Inclusive & Accessible Design

No screens

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COMS 4170

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Goals for this class

- Why is inclusive design important?
- How does accessibility affect people?
- What are principles for inclusive design?

Color and accessibility

TEST TYPE	r'_c	w	$\overrightarrow{w}_g$	t_c	COS SIM	DELTA-E
Seen Pairings		darker			0.97	0.9
		more greenish			-0.76	20.0
Unseen Pairings		lighter			0.94	4.2
		darker			0.77	12.3
Unseen Ref. Color		lighter			0.93	2.7
		bluer			-0.93	17.4
Unseen Comparative		more neon			0.96	1.3
		more neon			-0.14	26.1
Fully Unseen		paler			0.99	3.5
		rustier			-0.73	18

Figure 3: Examples of learned comparatives for each test condition

Olivia Winn and Smaranda Muresan.
”`Lighter’ Can Still Be Dark: Modeling Comparative Color Descriptions." *ACL*. 2018.

- **2.4% of people** in the US has a visual disability – that’s 7.6 MILLION people.
  - US Census Bureau
- **8% of men** with Northern European ancestry have red-green color blindness.
  - From National Institute of Health
- **19% of people** in the US has some kind of disability.
  - US Census Bureau

What are the assumptions 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
- They have high control over their fingers

How does a blind person use a smartphone?

How does a blind person use a smartphone?

- Screen reader says out loud what is on the screen
- Gestures are generally not location specific
- Feedback on location specific gestures corrects for error

Inclusive design focuses on individuals

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

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.

Pros and cons for designing for the average

PROS

- Only have to design one system
  - Faster and simpler
- Maybe 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

The World Health Organization redefined **disability** from an intrinsic property of a person, to a **property of a system**.

“If a system is designed perfectly
(which may be impossible, but we can try)
then no one would experience
disability when interacting with it.”

– Sasha Sproch, Microsoft Accessibility Team

Situational impairments

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

What are some situational impairments? What are **your** situational impairments?

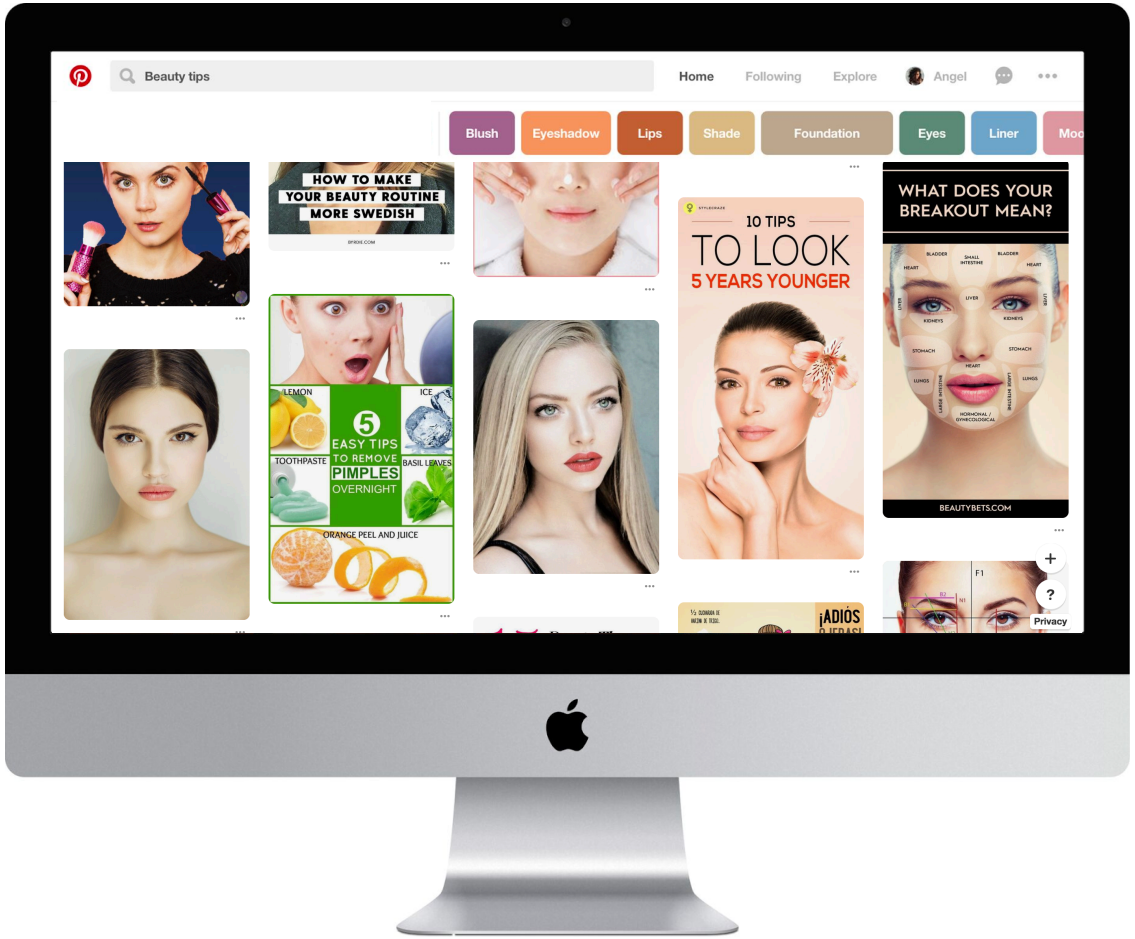
- Weather/environment
  - Rain
  - Cold temperatures
  - Light levels (too dark, glare on screen)
  - Ambient noise
- Physicality
  - Body motion
  - Clothing (e.g. gloves)
  - Device out of sight
  - Diverted gaze
  - Occupied hands
- Other people
  - Interruptions
  - Device changing state
- Cognitive
  - Distraction
  - Stress, fatigue, or haste
  - Intoxication
  - Multitasking
- Cultural
  - Language barrier

