battery



Wiggle the cursor back-and-forth over the content of interest to save it.

Ending with a swipe in different directions to encode mental judgement (e.g., **valence**)

Helpful | Report abuse

Robert

★★★★★ **Autofocus wow.**

Reviewed in the United States on January 23, 2022

Style: Body Only | Configuration: Base | **Verified Purchase**

Upgraded from the A7III. I thought the A7III autofocus was great, but this camera truly blows the A7III autofocus out of the water. I'd say this alone is worth the upgrade. I also really appreciate the improved menu system. It's actually usable now. I hear the video features are greatly improved which I appreciate, but I'm mostly a still photographer. I also appreciate the bump in megapixels, which extends the reach of this camera a bit more when I need to crop. There are many other improvements which you can read about online, but as I said the autofocus improvement alone is worth the upgrade in my opinion. Buy it and enjoy.

10 people found this helpful

Helpful | Report abuse

Amazon Customer

★★★☆☆ **Overheating Issues in Menu**

Reviewed in the United States on January 12, 2022

Style: w/ 28-70mm | Configuration: Base | **Verified Purchase**

I've been using this camera for only an hour now. I took a few pictures, and one video. As I operate the menu (customizing buttons and whatnot), the camera is overheating. I've had to turn it off twice now to let it cool down. I've looked it up, and apparently this is a common issue that users are experiencing - overheating, particularly while operating the device menu. It's very disappointing, but as I'm not sure if it will affect the operation of the camera after the settings are completed, I am not yet sure if I will return the device or keep it.

12 people found this helpful

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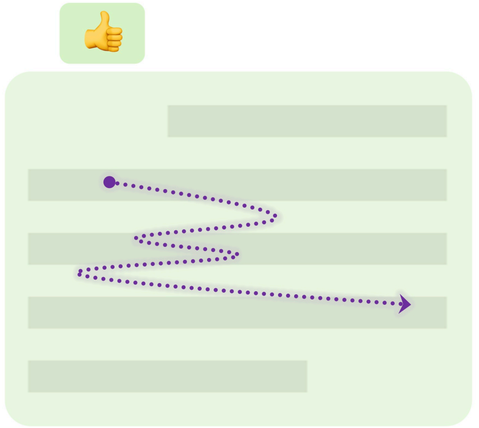

Positive valence, or "pro"

Ending with a swipe in different directions to encode mental judgement (e.g., **valence**)

this camera a bit more when I need to crop. There are many other improvements which you can read about online, but as I said the autofocus improvement alone is worth the upgrade in my opinion. Buy it and enjoy.

10 people found this helpful

Helpful | Report abuse

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12 people found this helpful

Helpful | Report abuse

Hai Le

★★★★★ **Love My New A7 IV!**

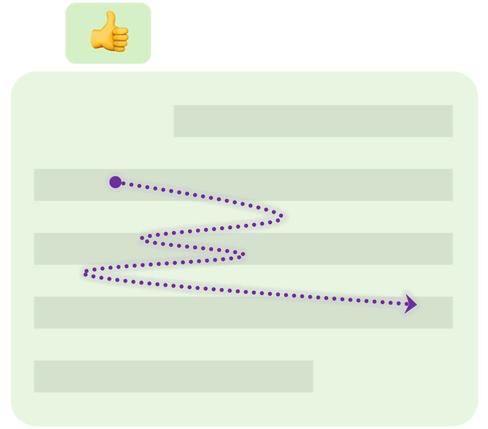
Reviewed in the United States on December 26, 2021

Style: Body Only | Configuration: Base | **Verified Purchase**

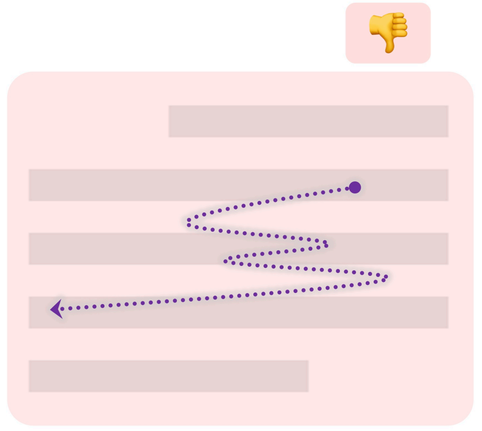
Received the camera early, yeah! A7IV's auto focus was awesome, the color was NICE and the images were sharp! The low light's shooting was unbelievable. Good job Sony!

