



# A11Y & the 3 Bears of AI



# Glenda Sims

the goodwitch of accessibility

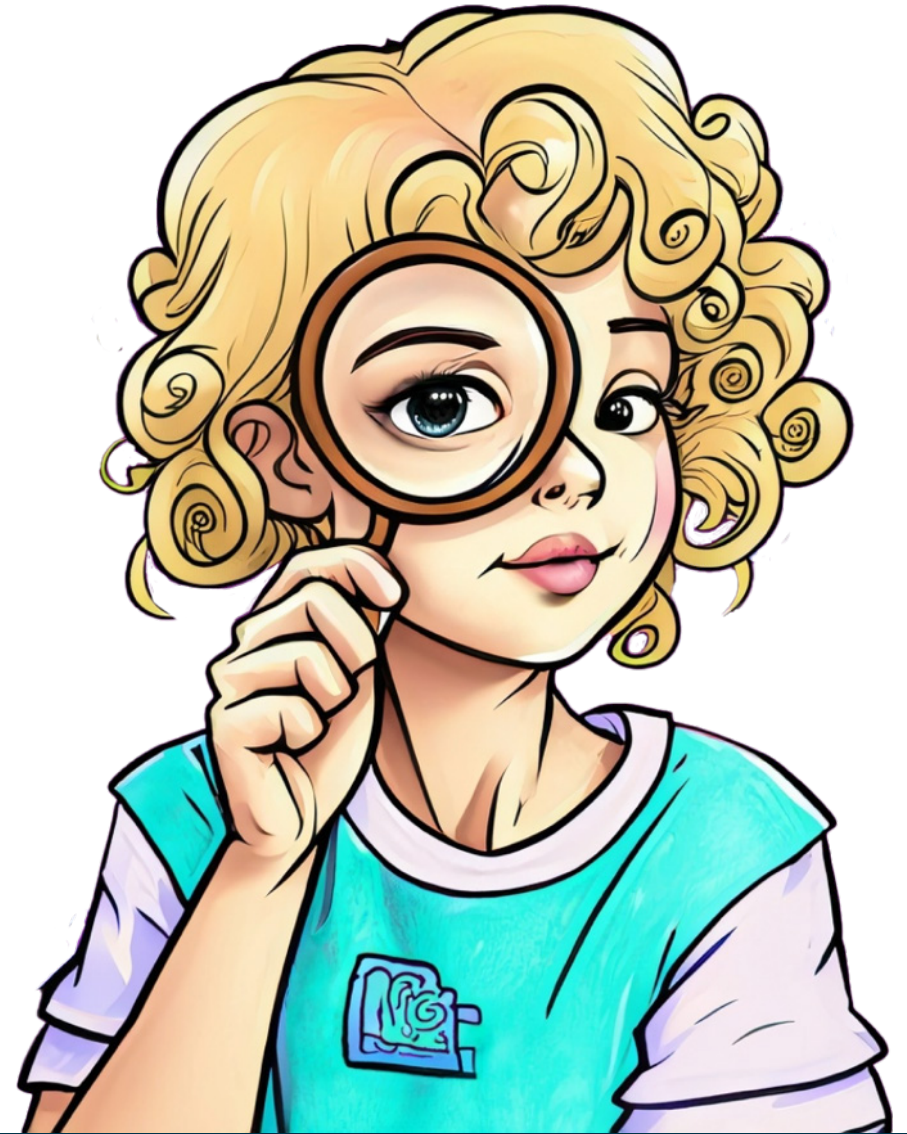
[deque.com](http://deque.com)

#a11y



# Learning Objectives

- What is Artificial Intelligence (AI)
- AI and digital accessibility
- Clear and present dangers of AI
- Ethical AI in digital accessibility
- Goldilocks Zone





# What is AI?

Artificial Intelligence (AI)

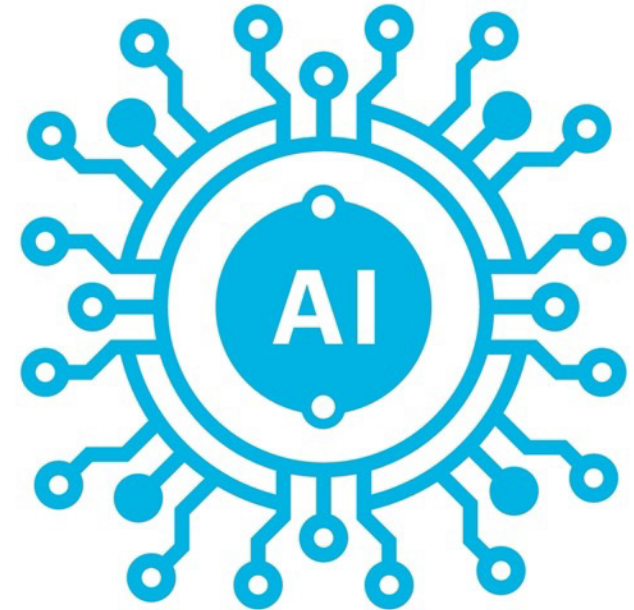
# AI Defined

## Artificial Intelligence (AI):

Computer systems able to perform tasks **on their own** that normally require human intelligence, such as:

- Visual perception
- Speech recognition
- Decision-making
- Translation between languages

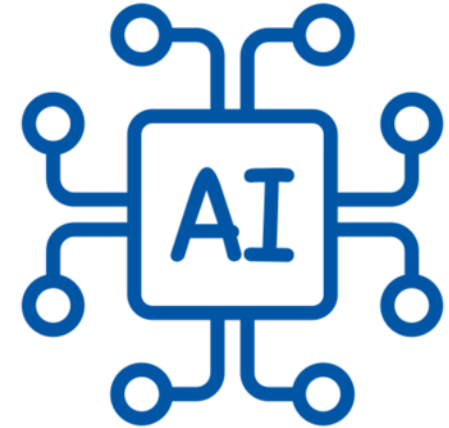
- ScienceDirect



# AI Narrow/Weak or General/Strong

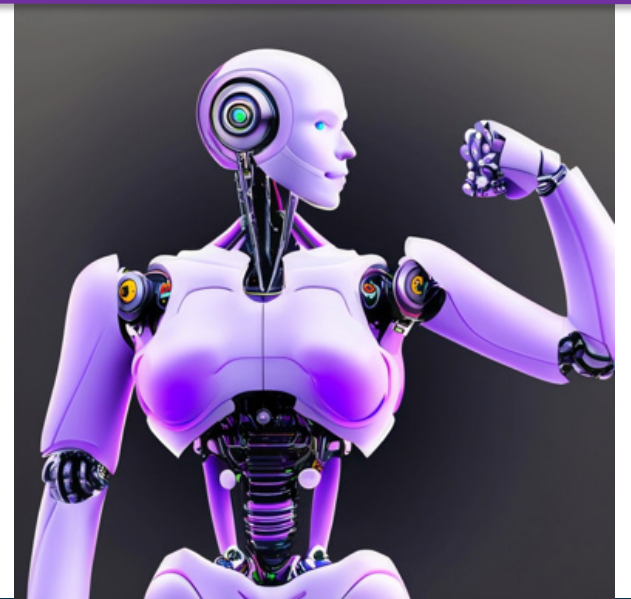
## Narrow/Weak AI

- inferior to human intelligence
- can solve 1 narrow specific problem
- many real examples today