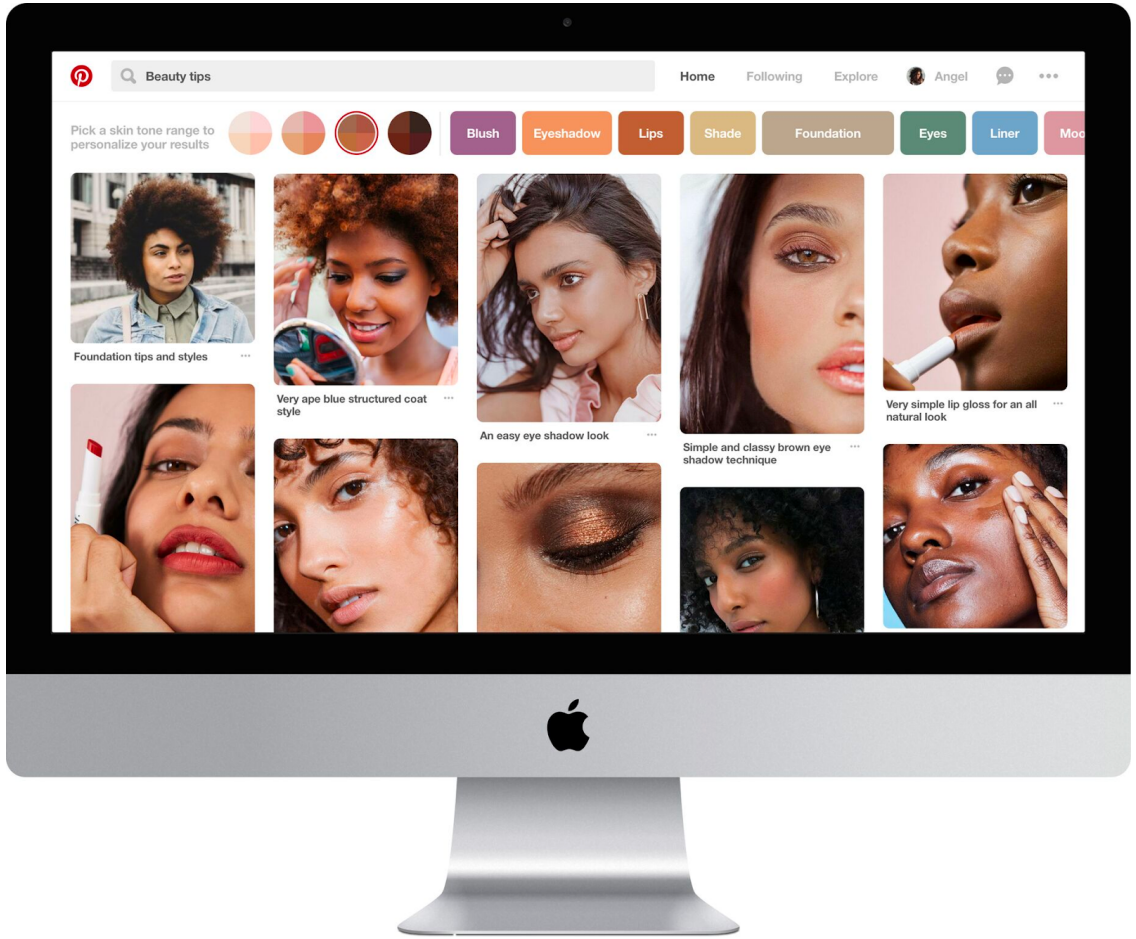
Inclusive design benefits everyone

Who benefits? People with strollers, shopping carts, rolling suitcases…