14 people found this helpful

Helpful | Report abuse

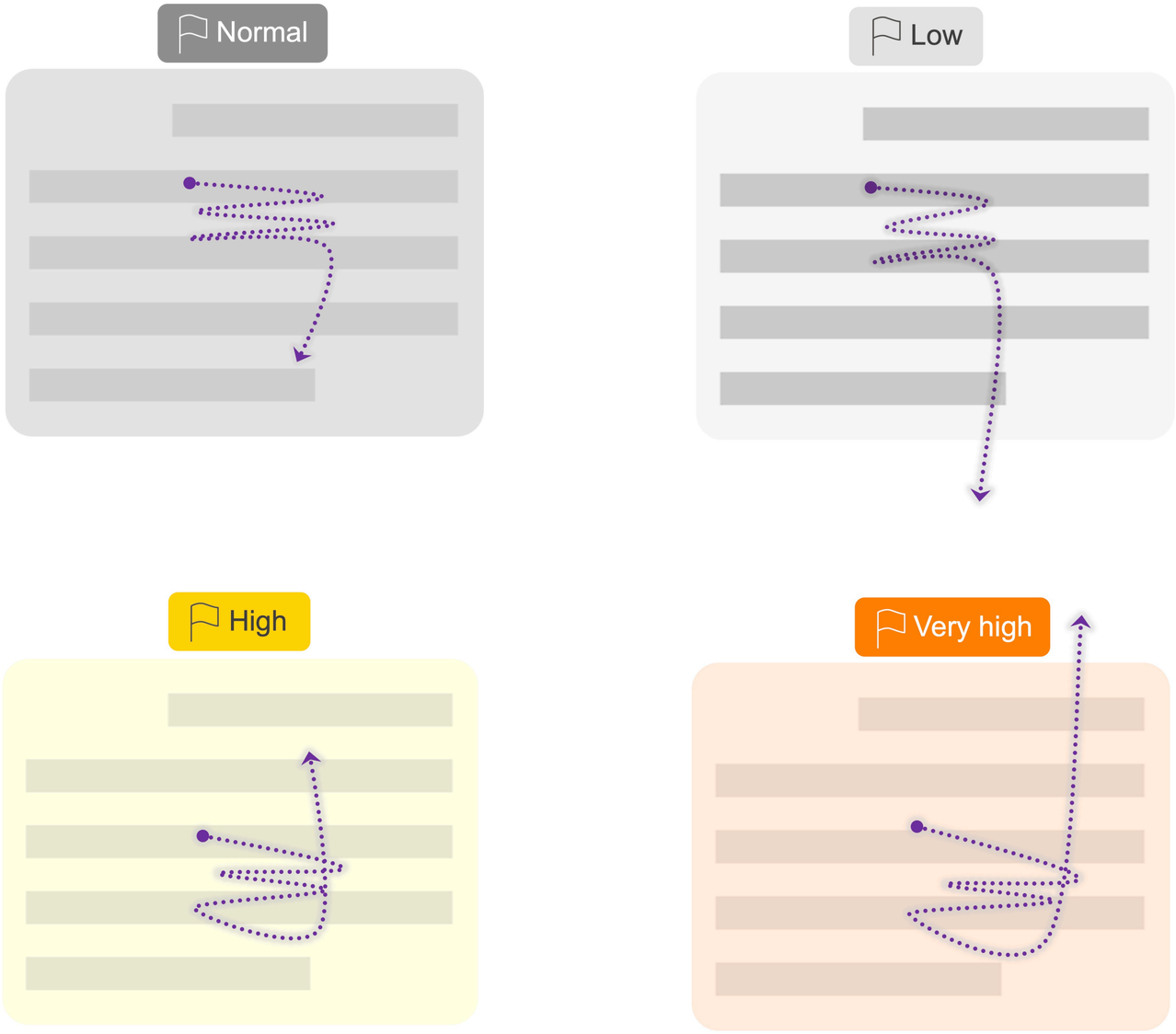


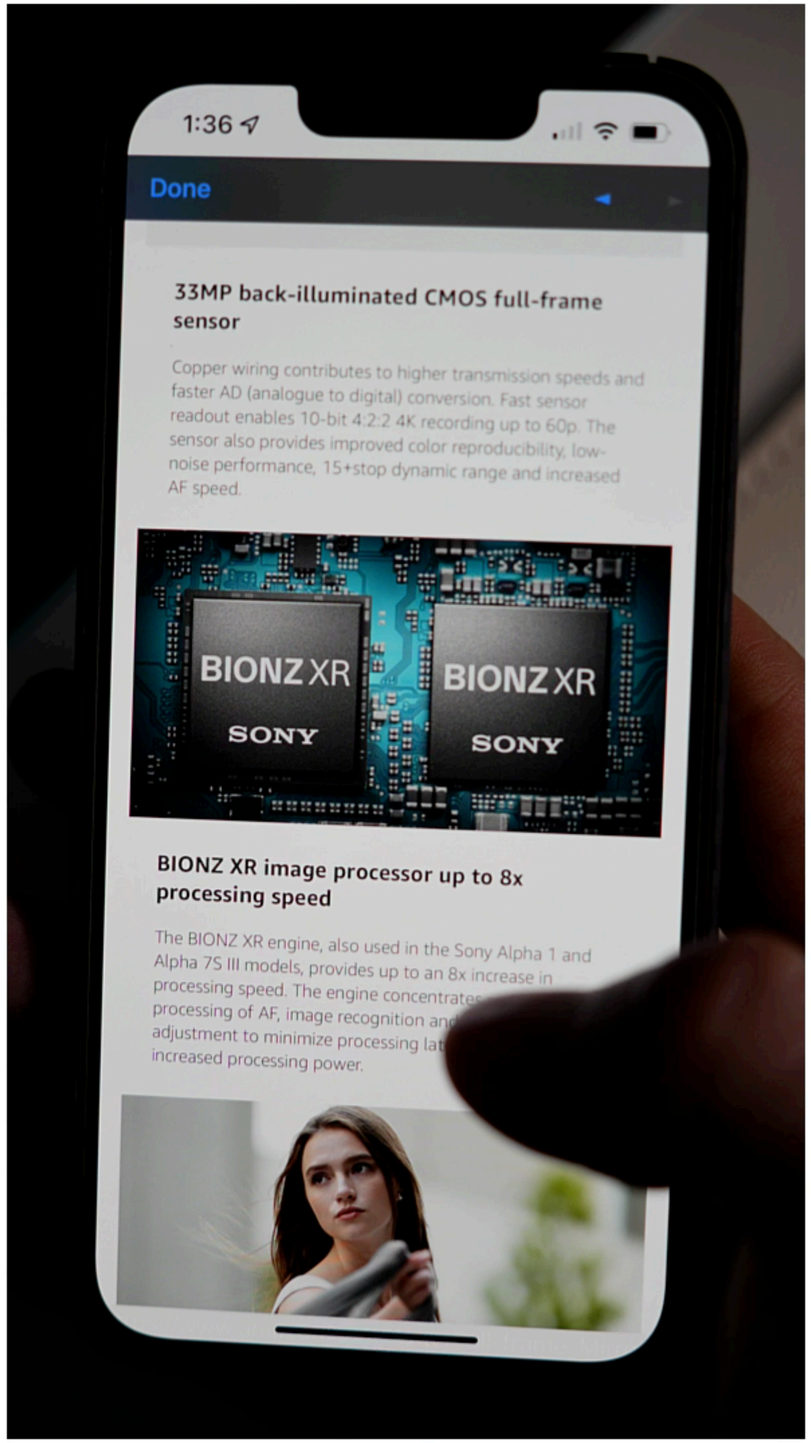
Positive valence, or "pro"

