

CSCI 1377

Tools for Thought

Hypertext II

To the Internet and Beyond

“Trying to fix HTML is like trying to graft arms and legs onto [a] hamburger.”

— Ted Nelson, 1999

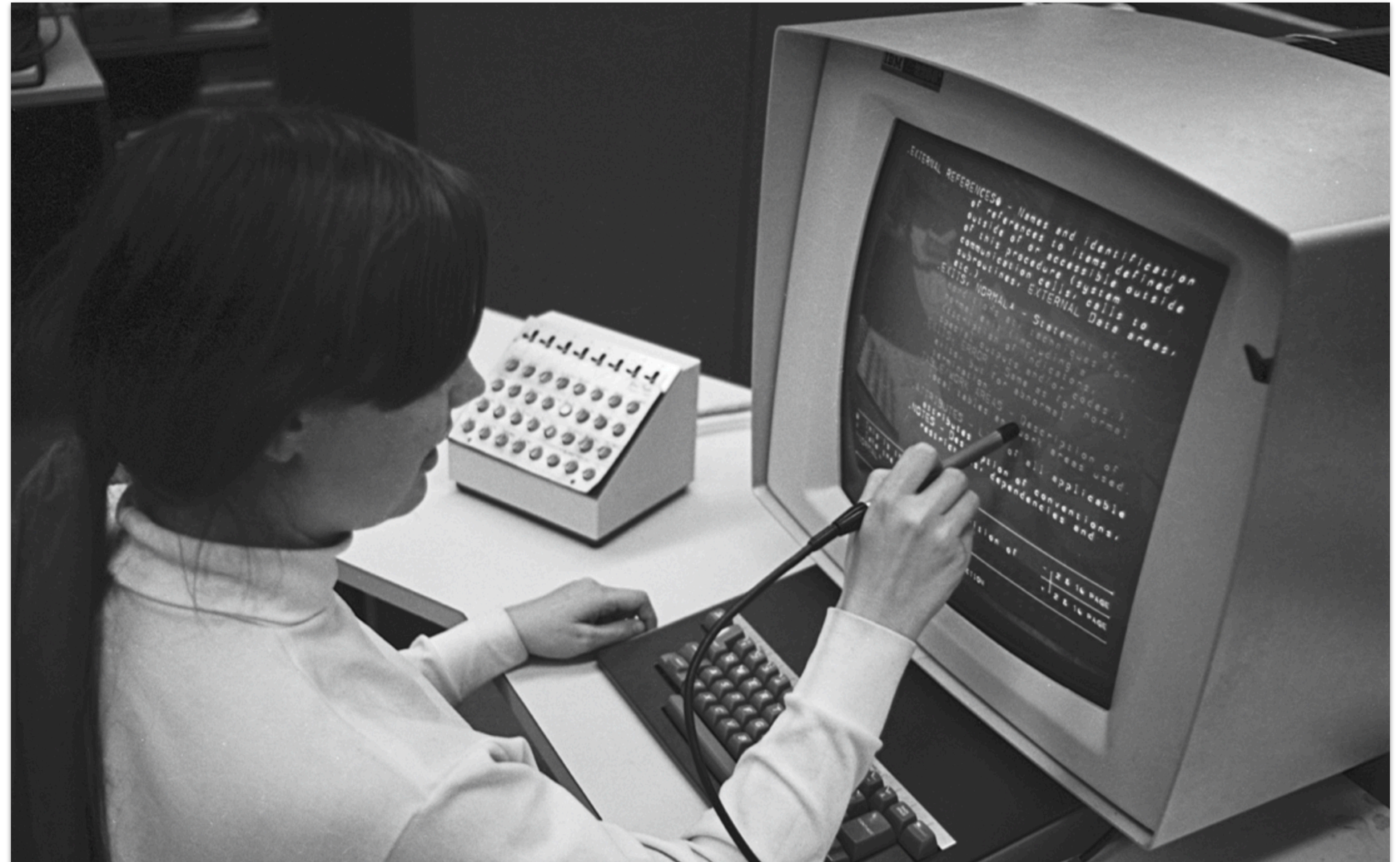
“Hypertext is the combination of natural-language text with the computer’s capacities for interactive, branching or dynamic display, *when explicitly used as a medium.*”

Ted Nelson, “Getting It Out of Our System” (1967)

Our very own Andy worked with Ted to create a prototype hypertext word processor in 1967



Hypertext
Editing
System
(HES)



Check out 1951V!