## General/Strong AI

- equal or better than human intelligence
  - probably does not exist today



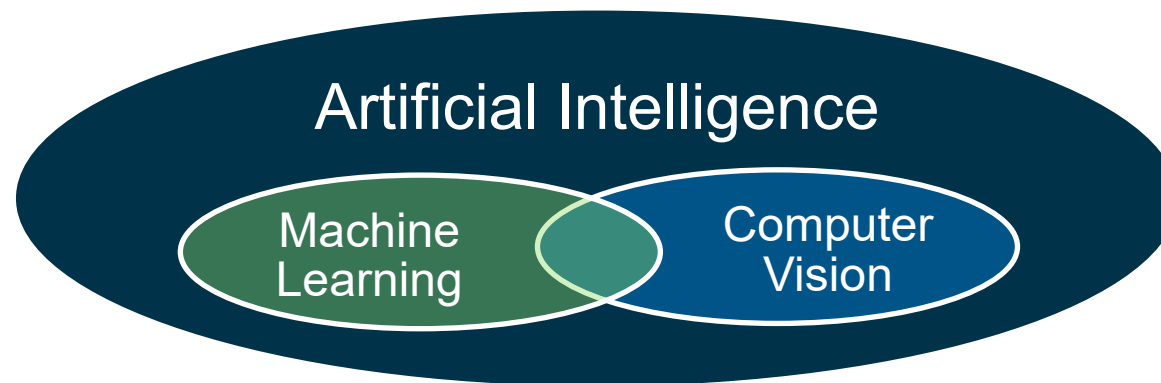
# Machine Learning (ML) & Computer Vision (CV)

- **Machine Learning (ML)**

- Process, analyze, interpret **data**
- Structured database
  - **Curated & tagged by real humans**
- Example: Email spam filtering

- **Computer Vision (CV)**

- Process, analyze, interpret **visuals**
- Structured database of **visuals**
  - **Curated & tagged by real humans**
- Example: face recognition





# Supervised & Reinforcement ML & Spam

## Machine Learning (ML) in Narrow AI

- **Built & Supervised by Humans:**
  - Structured database of spam
  - Decision model created by humans
- **Reinforcement from Humans:**
  - Positive/negative human feedback
  - Learns and improves accuracy

## Example: Spam Filter

- Filtered 200+ spam emails over 30 days
  - Supervised: database of spam vetted by humans
- Reinforce spam filter
  - Filter gets better as you mark an email as spam (or indicate something should not be spam)





# Computer Vision (CV) & Cats

100+ correct



## Computer Vision (CV) in Narrow AI

- Decision models based on structured image data
  - Structured database of cat images **vetted by humans**
- Enables CV app to learn and improve accuracy
  - **Tuned by human input**

## Example: Photos Search Feature

- Search 12,000+ photos for “cat”
- Result: 100+ photos CV thinks have a cat
- Accuracy: Only 1 photo did NOT have a cat in it

1 wrong



# What Narrow/Weak AI Examples Do You Use?

## Driving:

- Lane keep assistance
- Blind spot indicator
- Collision avoidance braking

## Mobile Phone:

- FaceID
- Predictive text

## Email

- Spam filtering

## Security

- Fraud detection

## Smart Speaker:

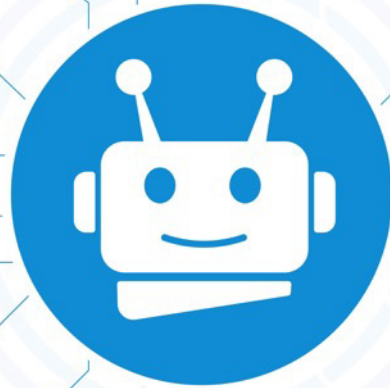
- Conversational AI (speech recognition and natural language understanding)

## Image Recognition:

- Tagging people in photos (facial rec)
- Search using image (instead of words)

## Sound Recognition Examples:

- Automatic captions/transcripts
- Filter out background sounds



# Generative AI

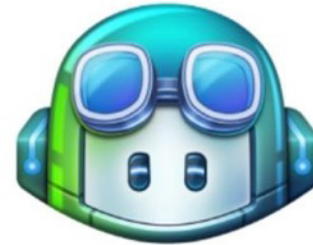
Generative AI can learn from existing artifacts to generate new, realistic artifacts (at scale) that reflect the characteristics of the training data but don't repeat it.

- Gartner

Can produce new content, including text, software code, images, video, music, and speech.



**ChatGPT**



**GitHub  
Copilot**





# Are you ready for the AI Tsunami?

It is already hitting our a11y shores



# AI: Act Decide Monitor

Amy Webb, SXSW 2023

# Amy Webb's 2023 Emerging Tech Trend Report



- It is the end of the internet as you know it
- We've entered the assistive computer era
- So much change is happening, you cannot just sit back & watch
- ADM Tool
  - Act
  - Decide
  - Monitor
- Use ADM to prioritize your actions



# Let's Apply Amy's ADM to AI in our A11Y Industry

<b>ACT</b> <b>Risk without Action!</b>	<b>Decide</b> <b>Near-Term Opportunity or Risk</b>	<b>Monitor</b> <b>Long-Term Opportunity or Risks</b>
<ul style="list-style-type: none"> <li>• Previously unseen immediate benefit to A11Y</li> <li>• Inflection point is imminent</li> <li>• New threat or risk is imminent</li> </ul>	<ul style="list-style-type: none"> <li>• Could disrupt A11Y</li> <li>• Meaningful impact on A11Y</li> <li>• Near-term financial, operational, regulatory risk or opportunity</li> </ul>	<ul style="list-style-type: none"> <li>• Potential for financial, operational or regulatory disruption</li> <li>• Knock-on effects could shape A11Y</li> <li>• Could pose novel A11Y risks</li> </ul>
<p><b>What requires action now?</b></p>	<p><b>What needs a decision?</b></p>	<p><b>What must we monitor?</b></p>