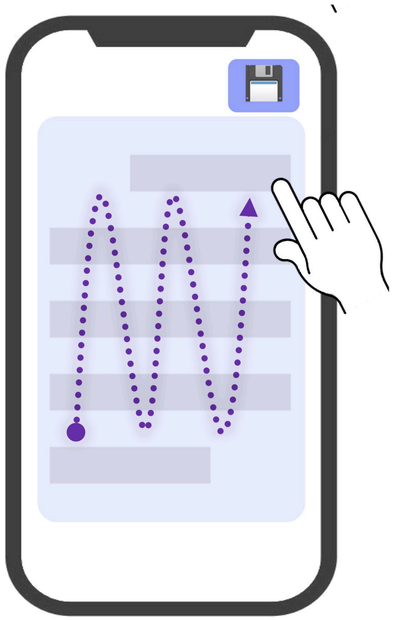


Negative valence, or "con"

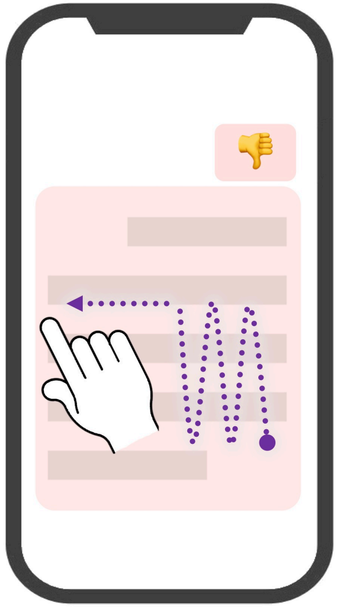
Ending with a swipe in different directions to encode mental judgement (e.g., **priority**)



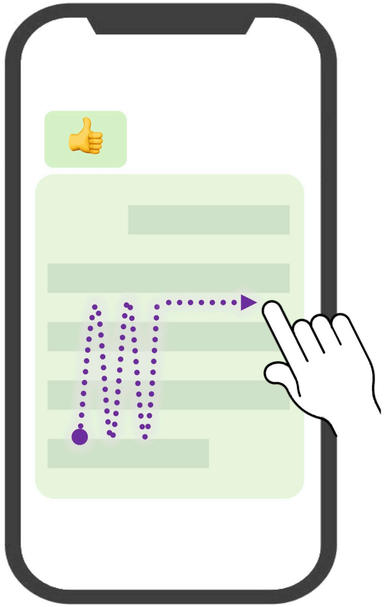




Wiggle the finger up-and-down on the content of interest to save it.



Negative valence, or “con”