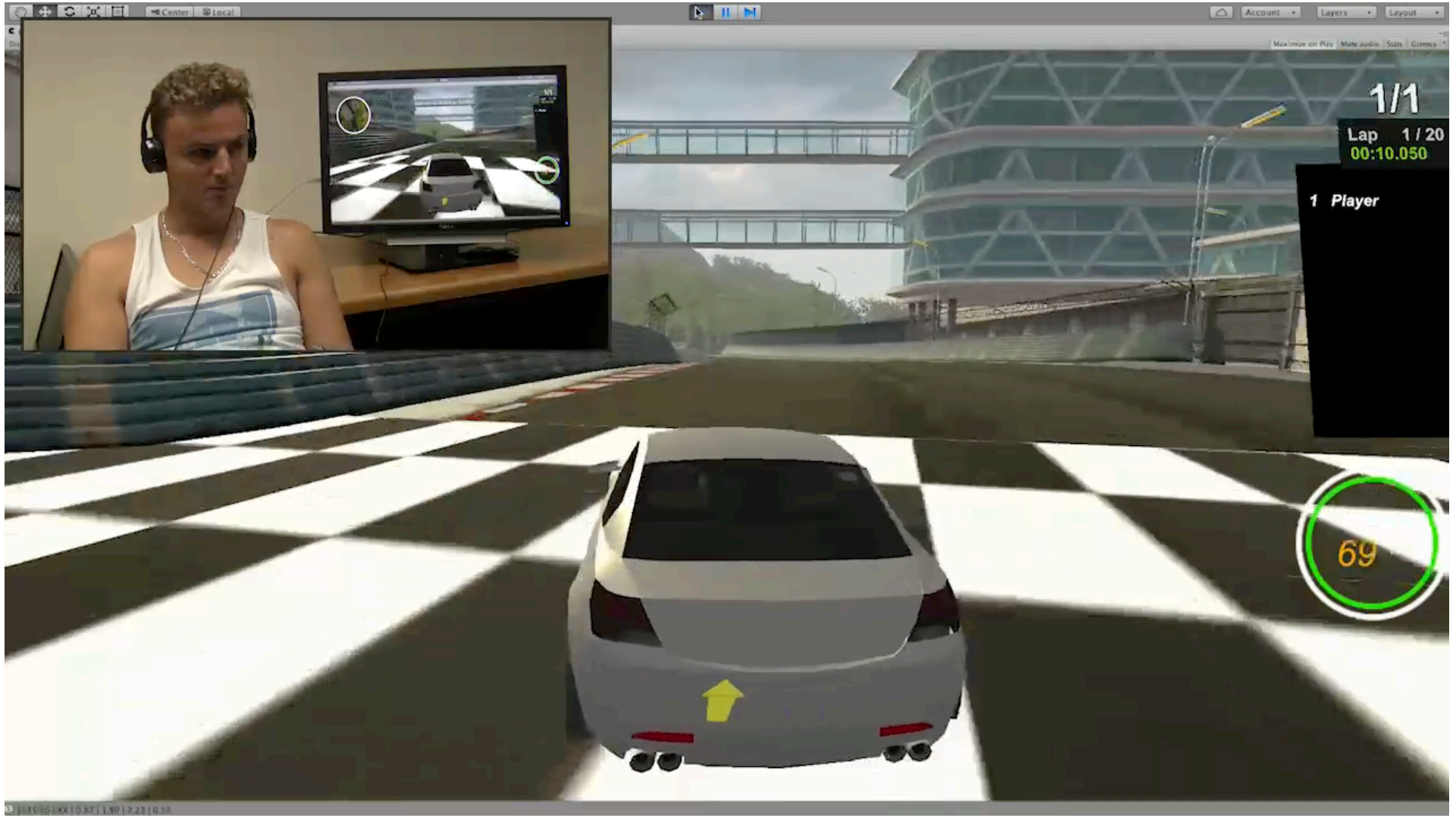
Who benefits? People in a rush, with hands full, with poor motor control…