<https://cs1951v-2023.vercel.app>

World Wide Web (not the Internet!) started at CERN

- CERN needed to organize a lot of technical knowledge
 - Turnover: “information is constantly being lost”
 - Churn: “CERN is constantly changing as new ideas are produced, as new technology becomes available, and in order to get around unforeseen technical problem”
 - Questions: “Where is this module used? Who wrote this code? Where do they work? Which systems depend on this device? What documents refer to this one?”
- Existing hierarchical / tree-like organizations were insufficient
 - e.g. HELP → COMPILER → SOURCE_FORMAT → PRAGMAS → DEFAULTS
- Keywords were also insufficient: “two people never chose the same keywords”

WWW influenced by CERN's requirements

- **“Remote access across networks:** CERN is distributed, and access from remote machines is essential.
- **Bells and Whistles:** Storage of ASCII text, and display on 24x80 screens, is in the short term sufficient, and essential.
- **Non-Centralisation:** A new system must allow existing systems to be linked together without requiring any central control
- **Private links:** One must be able to add one's own private links to and from public information. One must also be able to annotate links, as well as nodes, privately.”

WWW provides hypertext infrastructure

Hypertext Transfer Protocol (HTTP)

```
GET /csci-1377-s26/ HTTP/2
Host: cel.cs.brown.edu
User-Agent: Mozilla/5.0 [...]
Connection: keep-alive
```

```
HTTP/2 200
server: GitHub.com
content-type: text/html;
charset=utf-8
content-length: 14043
last-modified: Tue, 10 Feb
2026 20:00:25 GMT
```

Hypertext Markup Language (HTML)

```
<!DOCTYPE html>
<html>
  <head>
    <title>
      Tools for Thought
    </title>
  </head>
  <body>
    <h1>Course Notes</h1>
    <a href="/lectures">
      Lectures
    </a>
  </body>
</html>
```

Uniform Resource Locator (URL)

```
http://
cel.cs.brown.edu/
csci-1377-s26/
index.html
#lectures
?visited=true
```

Hypertext design dimensions of the Web

- **Nodes:** web pages
 - Pages have sub-nodes based on HTML structure, e.g. by ID or tag name
- **Links:** anchors via `<a>` tags
 - URLs link to pages or page fragments
 - Some webapps provide custom fragments, e.g., GitHub line ranges
 - Links are **unidirectional**, so the linked page does not know about being linked
 - `Referer` (sp.) header added in 1996 to address this
- **Content:** arbitrary applications without OS access
 - Cascading Style Sheets (1996) provides rich 2D UI layout and rendering
 - JavaScript (1995) provides interaction and computation
 - WebAssembly (2015) provides high-performance execution

Hypertext design dimensions of the Web

- **Navigation:** depends on browser and webpage
 - **Browser:** back/forward buttons, local browsing history, bookmarks
 - **Webpage:** can provide breadcrumbs
- **Finding:** depends on browser, web page, search engine
 - **Browser:** Ctrl+F to find text on the current page, bookmarks for browsing old pages
 - **Webpage:** can provide table of contents, sitemap
 - **Search engine:** use keywords (Google) or natural language (LLMs) to find pages
- **Viewing:** depends on OS, browser, webpage
 - **OS:** window management for viewing pages concurrently
 - **Browser:** tabs for multiple pages, tab groups more recently
 - **Webpage:** can provide app-specific support for viewing previews, multiple docs

Hypertext, search engines, and profit motives: is your tool for thought adversarially robust?

- Lewandowski et al. 2021: ~80% of results for popular Google queries show signs of non-trivial search engine optimization
- Bevendorff et al. 2024:
 - “higher-ranked pages are on average more optimized, more monetized with affiliate marketing, and they show signs of lower text quality”
 - “search engines measurably target SEO and affiliate spam with their ranker updates. Google’s updates in particular are having a noticeable, yet mostly short-lived, effect.”
- Let’s hope our LLMs fare better!