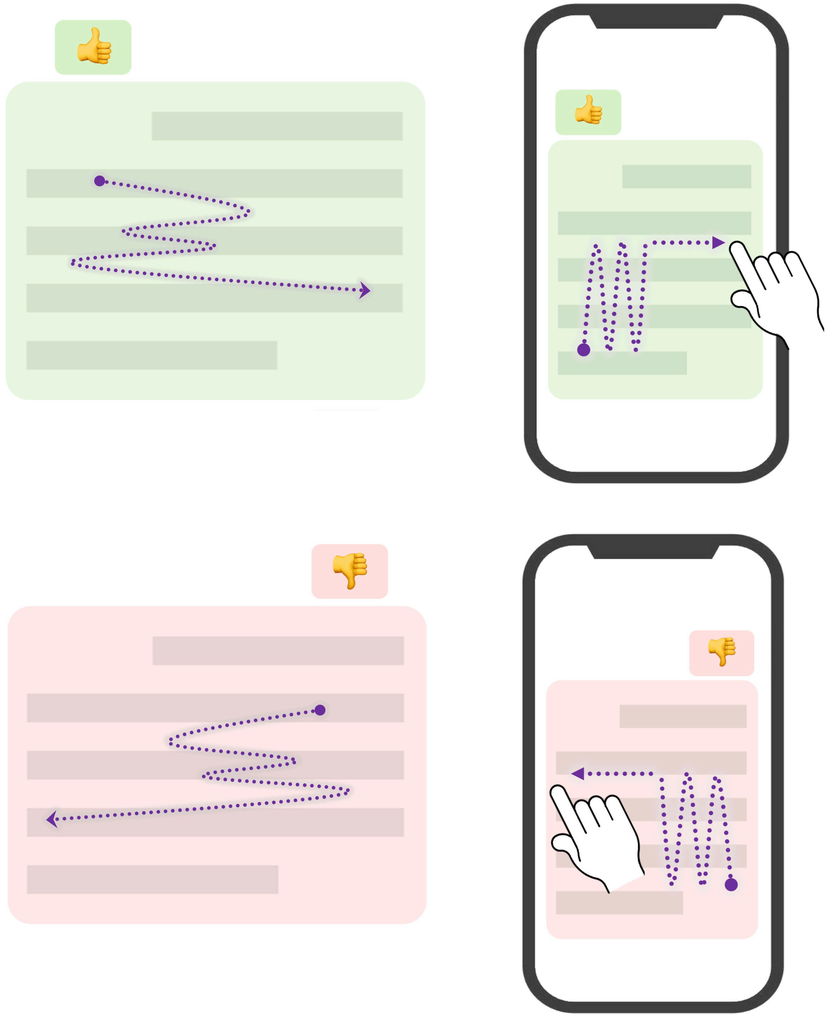


Positive valence, or “pro”

Design goals

[D1] Accuracy	It needs to be accurate and precise enough to lock onto the content the users intend to collect.
[D2] Efficiency	It should be quick and low-effort to perform, and minimize interruptions to the main activities that users are performing, such as learning and active reading.
[D3] Expressiveness	It should be extendable to provide natural and intuitive affordances for users to express aspects of their mental context at the moment, and in the scope of this work, encoding *valence* ratings as well as topic *priorities*.
[D4] Integration	It should be a complement to and not interfere with the existing interactions that users already use, such as using the pointer to select text and pictures or click on links.

The case for wiggling



- Mouse pointer is readily available
- No clicking required
- Natural extension to encode extra mental judgement
- Do not interfere with existing interactions
- Robust against false positives

Topics view

Holding tank

Search Google or type a URL

My Workspace

MY PROJECTS

Add Project

Picking a digital camera

Javascript frontend framework

Coffee Maker

Literature Review

Sprint meetings

Reading List

In app browser solutions

Competitor analysis

Note taking application

Vacuum cleaner

Hybrid App Development

javascript framework

ARCHIVED

Archived

Deleted 0

OTHER

Get Referral Codes

Settings

Help

SIGN OUT

Picking a digital camera

+ Add Topic

Sony Alpha 7 IV Full-frame Mirrorless Interchangeable Lens Camera

Sony Alpha 7 IV Full-frame Mirrorless Interch... 10.0

Upgraded from the A7III. I thought the A7III autofocus was great, but this camera truly blows the A7III autofocus out of the water. I'd say this alone is worth the upgrade. I also really appreciate the improved menu system. It's actually usable

Sony Alpha 7 IV Full-frame Mirrorless Intercha... -7.3

I've been using this camera for only an hour now. I took a few pictures, and one video. As I operate the menu (customizing buttons and whatnot), the camera is overheating. I've had to turn it off twice now to let it cool down. I've looked it up, and

Sony a7 IV review Digital Photography Review

The a7 IV uses the same NP-FZ100 battery as the a7 III and other more recent Sony cameras. It's a usefully hefty unit that, combined with the relatively modest viewfinder res, lets the a7 IV achieve a CIPA battery life rating of 580 shots per

Sony Alpha 7 IV Full-frame Mirrorless Interchangeabl...

Sony a7 IV review Digital Photography Review

	Compressed Raw (damagingly lossy)	Lossless compressed/ Uncompressed Raw
Max	10 fps (12-bit)	6 fps (14-bit)

Sony a7 IV review Digital Photography Review 2.6

The a7 IV also offers the ability to live stream video over its USB connection using the audio and video standards (UVC/UAC) that are part of the USB standard. This allows a choice of HD or FullHD resolutions with FullHD available at up to 60fps.

Canon EOS R6 Mirrorless Camera

Nikon Z6 Full Frame Mirrorless Camera Body

Priority Level

Normal

Frame Mirrorless Camera Body : ... 5.0

6 combines a 24.5MP Full-Frame BSI sensor with Nikon's advanced EXPEED image processor for the sharp, vibrant, high resolution photos and videos that Nikon is

Nikon Z6 Full Frame Mirrorless Camera Body :... -6.0

-Less than stellar battery life

Sony Alpha a6000 Mirrorless Digital Camera with 16-50mm Power Zoom ...