A11Y cannot be an AI spectator this year



A11Y cannot be an AI spectator this year  
or ever again



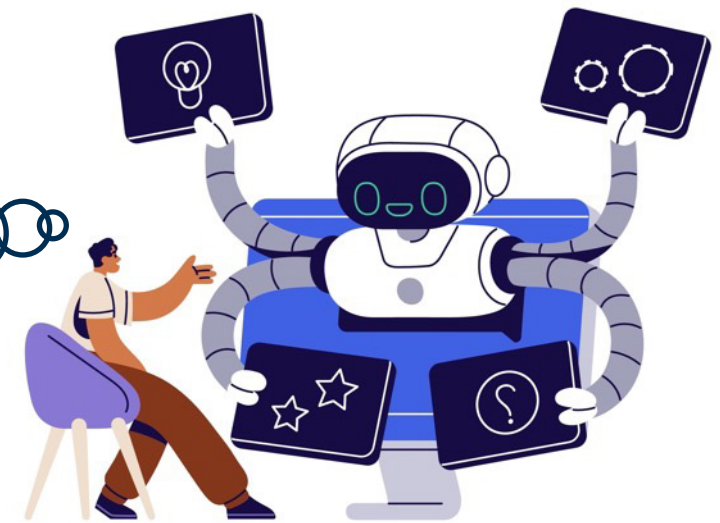
What can AI do for A11Y?

# Narrow AI Can Optimize A11Y Testing

Computer Vision can “look” at rendered UI

- **Table cell** looks like a header but not marked as <th>
- Looks like a **button** but is not keyboard accessible
- **Text in image** does not meet color contrast and more...

Sift through mountains of data to pinpoint what needs **HUMAN** review



# Must Use Narrow AI in Auto A11Y Testing

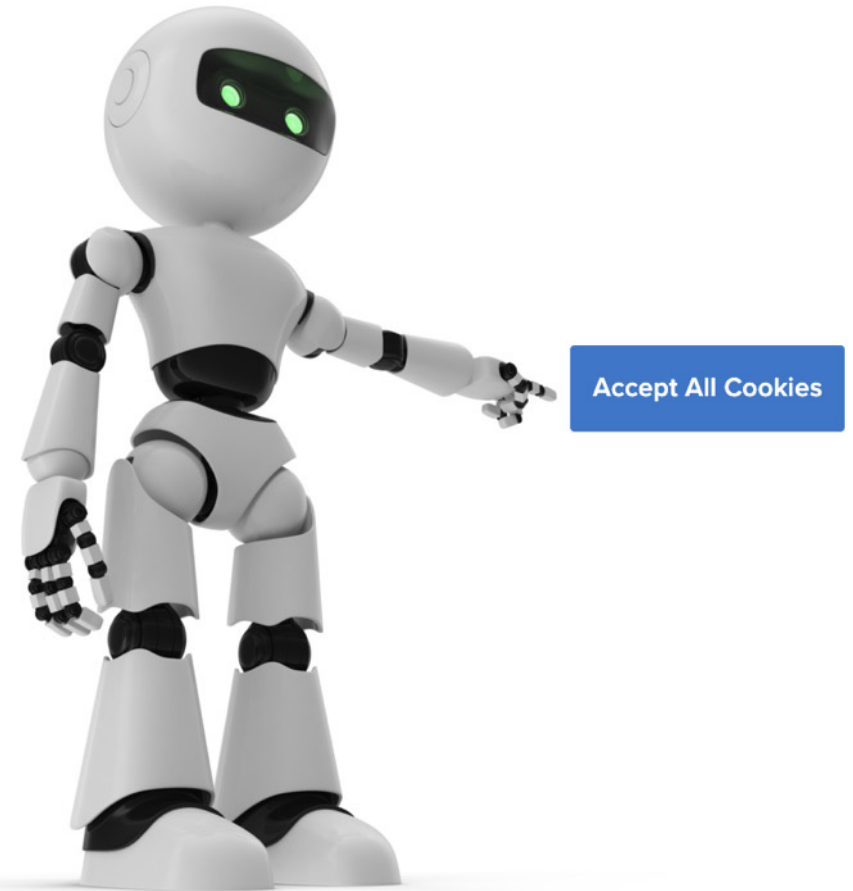
- Decision is simple
- A 12-year-old human + simple decision model
  - Correctly decide pass or fail in seconds
- Tons of data available To train/test AI model



# Narrow AI finds keyboard inaccessible “button”

This looks like a button

- a DIV (no role) only works with a mouse
- *Narrow AI Machine Learning compares this DIV to other curated examples of inaccessible “buttons” built with DIV*
- Computer tries to press “button”
  - If button cannot be activated:
    - Report a WCAG 2.x issue for SC 2.1.1 Keyboard



Wait! I've got so many questions!







# AI Real & Present Dangers



# Content Advisory: Bias, Discrimination

# AI Dangers (3 Bears of AI)

- Ethics
- Bias
- Over and Under Reliance



# AI & Ethics



**“In no other field is the ethical compass more relevant than in artificial intelligence.**

These general-purpose technologies are re-shaping the way we work, interact, and live. The world is set to change at a pace not seen since the deployment of the printing press six centuries ago.

AI technology brings major benefits in many areas, but without the **ethical guardrails**, it risks reproducing real world biases and discrimination, fueling divisions and threatening fundamental human rights and freedoms.”

– UNESCO

United Nations Educational, Scientific and Cultural Organization

# AI Ethics in A11Y: You decide



[New Low in the Accessibility “Industry:” Overlay Company Sues Globally-Recognized Accessibility Expert](#) – Lainey Feingold.

The 3<sup>rd</sup> party REDACTED2 integration on this page may temporarily modify content when WAVE is activated resulting in interference with WAVE's detection and of and accuracy identifying accessibility and compliance issues

A screenshot of the WAVE web accessibility evaluation tool interface. The header shows the WAVE logo, the text "powered by WebAIM", and "web accessibility evaluation tool". Below this is a search bar with the address "https%3A%2F%2Fneilpatel.com%2F". A toggle switch for "Styles" is set to "ON". The "Summary" section is active, showing a navigation menu with "Summary", "Details", "Reference", "Structure", and "Contrast". A red-bordered box highlights a message: "The 3rd party [REDACTED] integration on this page may temporarily modify content when WAVE is activated resulting in interference with WAVE's detection of and accuracy identifying accessibility and compliance issues." At the bottom, there are two counters: "Errors" with a red 'x' icon and a value of 0, and "Contrast Errors" with a red circle icon and a value of 0.

