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COMS 4170 · SPRING 2022

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# Inclusive Design & Accessibility

Prof. Lydia Chilton

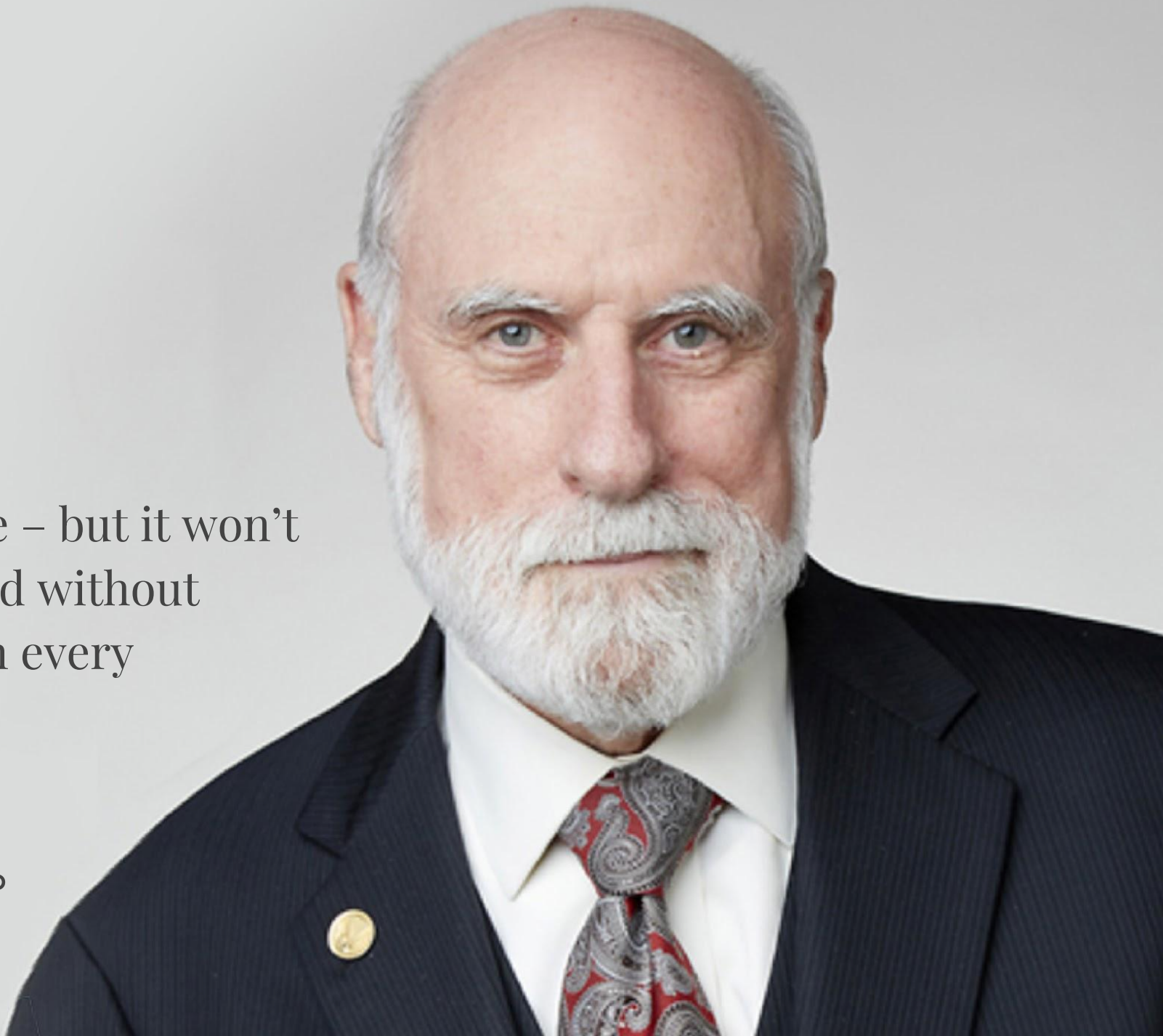
March 5, 2025

Graphic design by Prof Celeste Layne



“The Internet is for everyone – but it won’t be until ... [it] can be accessed without limitation, at any time and in every language.”

– Vinton Cerf, co-founder of TCP/IP





# Accessibility = Open to all

And there are laws in the US that ensure the web is accessible.



You're shopping (closes at 10pm): Augusta ▾

UC Berkeley student Bruce Sexton sued Target because its website was **inaccessible to the blind.**

ars TECHNICA  
BIZ & IT TECH SCIENCE POLICY CARS GAMING & CULTURE

POLICY —  
**Lawsuit over web site accessibility for the blind becomes class action**

A federal judge has just certified a class action lawsuit against Target after ...  
Los Angeles Times

**Blind shoppers win OK to sue Target**

LAT ARCHIVES  
OCT. 3. 2007 12 AM PT  
FROM BLOOMBERG NEWS

Target Corp., the second-largest U.S. discount store chain, lost a bid Tuesday to dismiss a lawsuit claiming the company's website wasn't accessible to the blind.

U.S. District Judge Marilyn Hall Patel in San Francisco rejected Target's request to dismiss the case. She also certified the case as a class action, ruling that all legally blind people in the U.S. who have been denied access to services at Target stores because of deficiencies in the company's website can join the suit.

Target has failed to use "technologically simple and not economically prohibitive" code embedded in websites allowing the blind to use software that vocalizes the content, according to court filings by the National Federation of the Blind.