Who benefits? People with sore hands, cold hands, dry hands…





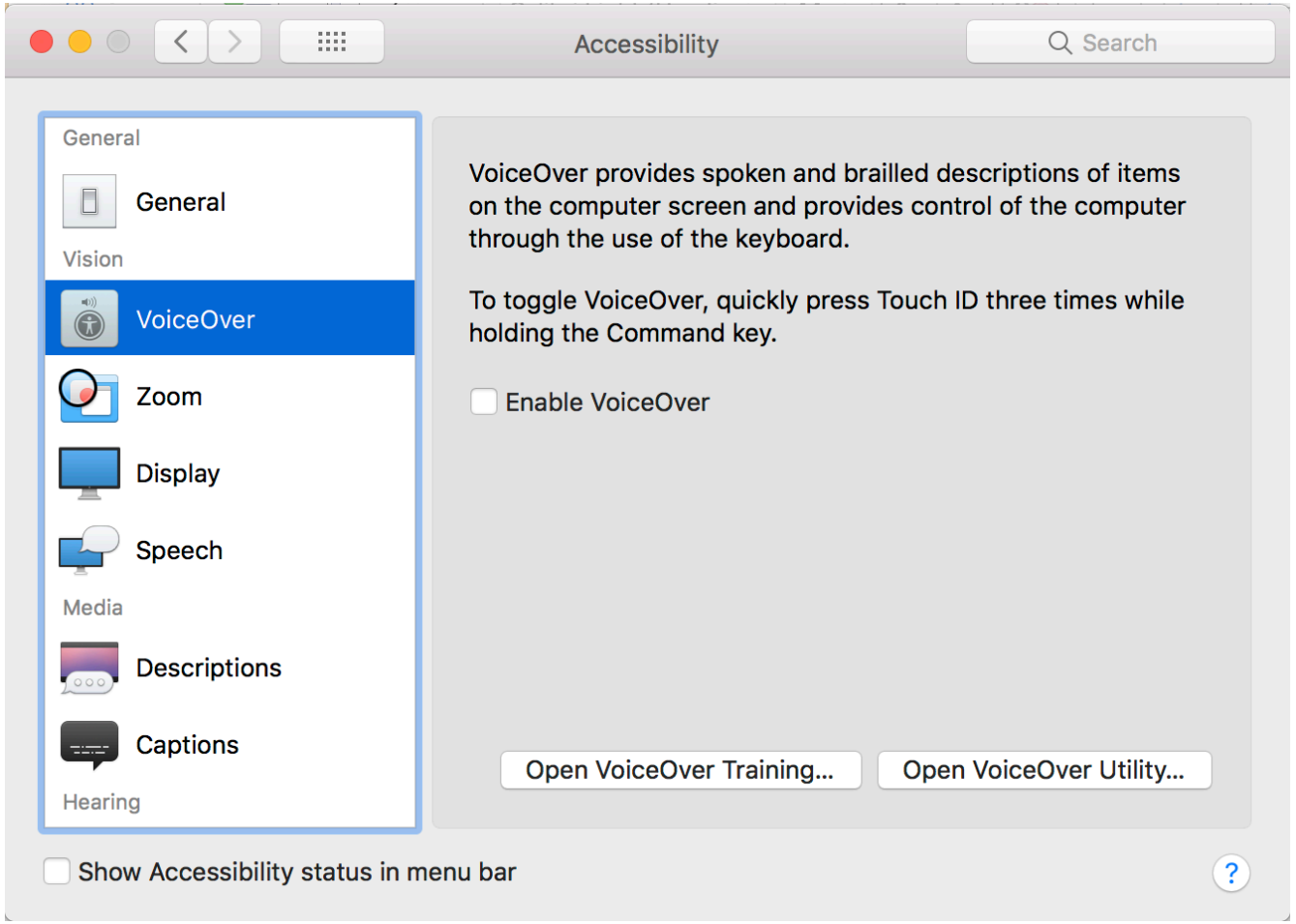
Who benefits? People with different skin tones (i.e. almost everyone)



Work by Professor Brian Smith

Blind/low vision and computers

How do screen readers work?