# AI & BIAS

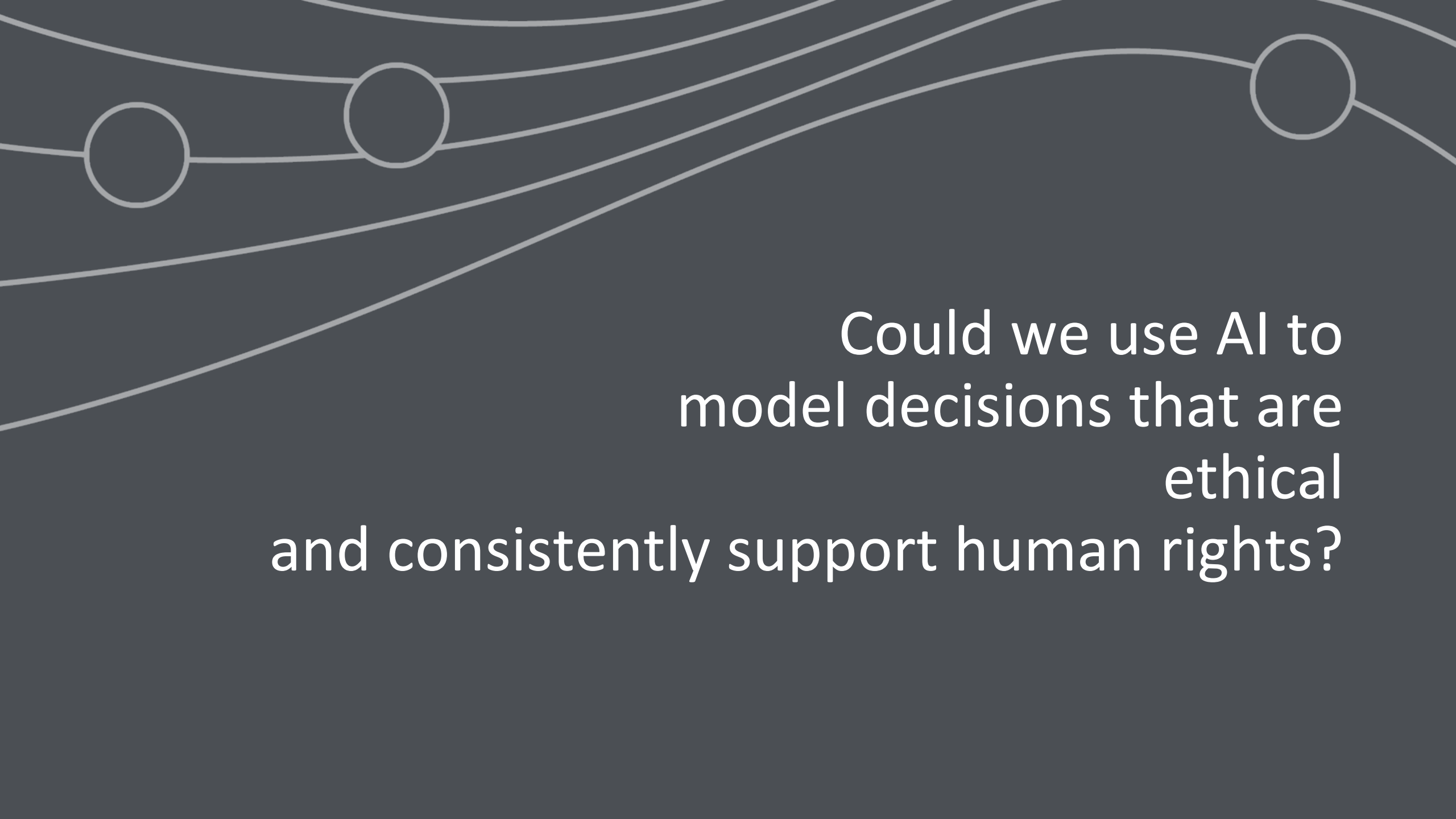
## Bad Bias in AI

- AI resume screening
- Facial recognition
- Bank loan approvals
- Garbage in garbage out

## Ethical Counter Bias in AI

- Identify and zero out the bias factors
- Inclusive data
- Transparency in data store
- Auditing process
- Diversity in workforce





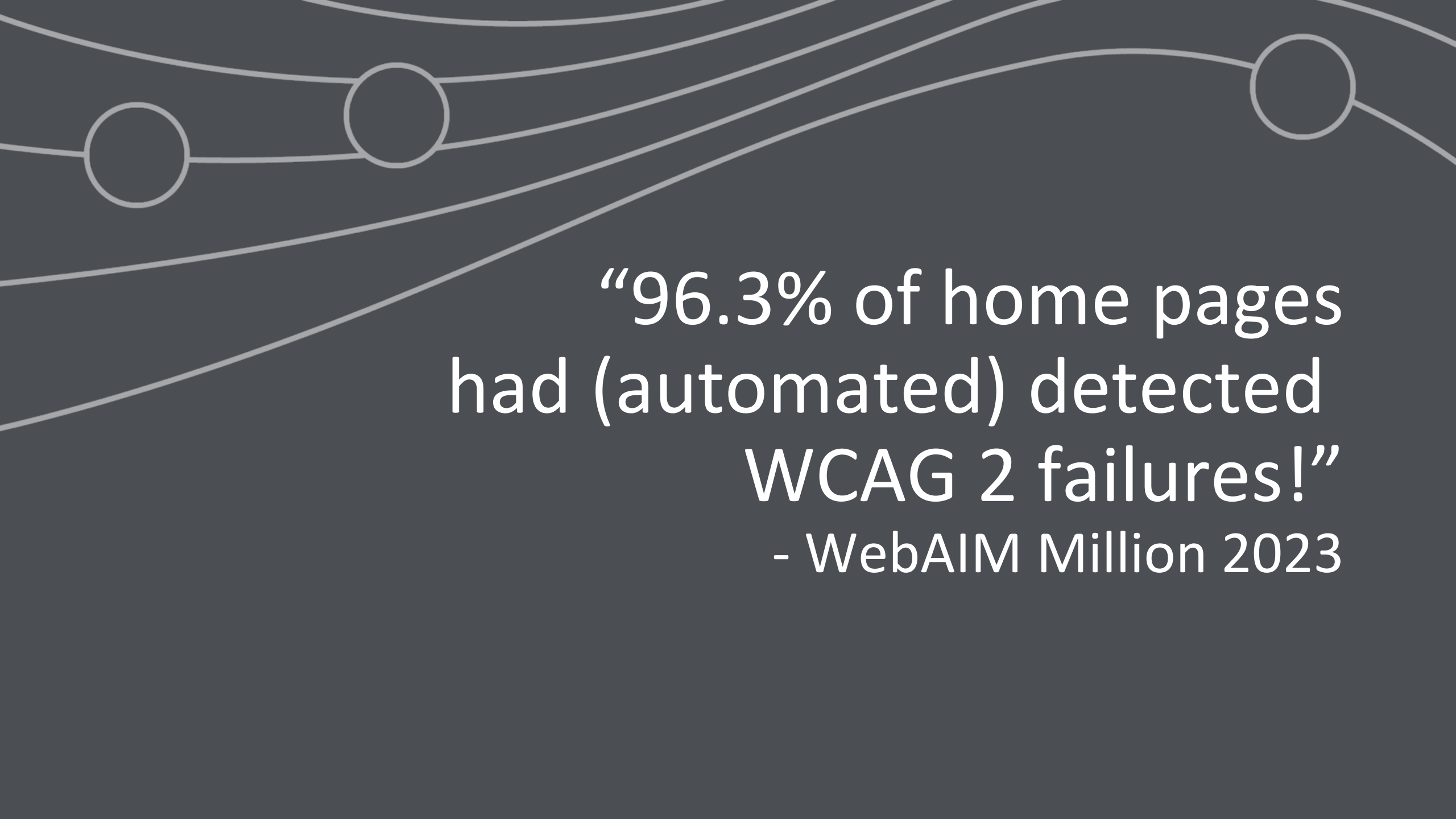
Could we use AI to  
model decisions that are  
ethical  
and consistently support human rights?