Target has failed to use "technologically simple and not economically prohibitive" code embedded in websites allowing the blind to use software that vocalizes the content, according to court filings by the National Federation of the Blind.

a blind student at the University of California-Berkeley has filed a lawsuit against US retailer Target. A federal judge has just certified a class action lawsuit against Target after ...

of descriptive "alt" tags in Target's HTML, making it difficult for blind users to use the software. The use of image maps is also problematic.

**Men's spring fave**  
Prep for sunny days ahead

UC Berkeley News

NewsCenter

- Today's news & events
- Subscribe to news
- For the news media
- Calendar of events

Web Feature



**Transfer student Bruce Sexton has Target-ed independence for blind people as a major goal**  
By Bonnie Azab Powell, NewsCenter | 20 March 2006

Bruce Sexton, an interdisciplinary studies major who is suing Target to make its website accessible for blind users. (Bonnie Azab Powell photos)

BERKELEY — Bruce "B.J." Sexton seems like a quiet, mild-mannered guy. But he can speak up when he has to. "people think I'm radical because I'm suing Target," says the third-year UC Berkeley student, who is president of the California Association of Blind Students and legally blind. "They don't try to understand what this is about."

He explains that he agreed to be a plaintiff, along with the National Federation of the Blind (NFB) and its California chapter, in a class-action suit filed February 7 against the discount retail giant only as a last resort. Starting in May 2005, the NFB and a Berkeley nonprofit law firm, Disability Rights Advocates, had been in active discussions with Target Corporation about making its website work with the screen-reading technologies used by the visually impaired, as many other business websites do. (To learn what's the issue with Target.com, see sidebar below.) When the talks broke down, the firm filed suit on behalf of the NFB and that of all blind people in California.



Guillermo Robles, who is blind, claimed in U.S. District Court in California that the pizza maker violated the federal disability requirements because he couldn't order a pizza on his iPhone: **The website didn't work with his screen-reader software.**

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DELIVERY

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MIX & MATCH DEAL

**CHOOSE ANY 2 OR MORE**

**\$5.99** each

ORDER NOW

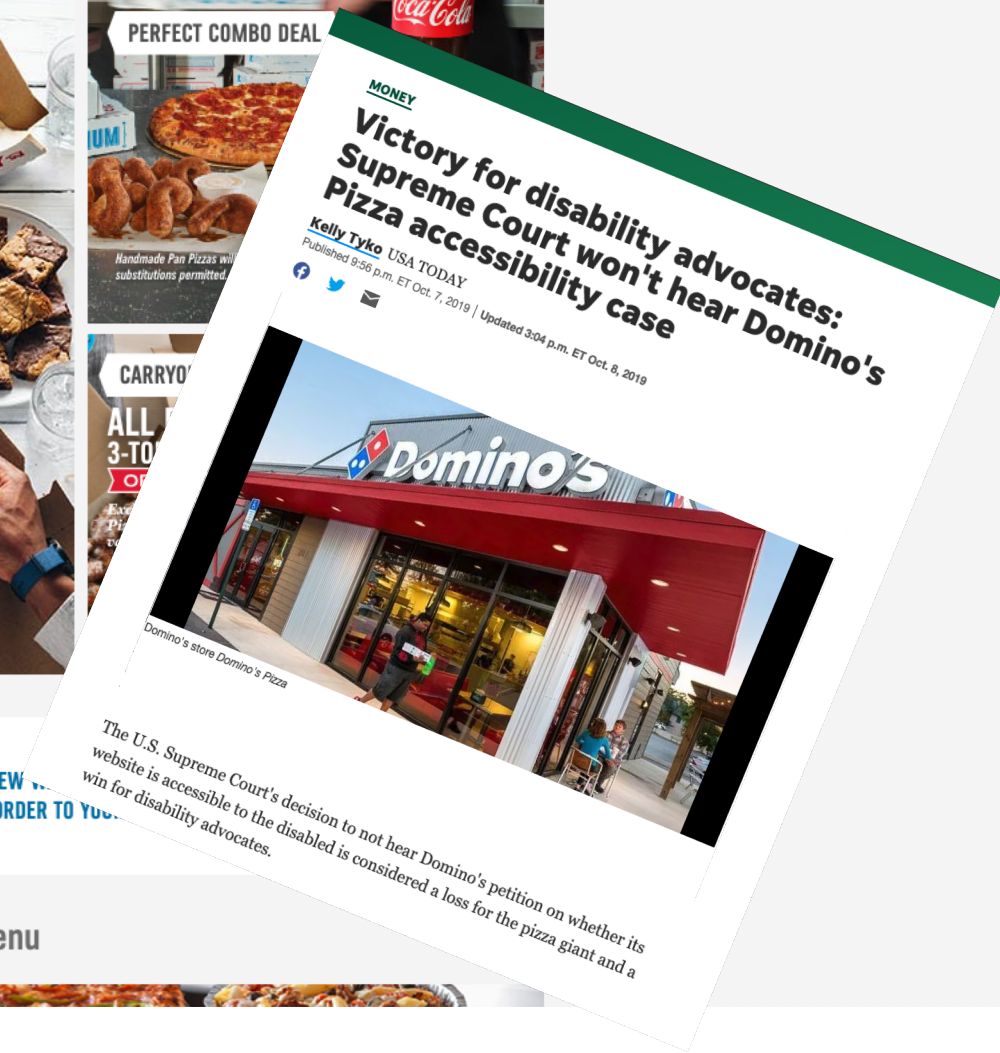
2-item minimum. Handmade Pan Pizzas, Bread Bowl Pasta, and Bone-In wings will be extra.