1 6 4 amazon.com 10 electronics.sony.com 1

Sony Alpha 7 IV Full-fram... 6 Canon EOS R6 Full-Frame M... 3

Sony a7 IV Mirrorless Cam... 1 Nikon Z6 Full Frame Mirro... 1

Focus on clips with a rating over 5.5

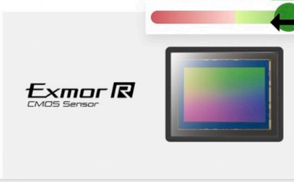
Sony Alpha 7 IV Full-frame Mir... 8.5

Exposure Control Aperture Priority, Manual, Program, Shutter Priority

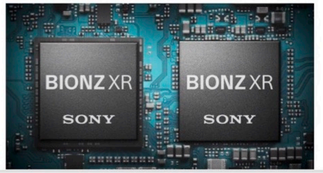
Type

33MP full-frame Exmor R back-illuminated CMOS sensor

Sony Alpha 7 IV Full-frame Mir... 7.6



Sony Alpha 7 IV Full-frame Mir... 6.1



Canon EOS R6 Full-Frame Mir... -6.0

The high-performance 20 MP CMOS image sensor helps the EOS R6 deliver outstanding image quality.

Low score clips 4

Move these clips to trash

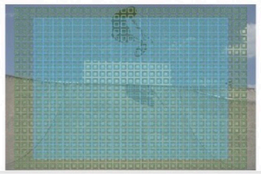
Canon EOS R6 Full-Frame Mirr... 3.1

The EOS R6 features the same base image sensor and image processor as the EOS-1D X Mark III, enabling a native ISO range of 100-102, 400. With high-speed continuous shooting of upto 12

Sony Alpha 7 IV Full-frame Mi... -2.4

Beautiful color expression made simple with S-Cinetone color profile

Sony Alpha 7 IV Full-frame Mir... 2.0

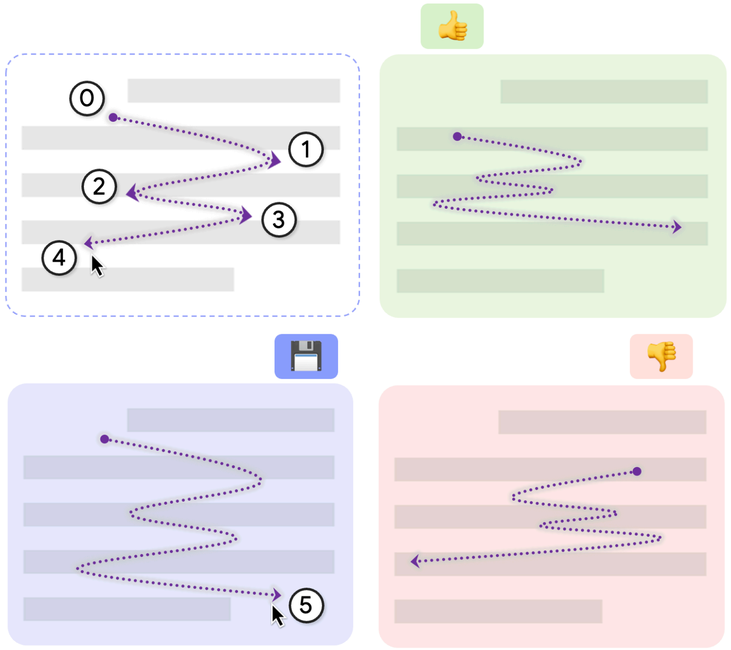


Sony Alpha 7 IV Full-frame Mir... 1.8

This is a very versatile system, it's really quick with lots of options, it works really well with the Imaging Edge app, overall this is a great tool to have for any hybrid shooter out here