Are we winning at A11Y?



“96.3% of home pages  
had (automated) detected  
WCAG 2 failures!”  
- WebAIM Million 2023

Will we ever achieve digital a11y?



# Quiz Time: True or False?

1. \_\_\_\_\_ Accessibility can be fully automated today to test for WCAG 2.1 A/AA and fix all issues, keeping a website accessible at all times.
2. \_\_\_\_\_ There are many real-world examples of weak/narrow AI providing reasonably good accuracy today.
3. \_\_\_\_\_ Machine Learning (ML) and Computer Vision (CV) are worthless to use in accessibility testing today.
4. \_\_\_\_\_ A company that sells an AI accessibility solution sued an accessibility expert to stop him from expressing his professional opinions about the dangers of overlays.

# Quiz Time: Answers

1. **(False)** Accessibility can be fully automated today to test for WCAG 2.1 A/AA and fix all issues, keeping a website accessible at all times.
2. **(True)** There are many real-world examples of weak/narrow AI providing reasonably good accuracy today.
3. **(False)** Machine Learning (ML) and Computer Vision (CV) are worthless to use in accessibility testing today.
4. **(True)** A company that sells an AI accessibility solution sued an accessibility expert to stop him from expressing his professional opinions about the dangers of overlays.





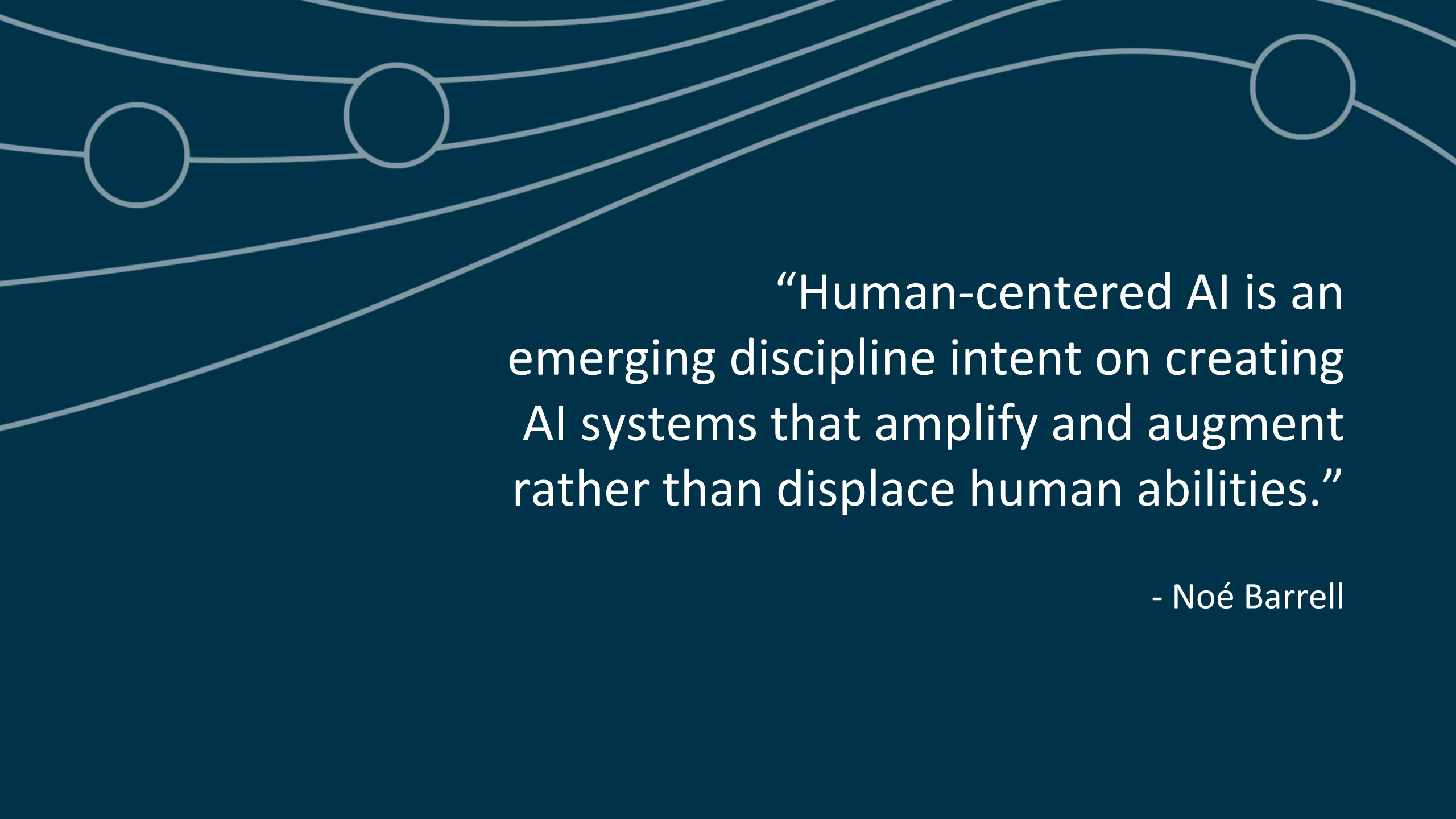
# Ethical AI in A11Y Today



# Deque's Investment in AI for Digital Equality

- Our approach to AI is **human centric**
  - Greatest accuracy + very high ROI
- Dedicated **AI expert team < humans**
- AI training data
  - Over 5,000,000 individual object labels
  - Very high quality
  - Growing every minute
- Allow **humans** to overrule (teach) our AI