PERFECT COMBO DEAL

Handmade Pan Pizzas will substitutions permitted.

CARRYOUT

ALL 3-TOP OR



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A NEW WAY TO ORDER THE ORDER TO YOU

Browse Our Menu






# Accessibility Today

## Internet inventor: Make tech accessibility better already

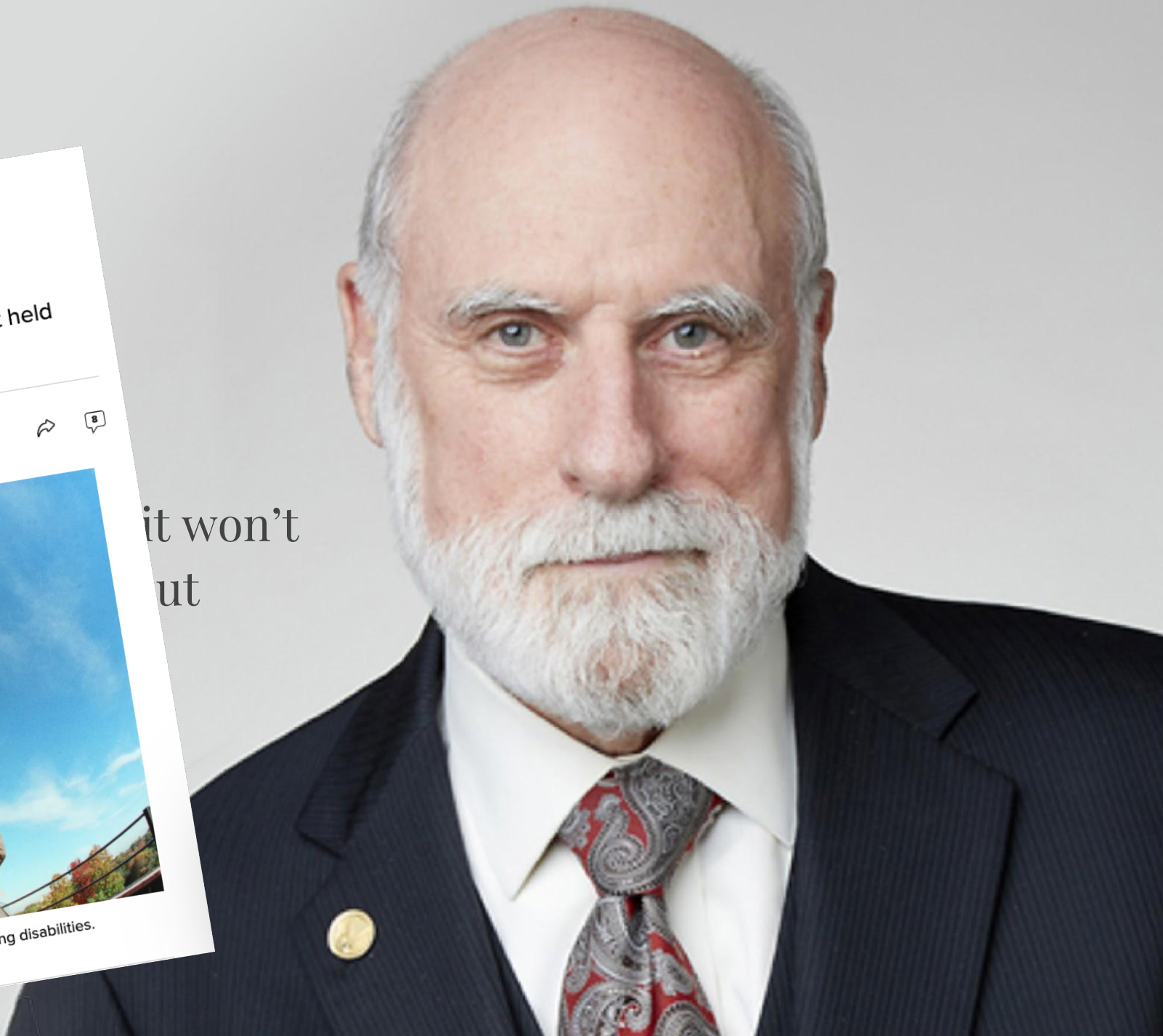
Vint Cerf says "it's almost criminal" that programmers aren't held accountable to design with disabilities in mind.

Joan E. Solsman  April 10, 2017 5:00 a.m. PT



Both Vint Cerf, known as a "father of the Internet," and his wife have hearing disabilities.

it won't  
ut



# — World Health Organization redefined disability

**Disability** is not a property of a person,  
but a **property of a system**.

**It reflects the interaction between features of a person's body and features of the society in which he or she lives.**

**Disability is part of being human in the world.**





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# What assumptions do we make about people?