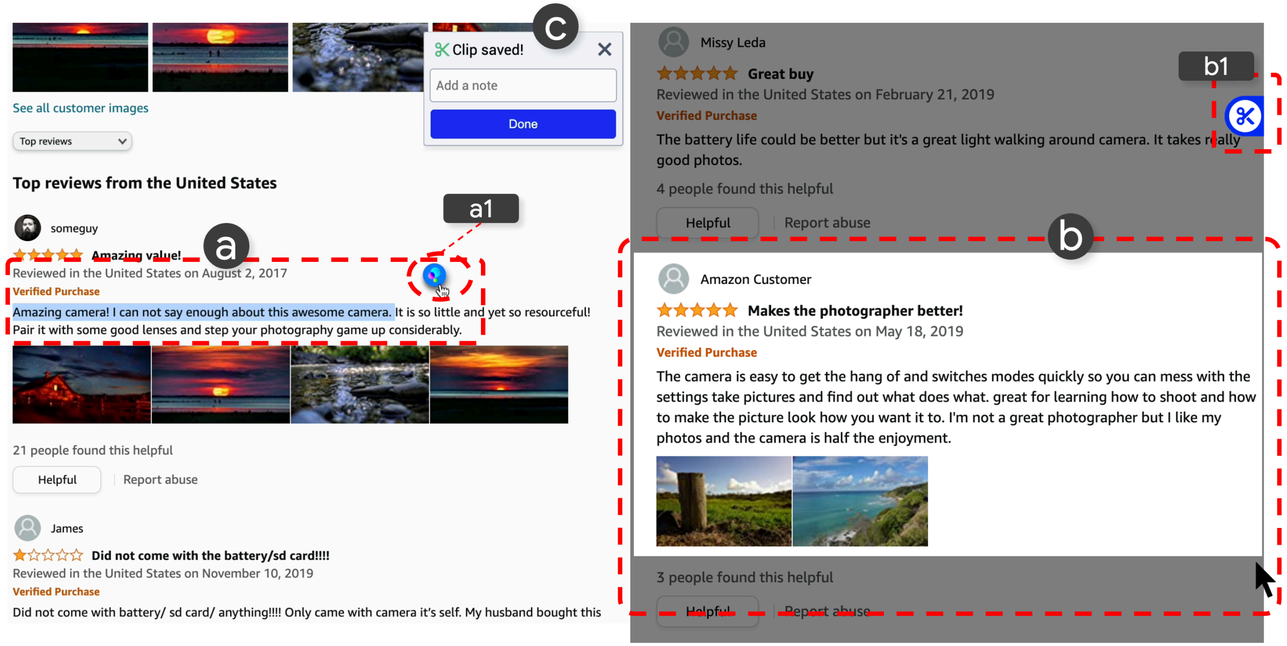
Lab study – collecting and triaging

N=12, within-subjects



Wiggling

v.s.

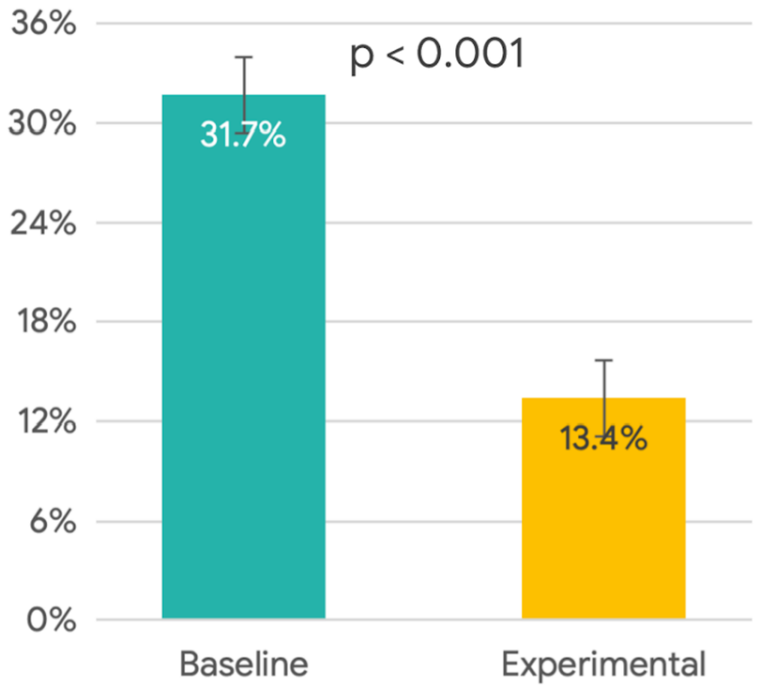


Clipping text

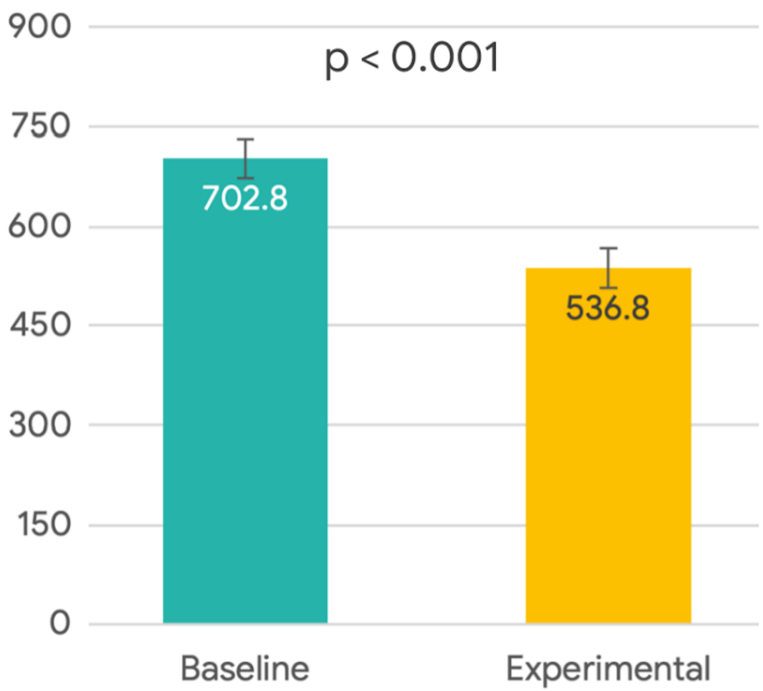
Clipping screenshot

Baseline

58% less overhead cost



24% faster



- Participants collected almost **twice** as many clips using wiggling
  (37.8 clips vs 20.3 clips, $p < 0.01$)

- **79.6%** encoded with either valence (62.4%) or priority (17.2%)

[D1] Accuracy

[D2] Efficiency

[D3] Expressiveness

[D4] Integration

TP

0 false positive (FP)

suggesting normal mouse movements would not trigger a wiggle activation

3.53% false negative (FN)

With the current implementation, 2.01% did not activate, 1.48% activated on the wrong content