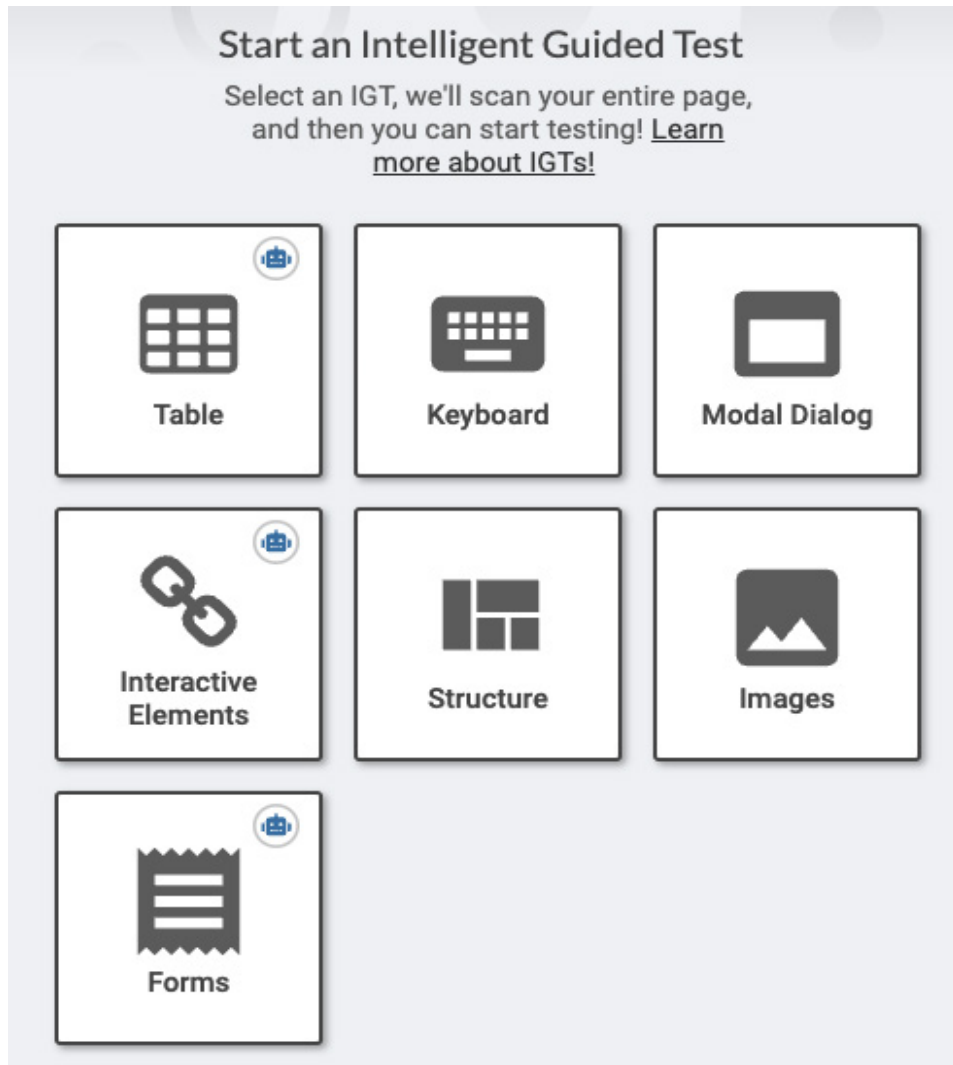


“Human-centered AI is an emerging discipline intent on creating AI systems that amplify and augment rather than displace human abilities.”

- Noé Barrell



# Axe DevTools Intelligent Guided Tests (IGTs) & AI



## We use narrow AI in IGT

- Auto detect WCAG issues
  - When possible
- Ask YOU a focused question when AI is not sure it is a WCAG issue

## Benefits

- More checks are automated
  - and accurate!
- A11Y testing can be faster
- YOU get to focus your brainpower on items that Narrow AI can't learn *(or hasn't learned yet)*