# — What assumptions do we make about users?



- Right-handed
- Fine motor control to move mouse around
- Fine motor control for scroller and ball motion
- Enough strength to press the buttons/move the ball
- Sensitivity to find smaller buttons

# What assumptions do we make about users?



- They can see well
  - Distinguish between colors
  - Distinguish between small icons
  - Distinguish between small letters (when typing)
- They can hold it in their hand
  - Arm mobility
  - Grip strength
  - Fine motor control

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# Visual

Blindness



# — Ways that websites fail the visually-impaired

- Poorly structured HTML
- Images with no meaningful alt text
- Poorly structured forms
- Repetitive items that cannot be skipped
- Features that require vision, or where the fallback is poorly implemented



# How does a blind person use a computer?



# — How does a blind person use a computer?

- Screen reader says out loud what is on the screen
- Gives rich feedback when the user types
- Allows for keyboard navigation (no mouse)

# Web accessibility for the visually-impaired

## Heading Structure

Headers should descend logically and should be used for section headers.

```
<!-- Example 2 -->
<!-- Be as explicit as possible when using tags and always include headings for main titles -->
<!-- Do This -->

<h1>Special Pizza NYC</h1>
  <h2>About Special Pizza</h2>
    <h3>Our Story</h3>
    <h3>Our Founder</h3>
  <h2>Why Our Pizza Is Special</h2>
    <h3>Our Ingredients</h3>
    <h3>Our Chef</h3>

<!-- Not This -->
<div>Special Pizza NYC</div>
<div>About Special Pizza</div>
<div>Why Our Pizza is Special</div>
```



# — Web accessibility for the visually-impaired

## Using Accessible Rich Internet Applications (ARIA)

ARIA roles provide screen reader users with more information, context and greater interactivity. ARIA roles are relevant to making sure readers can perceive content.

You can add an ARIA role by simply assigning a role attribute to a tag:

```
<div role="banner">
```



# Web accessibility for the visually-impaired

## Alt tags

Alt tags are added to images in order to help users understand what they are unable to **perceive** or **interact** with, particularly if they have low or no vision.

```
<!-- Example 3 -->
<!-- Add alternate text descriptions to images -->
<!-- Do This -->



<!-- Not This -->


```





# — Web accessibility for the visually-impaired

## Forms

```
<form>  
  <label for="first_name">Enter your first name</label>  
  <input type="text" id="first_name">  
</form>
```



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# Visual

Low Vision and Color Blindness



# — Ways that websites fail the visually-impaired

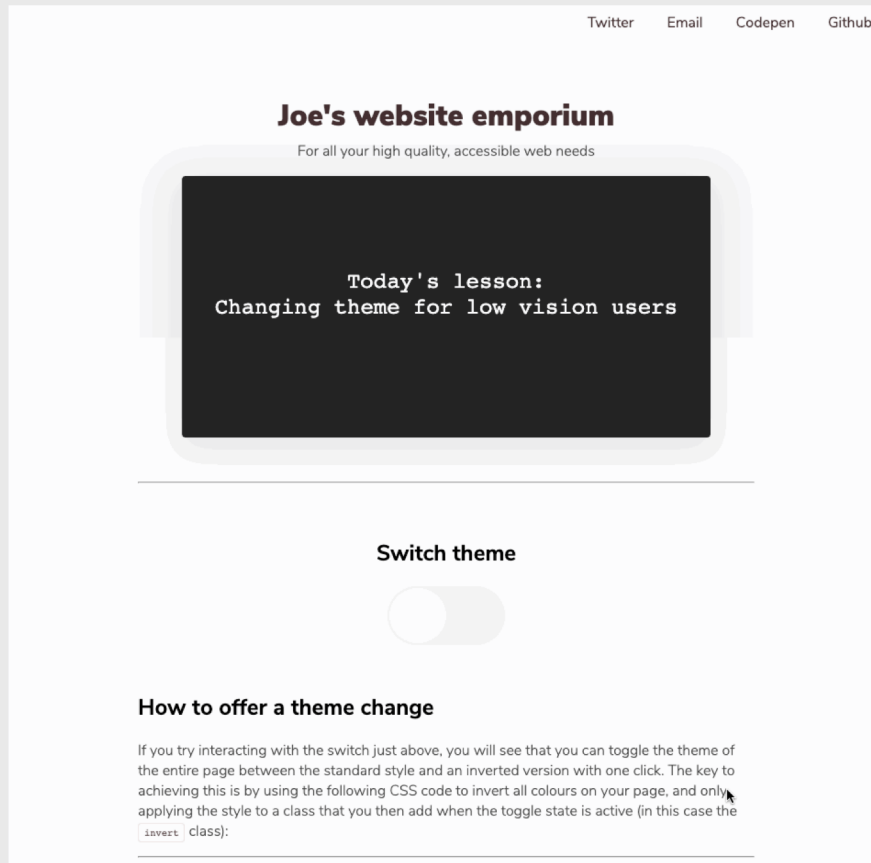
## Accessible Text

- Relative units
- Stop using pixels
- Raise your base font size
- Line height
- Letter spacing



# Ways that websites fail the visually-impaired

## Contrast Ratio



Depending on the browser supported, CSS has a filter property available that can create a whole range of different visual effects.

```
body.invert{
```

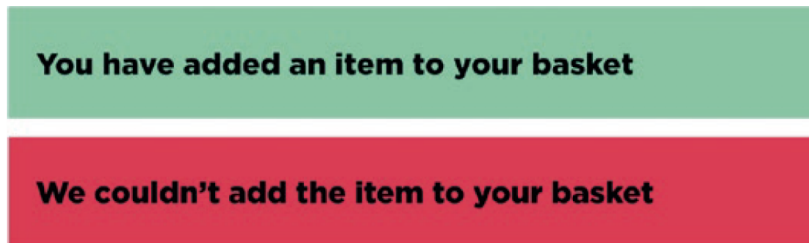
```
    filter: invert(100%);
```

```
}
```