Designing for blind/low vision

“Close your eyes and unplug your mouse.”
– advice from Microsoft accessibility designer

- Does the visual order align with the keyboard order?
  - If invisible elements are keyboard focusable, they become roadblocks if they have weird names.
- High contrast helps both those with colorblindness and low vision.
  - Browsers extensions can simulate this.
  - Use color last!
  - Use redundant visual principles (like color + underline for links).
- Use alt text for images (different from caption) – especially logos!

Summary

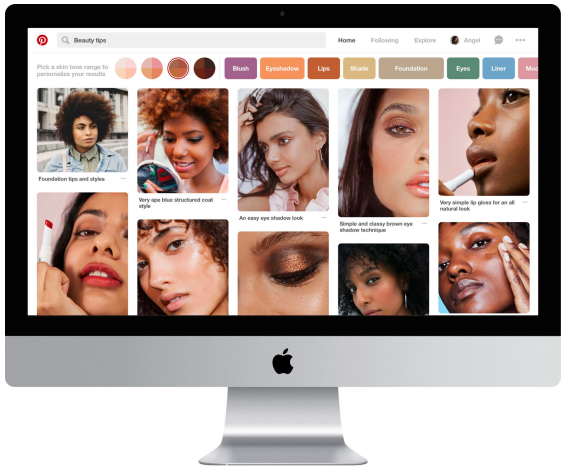
Disability is a property of a system

The myth of average

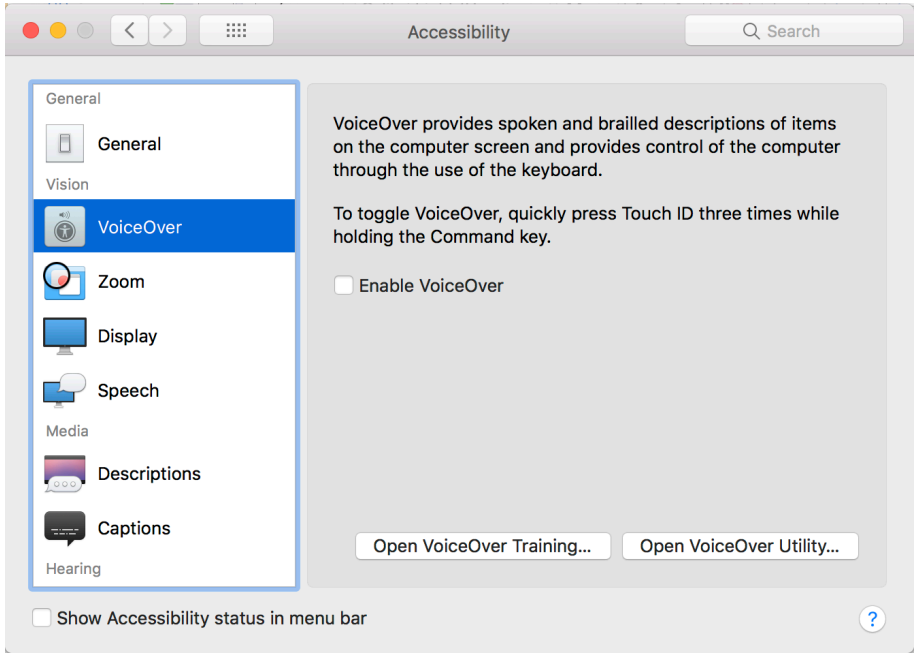
Situational impairments

Ability assumptions

Inclusive design benefits everyone



Blind/low vision and computers



- Close your eyes and unplug the mouse.
- Visual hierarchies are better for everyone.
  - High contrast
  - Low clutter
  - Use color last