# Problem: Understanding complex color contrast situations

We use **visual text and background rendering**

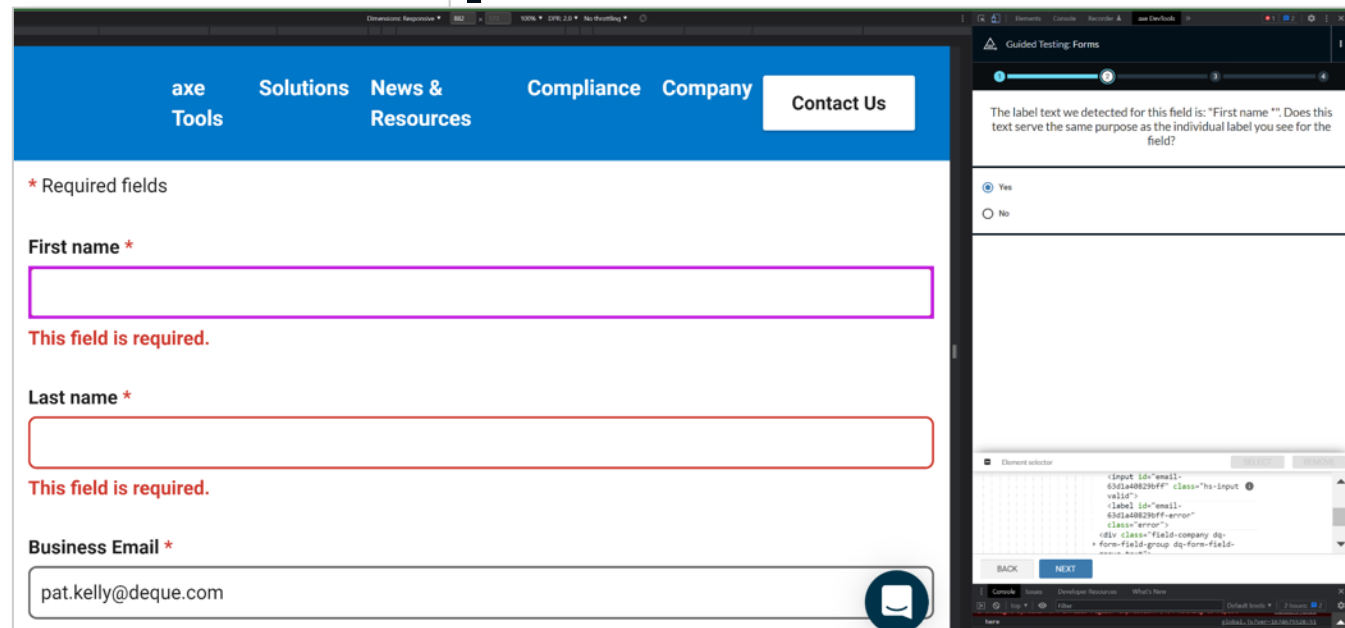
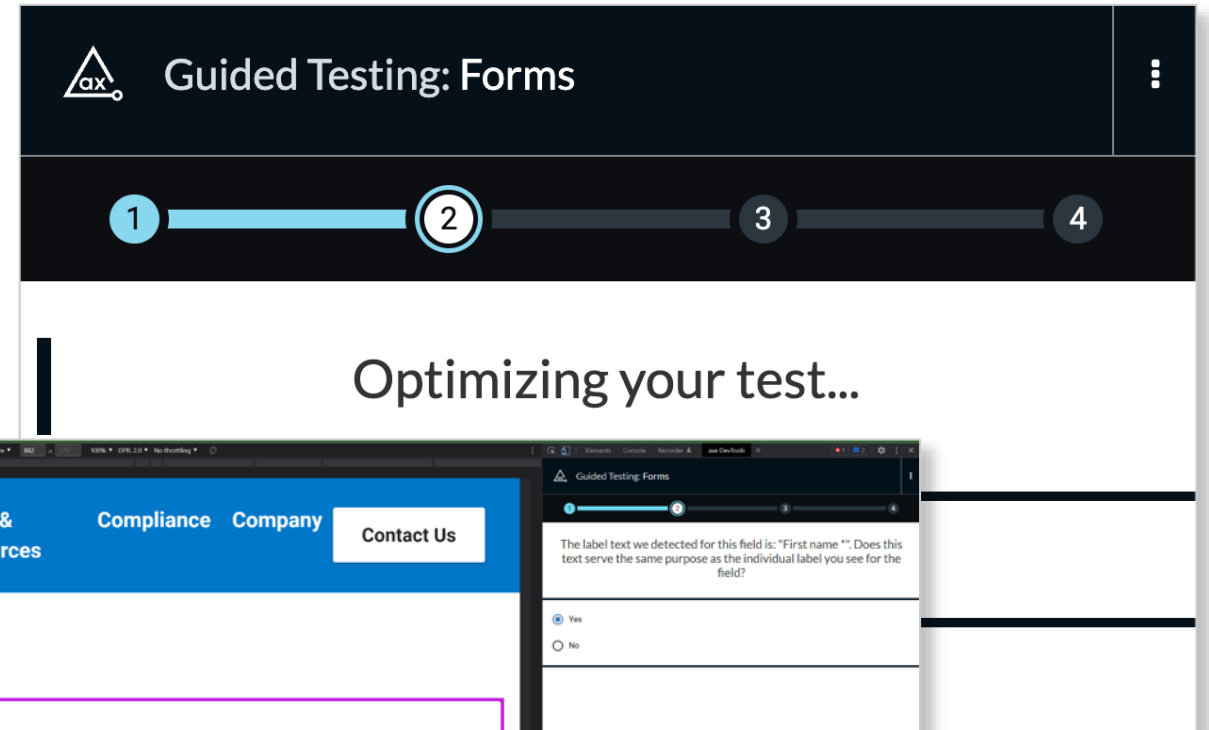
- Automatically calculate the range of color contrast values
- CV components use the range to determine whether there is an issue

The image displays a complex user interface for a color contrast testing tool. It features several overlapping components:

- Gradient Text Test:** A panel titled "Gradient Text" showing "Passing" for "Hello World" and "Failing" for "Goodbye World" under "Font Variation Settings".
- Summary Notification:** A green notification box stating "Automatic color contrast review complete." with a checklist:
  - 4 passed.
  - 19 failed and are in "AUTOMATIC ISSUES".
  - 7 need manual review and are in "NEEDS REVIEW".
- Test Configuration Panel:** A dark-themed panel with fields for "Test Name", "Test URL" (https://codepen.io/scurker/pen/BadMPjd), and buttons for "SAVE TEST" and "RE-RUN SCAN".
- Review Progress Overlay:** A semi-transparent overlay showing "Reviewing 28 of 30 potential color contrast issues (90%)" with a progress bar and a "Cancel" button.
- Background Dashboard:** A dark dashboard in the background showing "TOTAL ISSUES" as 19 and a "RE-RUN SCAN" button.