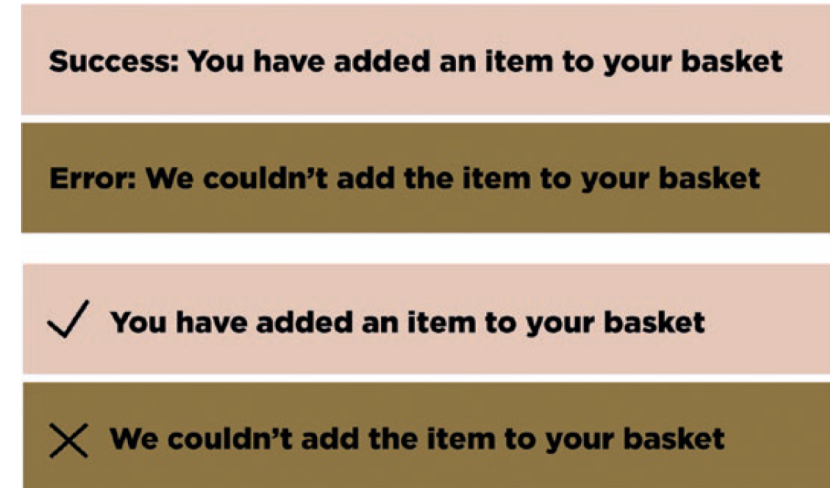


# Ways that websites fail the visually-impaired

## Color Blindness



*Figure 3-10. Two alerts, one positive and one negative, both where colour is the primary way in which status is displayed*



*Figure 3-12. The status messages now use either "Success" and "Error", or a tick and a cross icon, so the meaning of the message doesn't rely on colour*



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# Audio



# — Ways that websites fail the hearing-impaired

- Videos with no captioning
- Videos with poor captioning
- Interactive features with no visual alerts
- Poor quality live feeds



# Web accessibility for the hearing impaired

## <track> element

HTML5 allows us to add subtitles for a video using the <track> tag:

```
<video controls>
  <source src="videos/video.mp4" type="video/mp4">
  <source src="videos/video.webm" type="video/webm">
  <track label="English" kind="subtitles" srclang="en" src="captions/vtt/video-en.vtt"
default>
  <track label="Deutsch" kind="subtitles" srclang="de" src="captions/vtt/video-de.vtt"
default>
</video>
```



# Web accessibility for the hearing impaired

## <audio> tag and captions

```
/* CSS */  
.audio {  
  height: 120px;  
}  
  
WEBVTT  
00:00:08.100 --> 00:00:10.500 line:1  
I'm not the monster here. You are.
```



*Figure 5-9. A custom audio player using the <video> tag, a fixed height, and positioned captions*

```
<video class="audio" controls>  
  <source src="media/audio.mp4" type="audio/mpeg">  
  <track label="English" kind="subtitles" srclang="en" src="vtt/audio.vtt" default/>  
</video>
```

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# Physical



# Web accessibility for the physically impaired

## Keyboard-only navigation



*Figure 4-1. A picture of a button and then that same button with keyboard focus style applied*

## Have you ever tried using a website without a mouse?

The most common method of keyboard-only navigation relies on the Tab key, which moves the user sequentially between elements on a page. When you're focused on an element using the keyboard, by default an outline appears to reflect that.

# Web accessibility for the physically impaired

## Set visible keyboard focus



Imagine you're a keyboard-only user and you're aiming to interact with one of these menu items. In the first example, you're left to guess which link you're on and could potentially end up heading to pages you weren't trying to navigate to.



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# Cognitive





# Web accessibility for the cognitively impaired

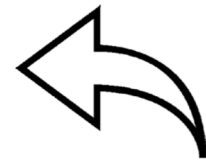
## Clear iconography



*Figure 6-4. A "speech bubble" icon*



*Figure 6-5. A "pencil" icon*



*Figure 6-6. An icon of an arrow, pointing upward and left*

# Web accessibility for the cognitively impaired

## Autocomplete

Search for a country:



cro
Croatia
Micronesia (Federated States of)

**Figure 6-15.** Strict search accurately returning “Croatia” when the user has entered “cro”

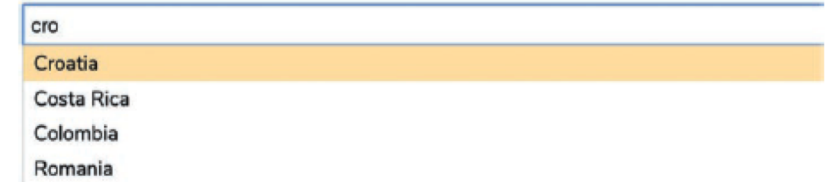
### Strict Search

Relies on an exact match

### Fuzzy Matching

Doesn't rely on an exact match

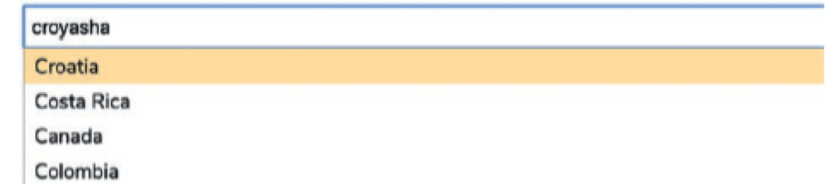
Search for a country or ISO code:



cro
Croatia
Costa Rica
Colombia
Romania

**Figure 6-17.** Fuzzy search accurately returning “Croatia” when the user has entered the start of the word – “cro” – the same as strict search