TN

[D1] Accuracy

[D2] Efficiency

[D3] Expressiveness

[D4] Integration

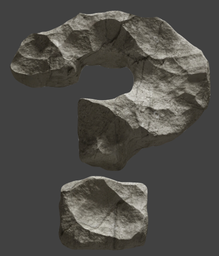
- **Fluid workflow**

  “I just wiggle and move on, in fact, when I am wiggling on something, my eyes are already onto the next paragraph, no more stopping to do the regular clipping thing any more” – P11

- **Potential customizability**

  Participants wondered if they could customize the system, such as by *“writing some sort of plugin, like the one I wrote for Obsidian, to map the different directional swipes to what I want depending on the situations that I’m in” – P1*

Future work



Foraging

Structuring

Transfer

What we learned so far

- **Externalizing mental models is beneficial**
  - Reduces mental load & scaffolds decision making
  - Explains/justifies decision making processes and rationale
  - Facilitates reuse of sensemaking resources & results

- **Tools should reduce the cost of externalization**
  - Providing in-situ info. foraging and structuring support
  - Enabling automatic info. foraging and structuring
  - Supporting lightweight interactions

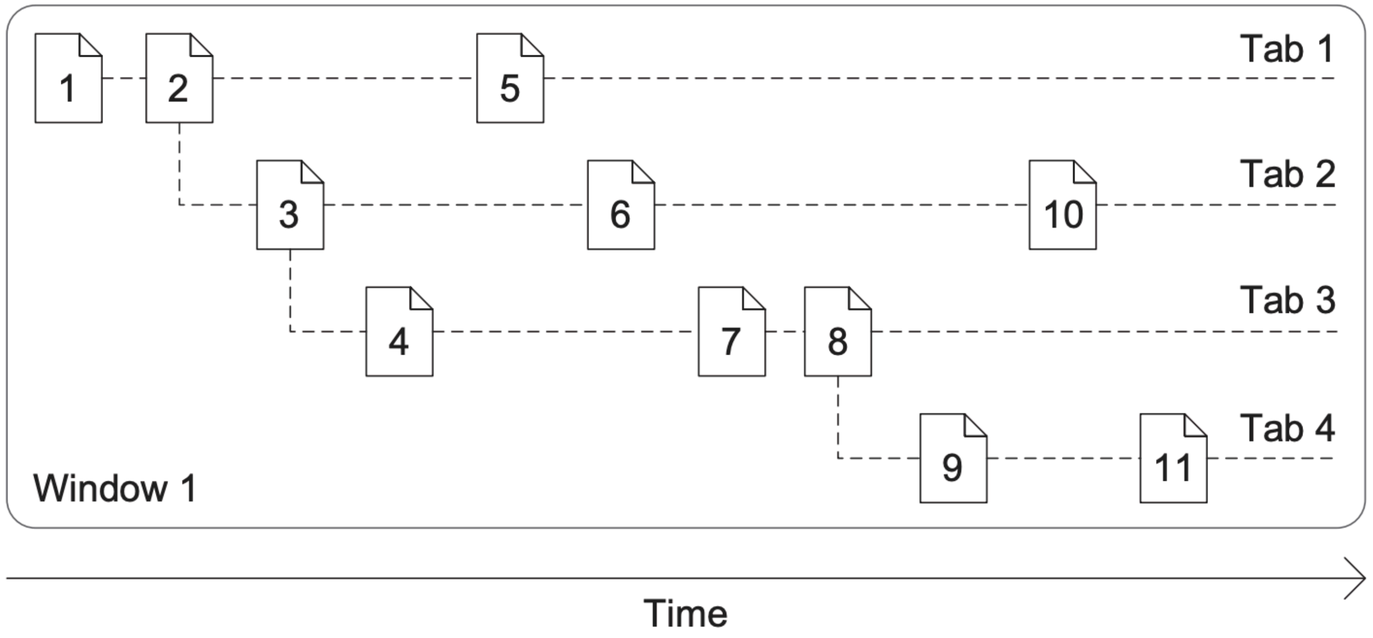
Limitations of existing work

- **Problems with tabular structure**
  - Doesn’t quite match people’s mental models during early sensemaking stages.

Lethbridge et al. 2003, Crescenzi et al. 2019, Nguyen et al. 2016, Fisher et al. 2012, Kittur et al. 2013

Flexible organizational structures

Organizing with branches



Huang et al. 2012

plate rich text editor

Snippets Code Pages 1 Notes

draft.js

Snippets 2 Code Pages 1 Notes

highlighted

The Draft.js model is built with immutable-js, offering an API with functional state updates and aggressively leveraging data persistence for scalable memory usage.

clicked

Immutable **Editor** State

react rich text editor

Snippets 5 Code 1 Pages 4 Notes

texts that you copied

- **Immutable Editor State: ** The Draft.js model is built with immutable-js, offering an API with functional state updates and aggressively leveraging data persistence for scalable memory usage.

highlighted

- **The editor's "schema" was hardcoded and hard to customize**. Things like bold and italic were supported out of the box, but what about comments, or embeds, or even more domain-specific needs?

highlighted

- Support for setting font-size and font-family.

clicked

- **The repositories were monolithic, not small and reusable**. The code bases for many of the editors often didn't expose the internal tooling that could have been re-used by developers, leading to having to reinvent the wheel.