Hypertext design dimensions of the Web

- **Authoring:** requires a web site and a server
 - WYSIWYG web builders like Squarespace have a long history, e.g. Adobe Dreamweaver (1997) and NaviPress (1994)
- **Collaboration:** entirely application-driven
 - Operational Transforms and Conflict-Free Replicated Datatypes provide the basis for modern collaborative editing
- **Annotation:** entirely application-driven
 - E.g., Google Docs / Notion / Overleaf have bespoke support
 - Web Annotation Protocol (2017) could change this! Supported by Hypothes.is
- **Versioning:** only latest version available, can disappear any time
 - “Link rot”: ~half of links in Supreme Court opinions are dead! (Zittrain et al. 2014)

“The Xanadu project did not "fail to invent HTML". HTML is precisely what we were trying to PREVENT-- ever-breaking links, links going outward only, quotes you can't follow to their origins, no version management, no rights management.”


— Ted Nelson, 1999

Some other lesser-used hypertext concepts


Transclusion


Live inclusion of content from other nodes

↻ Reposted by rev. howard arson

 **Ryan Moulton** @moultano.bsky.social · 5h

It's pretty crazy that this book was published in 2006, and the characters suspect that the alien they are talking to in the opening is an LLM in a sense more or less recognizable to anyone reading it today.

 **hikikomorphism** @hikikomorphism.bsky.social · 6h


 Posts a lot: more than 50 times yesterday

competitive advantage for the LLM era: went insane reading Blindsight a decade ago; confronted the fact that much of what we value as intelligence can be decomposed into component submodules; accepted that sentience/consciousness was not a precondition of effectiveness wrt many cognitive tasks, etc

5 12 94


Dynamic linking

Reader rather than author determines links

 **Annotation**
Piece of metadata attached to a document or other entity

An annotation is extra information associated with a particular point in a document or other piece of information. It can be a note that includes a comment or explanation. Annotations are sometimes presented in the margin of book pages. For annotations of different digital media, see web annotation and text annotation.

Wikipedia

See More on Wikipedia 

Dictionary Siri Knowledge Siri Suggested Websites

- Web **Annotation** Protocol (20

Some other lesser-used hypertext concepts

Bidirectional links

See nodes which link to a given node

The following pages link to **Brown University**

External tools ([link count](#) · [transclusion count](#) · [sorted list](#)) ·

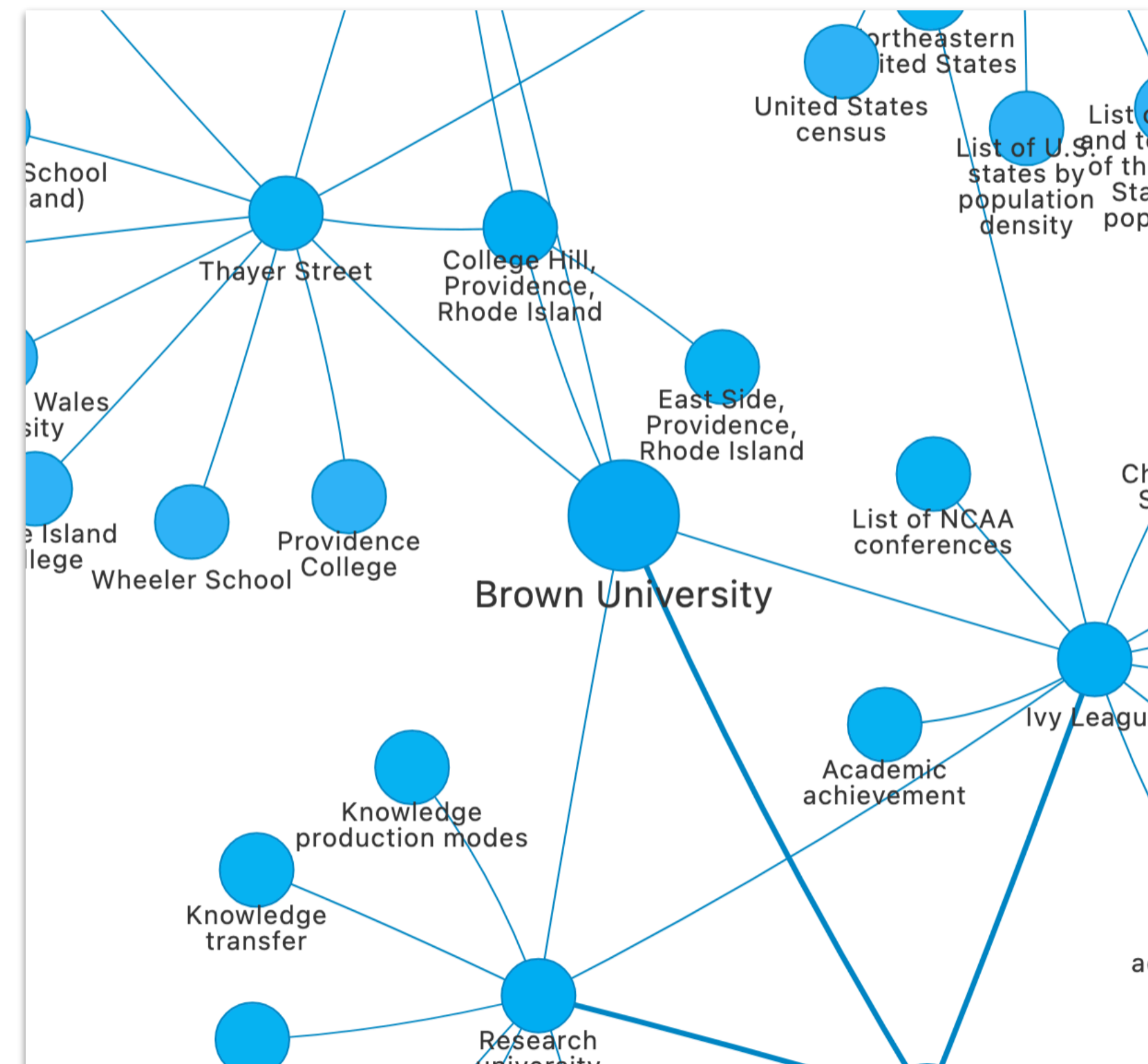
Showing 50 items.