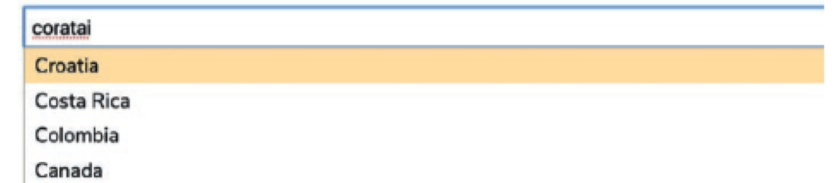
Search for a country or ISO code:



croyasha
Croatia
Costa Rica
Canada
Colombia

**Figure 6-18.** Fuzzy search accurately returning “Croatia” when the user has entered an incorrect spelling based on how the word is said – “croyasha”

Search for a country or ISO code:



coratai
Croatia
Costa Rica
Colombia
Canada

**Figure 6-19.** Fuzzy search accurately returning “Croatia” when the user has entered all of the correct letters for the word but in the wrong order – “Coratai”

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**Inclusive design focuses on  
individuals, not averages**



# The myth of average

☰

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## When U.S. air force discovered the flaw of averages

By **TODD ROSE**  
Sat., Jan. 16, 2016

f t ✉ ...

In the late 1940s, the United States air force had a serious problem: its pilots could not keep control of their planes. Although this was the dawn of jet-powered aviation and the planes were faster and more complicated to fly, the problems were so frequent and involved so many different aircraft that the air force had an alarming, life-or-death mystery on its hands. “It was a difficult time to be flying,” one retired airman told me. “You never knew if you were going to end up in the dirt.” At its worst point, 17 pilots crashed in a single day.



# — Designing for the Average

## Pros

- Only have to design one system
  - Faster and simpler
- Maybe you can model after yourself
  - Need fewer test users
- Almost always cheaper

## Cons

- Limit who can use your system
- Might be imperfect for everyone
- Might make incorrect assumptions about what average means
- Might never learn how to design for others



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# Situational Impairments



# — World Health Organization redefined disability

**Disability** is not a property of a person,  
but a **property of a system**.

**It reflects the interaction between features of a person's body and features of the society in which he or she lives.**

**Disability is part of being human in the world.**



# What are some situational impairments of this system?



- Only using one hand
- Distracted (riding a bike)
- Wearing a long coat
- Diminished hearing



# — What are some situational impairments of this system?



- Only using one hand
- Distracted

# What are some situational impairments of this system?



- Diminished hearing
- Distracted
- Low lighting
- “Cognitive impaired.”

# What is Inclusive Design?

A **design methodology** that enables and draws on the full range of human diversity. Most importantly, this means including and learning from people with a range of perspectives.

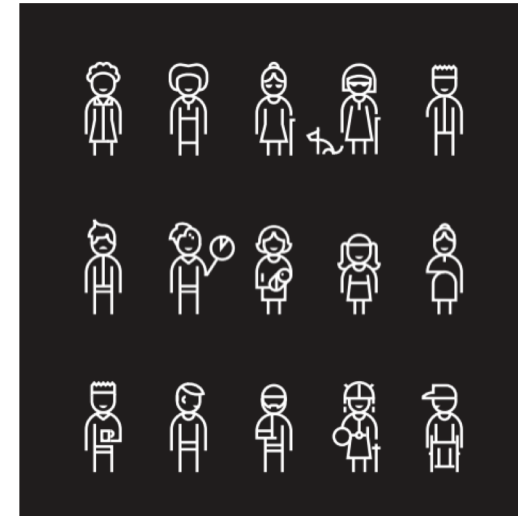


# Inclusive Design



## Who we design for

If we use our own abilities and biases as a starting point, we end up with products designed for people of a specific gender, age, language ability, tech literacy, and physical ability. Those with specific access to money, time, and a social network.



## Who gets excluded

When it comes to people, **there's no such thing as "normal."** The interactions we design with technology depend heavily on what we can see, hear, say, and touch. Assuming all those senses and abilities are fully enabled creates the potential to ignore much of the range of humanity.

# — Inclusive Design

## 3 Principles of Inclusive Design

1. Recognize  
exclusion

2. Learn from  
diversity

3. Solve for one,  
extend to many



# Recognize exclusion



One arm



Arm injury



New parent

## Situational impairments

Sometimes exclusion is **situational**. e.g. inability to hear in a loud crowd; trying to see after looking into a bright light.

## Activity limitations

**Context** affects how people interact with the world: e.g. a new parent spending their day doing one-handed tasks.

## Restrictions on participation

Sometimes exclusion is **temporary**. e.g. ordering dinner in a foreign country; wearing a cast on your arm.



# Learn from Diversity

The insight is in the adaptation

When experiences don't serve people the way they should, people adapt. Insights come when we understand those adaptations.

Learning how people adapt to the world around them means spending time understanding their experience from their perspective.



# Solve for one, extend to many



Permanent 26K



Temporary 13M



Situational 8M

## The beauty of constraints

High-contrast screen settings were initially made to benefit people with vision impairments. Today, many people benefit from high-contrast settings when they use a device in bright sunlight.

## Different people benefit

By designing for someone with a permanent disability, someone with a situational limitation can also benefit.

## More people benefit

In the United States, 26,000 people a year suffer from loss of upper extremities. But when we include people with temporary and situational impairments, the number is greater than 20M.