Flexible organizational structures

Other potential ways of organizing knowledge

e.g., similarity-based grouping and categorizations

I plan to run contextual inquires and brainstorming sessions with participants.

Limitations of existing work

- **Problems with tabular structure**
  - Doesn’t quite match people’s mental models during early sensemaking stages.

- **Disconnect between automation and user input**
  - Limited ways for users to guide system automation

Lethbridge et al. 2003, Crescenzi et al. 2019, Nguyen et al. 2016, Fisher et al. 2012, Kittur et al. 2013

Implicit Behavioral Signal	Selected References in Prior Research	Descriptions	Strength of indication of user attention	Score Function W
Copying content	Developers frequently copy sample code from the web to use in their own code [8, 54, 55]	Triggers when the user copies some text from a content block b. This typically happens when a developer copies sample code from web pages to try out in their own code.	Strongest	40 for each triggering
Text highlighting	People tend to highlight text while reading to help focus their attention [105]	Triggers each time when some text in a content block b gets selected. Triggerings where the selected text is shorter than 5 characters are disqualified.	Strong	20 for each triggering
Clicking	Clicking on content, such as widgets and links, is considered to be a decent behavioral indicator for perceived interesting elements on web pages [57]	Triggers when the user clicks on a content block b. This accounts for situations where the developer interacts with content on a page, such as live demo widgets. Clicks that are part of text highlighting are excluded.	Strong	20 for each triggering
Cursor hovering	People tend to use the cursor to guide their attention while reading web pages [18, 52, 57, 65, 103].	Triggers each time when the mouse cursor hovers over a content block b for at least 2 seconds. This accounts for situations where the developer naturally moves the mouse cursor onto the content that is currently being read to guide his or her attention [18, 64, 102, 103]. However, a cursor hover triggering will be disqualified when the system detects an extended period of idling (2 minutes) without any user actions.	Weak	$0.5t$, where t is the duration (measured in seconds) of the cursor's stay within the bounds of content block b. The maximum score is 10. In our pilot testing, users rarely spend more than 10 seconds reading a text block.
Content dwelling	The longer some content stays visible, the more likely that the user is interested in it [22, 65].	Triggers each time when a content block b gets scrolled into and stays in the visible view port for at least 2 seconds. This indicates that the developer has at least paid attention to b. However, a dwell triggering during idling is disqualified.	Weak	$0.2t$, where t is the duration (measured in seconds) of content block b's stay in the visible browser viewport. The maximum score is 4. In our pilot testing, users rarely stay at one location for more than 10 seconds.

Guiding automation with user input

Direction customization of scoring functions

Allow users to directly adjust the parameters.

Learning scoring functions over time

Train an online learning model that takes into account user input (fixes of incorrect automation results) and improve its performance over time.

- generalizable to all users and scenarios
- allow additional signals

Limitations of existing work

- **Problems with tabular structure**
  - Doesn't quite match people's mental models during early sensemaking stages.

- **Disconnect between automation and user input**
  - Limited ways for users to guide system automation

- **Limited ecological validity**
  - Few evidence on how people use the systems for real-world tasks.

Lethbridge et al. 2003, Crescenzi et al. 2019, Nguyen et al. 2016, Fisher et al. 2012, Kittur et al. 2013

Field deployment study

Research questions:

- **[Usability]** Can people use the system to collect and organize information and externalize their thought processes when sensemaking?
- **[Usefulness]** Does the system offer value over what people would normally do when reading through and making sense of web content for decision making?
- **[Effectiveness]** How much effort do people perceive that they have to put into to keep the external structure up-to-date and reflective of their state of thinking at any given point in time?
- **[Characteristics]** What are some potential common characteristics of the structures that people externalize depending on the nature of the tasks?

Field deployment study

Planned approach:

- Integrate existing and the proposed techniques into a new system.
- A small group (20 - 30 users) of participants use the new system for their everyday sensemaking and decision making tasks for an extended period of time (~1 month).
- Use a mix of qualitative (e.g. interviews, surveys, ESM) and quantitative (e.g., log data analysis) methods.
- Present findings and offer design implications for future in-situ sensemaking systems.

Timeline


2022
2023
DEC.
JAN.
FEB.
MAR.
APR.
MAY.
JUNE
JULY
AUG.
SEP.
OCT.
NOV.
DEC.
Designing + Building + Evaluating
Thesis writing
Proposal
Defense
Graduation
Job search 🙏
CHI ddl

Summary of Contributions

Foraging

Structuring

Transfer

Unakite (UIST 2019)
Honorable Mention (top-6)

In-situ Information Foraging & Organization

Crystalline (CHI 2022)

Automated Information Collection & Organization

Wigglite (UIST 2022)

Lightweight interactions for Collection & Triaging

Proposed Work (2023)

Flexible structures + improved human-AI interaction + field study

Strata (CSCW 2021)
Best paper (top 1%)

Framework + System Guiding Knowledge Reuse

Committee

Thank you ❤️

Collaborators, friends,

R2, participants, & instant noodle

Sponsors

Monday, December 12, 2022

Ph.D. thesis proposal

Tool Support for Knowledge Foraging, Structuring, & Transfer During Online Sensemaking

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Brad A. Myers
Aniket Kittur
Kenneth Holstein
Daniel M. Russell (Google)


Happy Gingerbread House Day 🎉