View (previous 50 | next 50) ([20](#) | [50](#) | [100](#) | [250](#) | [500](#))

- [Alvin Toffler](#) ([links](#) | [edit](#))
- [Alexis Carrel](#) ([links](#) | [edit](#))
- [Aberdeen](#) ([links](#) | [edit](#))
- [Arizona State University](#) ([links](#) | [edit](#))
- [A cappella](#) ([links](#) | [edit](#))
- [Barnard College](#) ([links](#) | [edit](#))
- [Bioterrorism](#) ([links](#) | [edit](#))
- [Zebrafish](#) ([links](#) | [edit](#))
- [California Institute of Technology](#) ([links](#) | [edit](#))
- [Columbia University](#) ([links](#) | [edit](#))

Spatial hypertext

Visualize topology of hypertext graph



What is the hypertext architecture of each system?

- Nodes
- Links
- Content
- Navigation
- Finding
- Viewing
- Authoring
- Collaboration
- Annotation
- Versioning

(What are new dimensions we haven't discussed?)

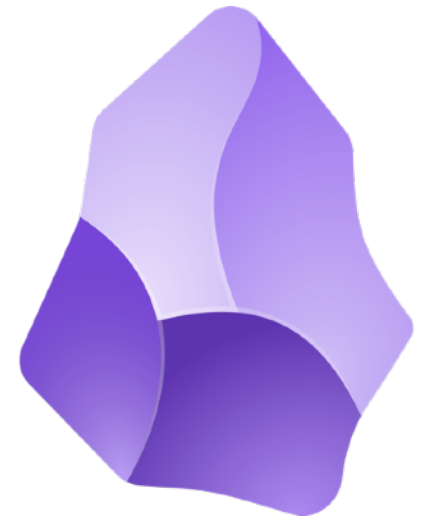
How does the design support knowledge work?

Creative writing

Literature review

Team management

Task management



Obsidian

<https://youtu.be/Vmlh7EjrdIk>



Tinderbox

https://youtu.be/_DT_Un3M06o



Notion

<https://youtu.be/2t5FvgPBVKY>



Coda

https://youtu.be/cw61T_pgMeU

Notion's data model is built on blocks

```
{  
  "id": "e7e93fae",  
  "type": "to_do",  
  "properties": {  
    "title": [["Write a blog post about blocks"]],  
    "checked": [["No"]]  
  },  
  "content": [  
    "00315dfb",  
    "bf2d3c32",  
    "3070827f",  
  ],  
  "parent": "fc32e031",  
}
```

- Write a blog post about blocks
- Do a rough first draft
- Clean it up
- Share it with the world!