# Designed for wheelchairs. Who else benefits?



- People with luggage
- People with shopping carts
- People with strollers
- People walking and texting

# Designed for fire safety. Who else benefits?



- People in a rush
- People holding two cups of coffee
- People who can't read
  - Children
  - Elderly
  - Non-English speakers



# Designed for arthritis. Who else benefits?



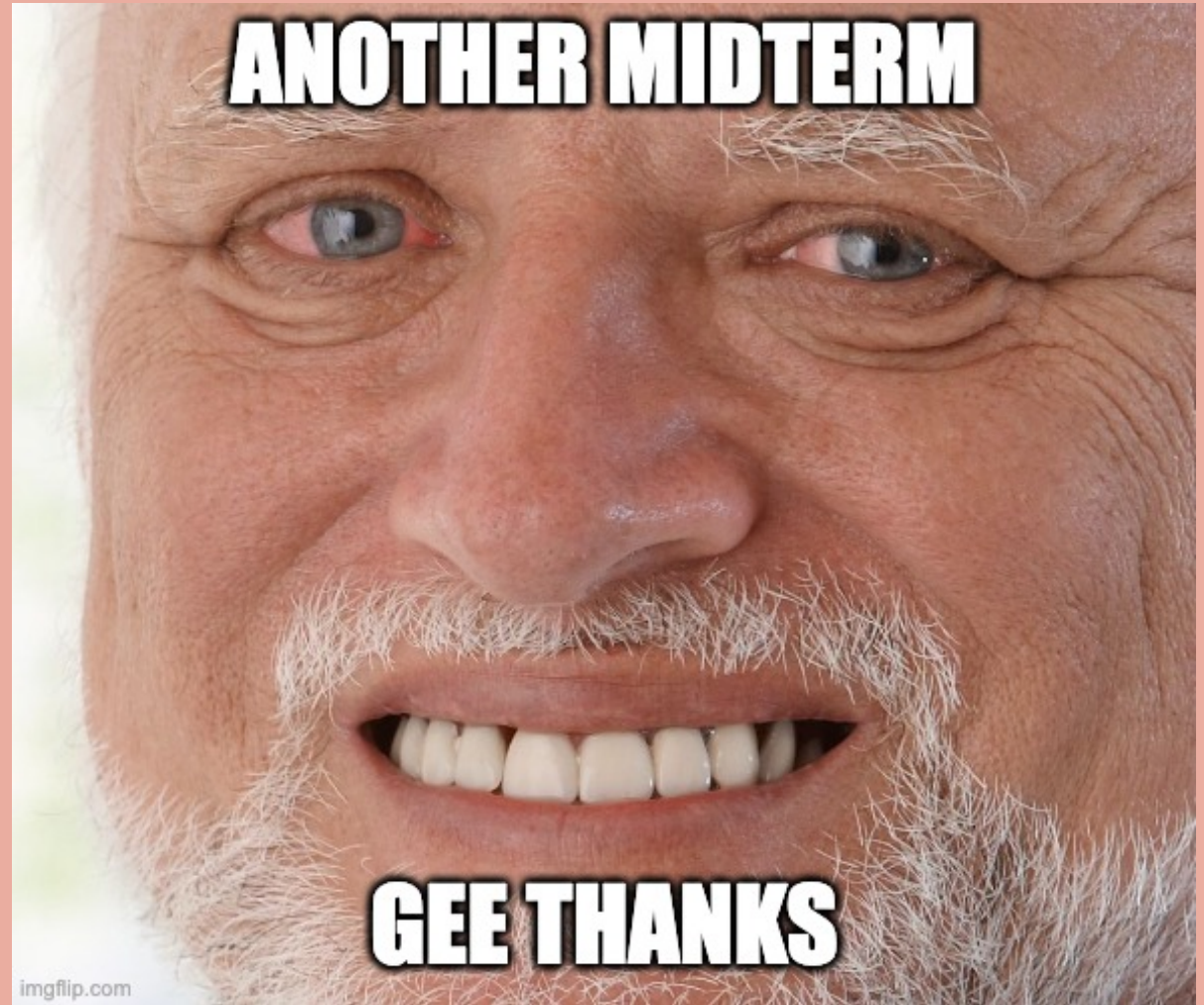
- Anyone who has ever peeled anything!

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# Midterm





# —

## Due Friday 3/14

### It's worth 10% of your grade

#### **Midterm: Usable CRUD Application**

This assignment is the midterm in this classes – it displays cumulative knowledge of the things learned in all the lectures in the first half of the class and it is worth 10% of your final grade. Although it has the same structure as a homework assignment, treat it with the same urgency as an in-class midterm. However, just like a regular homework, you are still allowed to Google things, use ChatGPT, come to office hours, work with others, and seek other forms of help.

You may not use a late pass on this assignment. If you have an emergency situation that requires an extension, please contact your advising dean and have them reach out to me.

There will be no office hours the week of spring break.

When students ask me for letters of recommendation, I always ask them to give me links to the Midterm and Final project videos. These are portfolio pieces that demonstrate your technical and design skills, and your ability to put them together for a polished final product. It's worth putting in some time to refine the design and make a decent video. We highly recommend

# Warm up: Visual Information design

Visual Information Design Lebowski

Search in Presentation

Home Insert Design Transitions Animations Slide Show Review View

Layout Calibri (Body) 28 A A

Paste Copy New Slide Reset Section

B I U abc X<sup>2</sup> X<sub>2</sub> AV A A

Convert to SmartArt Picture Shapes Text Box Arrange Quick Styles Shape Fill Shape Outline

Office Update To keep up-to-date with security updates, fixes, and improvements, choose Check for Updates. Check for Updates

1 Visual Information Design

2


3

4

5

6

## The Big Lebowski 1998



Genres **buddy** **screwball**  
**indie** **stoner**

Directors [Joel Coen](#), [Ethan Coen](#)

Cast: [Jeff Bridges](#)  
[John Goodman](#)  
[Julianne Moore](#)

★★★★☆

When 'The Dude' Lebowski is mistaken for a millionaire Lebowski, two thugs urinate on his rug to coerce him into paying a debt he knows nothing about. While attempting to gain recompense for the ruined rug from his wealthy counterpart, he accepts a one-time job with high pay-off. He enlists the help of his bowling buddy, Walter, a gun-toting Jewish-convert with anger issues. Deception leads to more trouble, and it soon seems that everyone from porn empire tycoons to nihilists want something from The Dude."

Budget: \$15,000,000

Slide 6 of 6 English (United States) Notes Comments 110%





# Purpose and User background

- What data will your website allow users to search?
  - Example: “*Crime Comedy Films.*” (You may not use this answer)
- What is an example of a person who would want to search this and why?
  - Example: *A college student who saw The Big Lebowski and is now fascinated by the genre of crime comedies and wants to find more to watch*
- What information on this page should help the user issue a new search? And why?
  - Example: *The similar movies, genres, directors and actors are searchable because they can help the user find similar movie they may like*

# ~3 conceptual groups

```
data = {
  "1": {
    "id": "1",
    "title": "The Big Lebowski",
    "image": "https://cdn.theatlantic.com/thumbor/g-
l6jdrxQ6F6fulhsY_GeP6xaBQ=/0x23:1842x1059/1600x900/media/img/mt/2014/09/Big_Lebowski_2/origin
al.jpg",
    "year": "1998",
    "summary": "When 'The Dude' Lebowski is mistaken for a millionaire Lebowski, two thugs urinate on
his rug to coerce him into paying a debt he knows nothing about. While attempting to gain recompense for
the ruined rug from his wealthy counterpart, he accepts a one-time job with high pay-off. He enlists the
help of his bowling buddy, Walter, a gun-toting Jewish-convert with anger issues. Deception leads to more
trouble, and it soon seems that everyone from porn empire tycoons to nihilists want something from The
Dude.",
    "director": ["Joel Coen", "Ethan Coen"],
    "budget": "$15,000,000",
    "stars": ["Jeff Bridges", "John Goodman", "Julianne Moore"],
    "score": "8.1",
    "genres": ["Comedy", "crime", "buddy", "indie", "screwball", "stoner"]
  },
}
```



# The Big Lebowski

1998



Genres

buddy

screwball

indie

stoner

Directors

[Joel Coen](#), [Ethan Coen](#)

Cast:

[Jeff Bridges](#)

[John Goodman](#)

[Julianne Moore](#)



When 'The Dude' Lebowski is mistaken for a millionaire Lebowski, two thugs urinate on his rug to coerce him into paying a debt he knows nothing about. While attempting to gain recompense for the ruined rug from his wealthy counterpart, he accepts a one-time job with high pay-off. He enlists the help of his bowling buddy, Walter, a gun-toting Jewish-convert with anger issues. Deception leads to more trouble, and it soon seems that everyone from porn empire tycoons to nihilists want something from The Dude.",

Budget: \$15,000,000



**Concept:**  
What is it?

**Most important:**  
Title is most important.

**Tools:**  
Size, contrast, position

# The Big Lebowski

1998



Genres

buddy

screwball

indie

stoner

Directors

[Joel Coen](#), [Ethan Coen](#)

Cast:

[Jeff Bridges](#)

[John Goodman](#)

[Julianne Moore](#)

**Concept:**  
Do I want to watch it?

**Most important:**  
Stars.

**Tools:**  
Size, Image, color, position



When 'The Dude' Lebowski is mistaken for a millionaire Lebowski, two thugs urinate on his rug to coerce him into paying a debt he knows nothing about. While attempting to gain recompense for the ruined rug from his wealthy counterpart, he accepts a one-time job with high pay-off. He enlists the help of his bowling buddy, Walter, a gun-toting Jewish-convert with anger issues. Deception leads to more trouble, and it soon seems that everyone from porn empire tycoons to nihilists want something from The Dude.",

Budget: \$15,000,000

**Concept:** Help me find more like this.

**Most important:** Genres you can click on

**Tools:** Size, contrast, position



# Main Assignment: Complete CRUD application

- **Functionality:**

- Homepage
- View item
- Search
- **Add item**
- **Edit item**

- **Visual Design:**

- **Visual Information Hierarchy**
- **Colors**
  - **Base, accent, light grey, dark grey**
- **Accessibility**
  - **Alt text**



# — Next week: no lectures

- Office hours – check the website!
- If you want to see HW6 Solutions, ask a TA! We want to walk you through it and help you understand, so you can build on it.



# — After Spring break, we switch to group projects

- We'll be learning and practicing human-centered design.
- On Monday, you'll meet in your TA group,
  - **In-person section:** Your TA will tell you a time and place.
  - **Zoom section:** Your TA will reach out to you with a link.
  - **CVN:** Your TA will reach out to you. We may find a time that works for everyone, we may give feedback asynchronously.