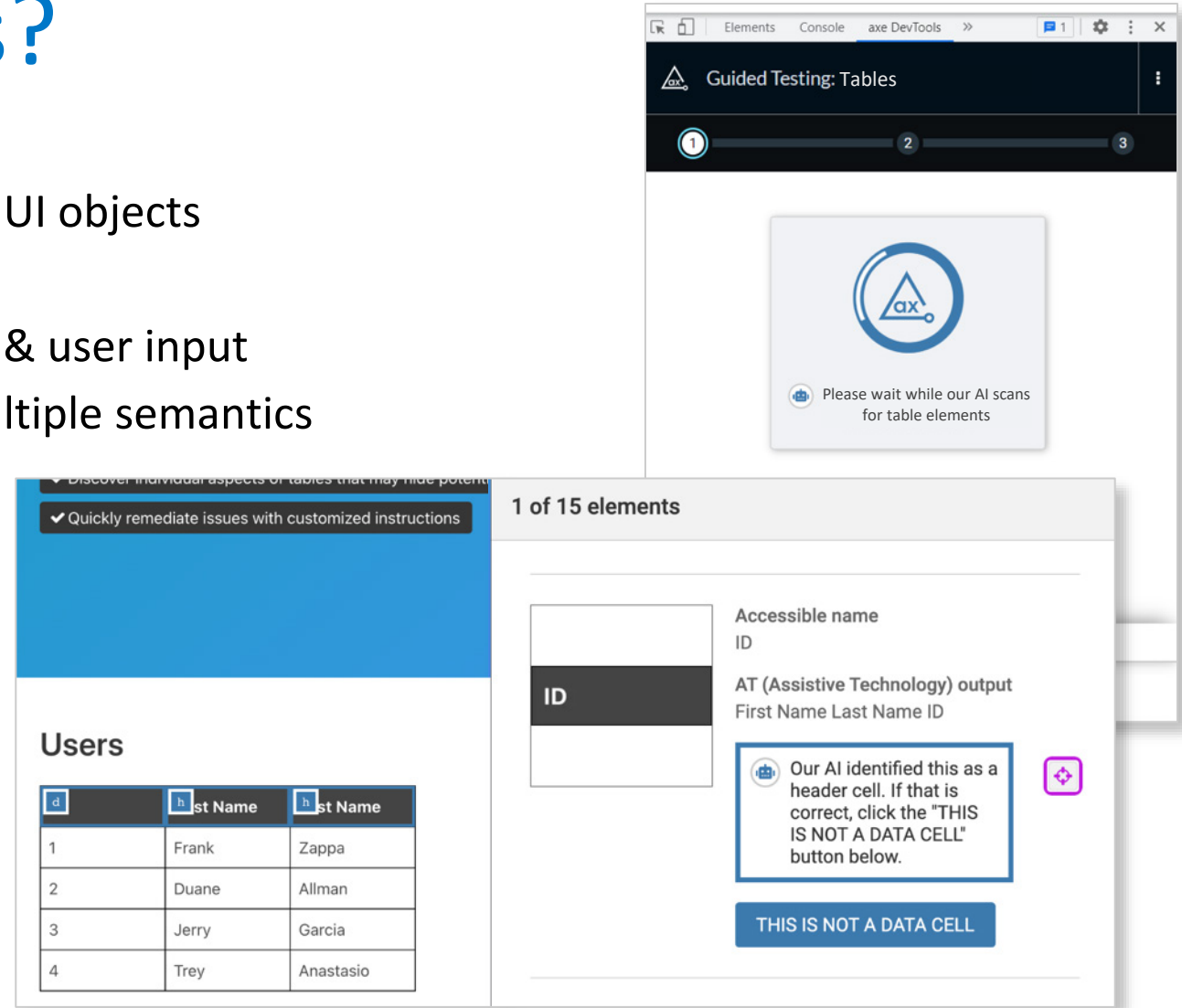
# Problem: What goes with what?

Our **OCR model** evaluates the text associated with form labels and uses it to validate the accessible name for form fields



# Problem: What is this?

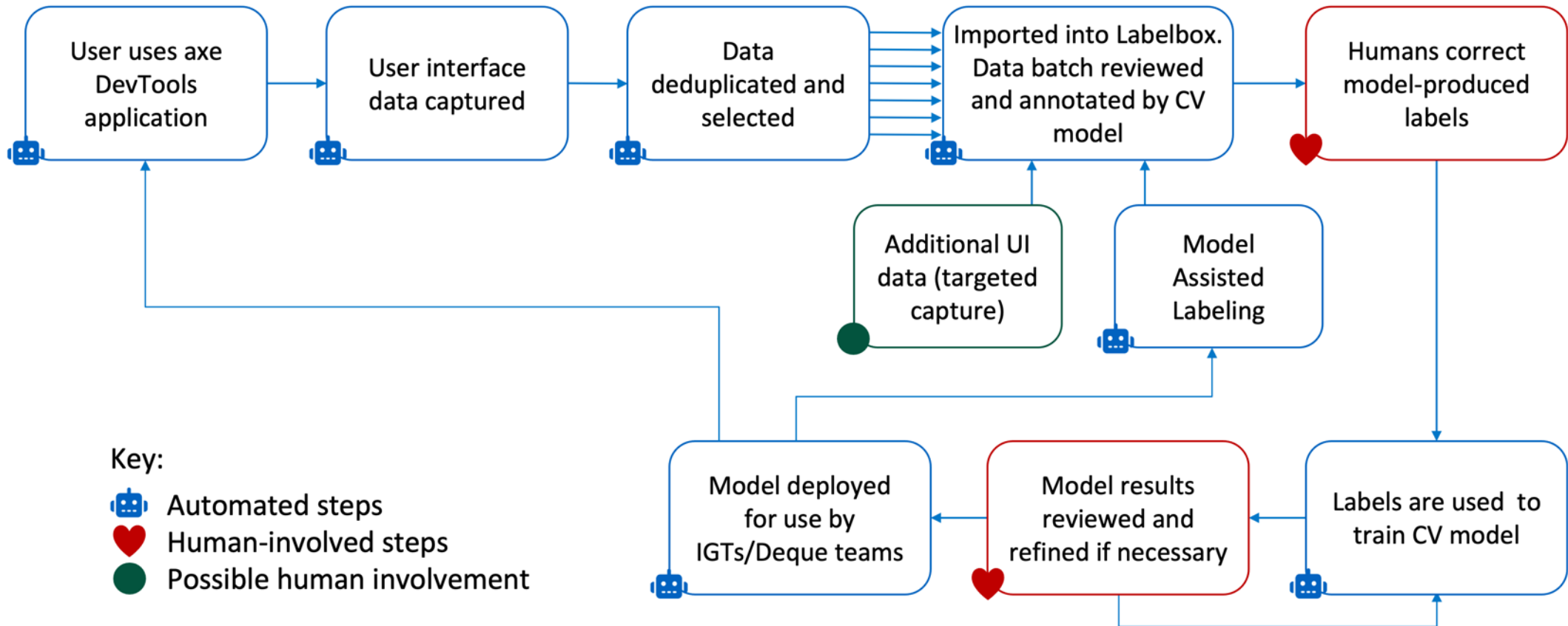
- Our **object detection model** identifies & classifies UI objects
  - detects aspect ratios and sizes
  - combines classification with semantics & user input
  - recognizes single items that map to multiple semantics
- Currently Covers:
  - forms, form fields, form field labels, data tables, data table headers and interactive elements.
- More to come!



The image shows a screenshot of the axe DevTools interface. At the top, there's a progress bar with three steps, and a message: "Please wait while our AI scans for table elements". Below this, a table titled "Users" is displayed. The table has four rows and three columns. The first row is a header row with columns labeled "ID", "First Name", and "Last Name". The subsequent rows contain user data: (1, Frank, Zappa), (2, Duane, Allman), (3, Jerry, Garcia), and (4, Trey, Anastasio). An overlay window titled "1 of 15 elements" is open over the "ID" header cell. It shows the accessible name "ID" and the AT (Assistive Technology) output "First Name Last Name ID". A message from the AI states: "Our AI identified this as a header cell. If that is correct, click the 'THIS IS NOT A DATA CELL' button below." A blue button with the text "THIS IS NOT A DATA CELL" is visible at the bottom of the overlay.

ID	First Name	Last Name
1	Frank	Zappa
2	Duane	Allman
3	Jerry	Garcia
4	Trey	Anastasio

# A11Y Data is a Strategic Asset

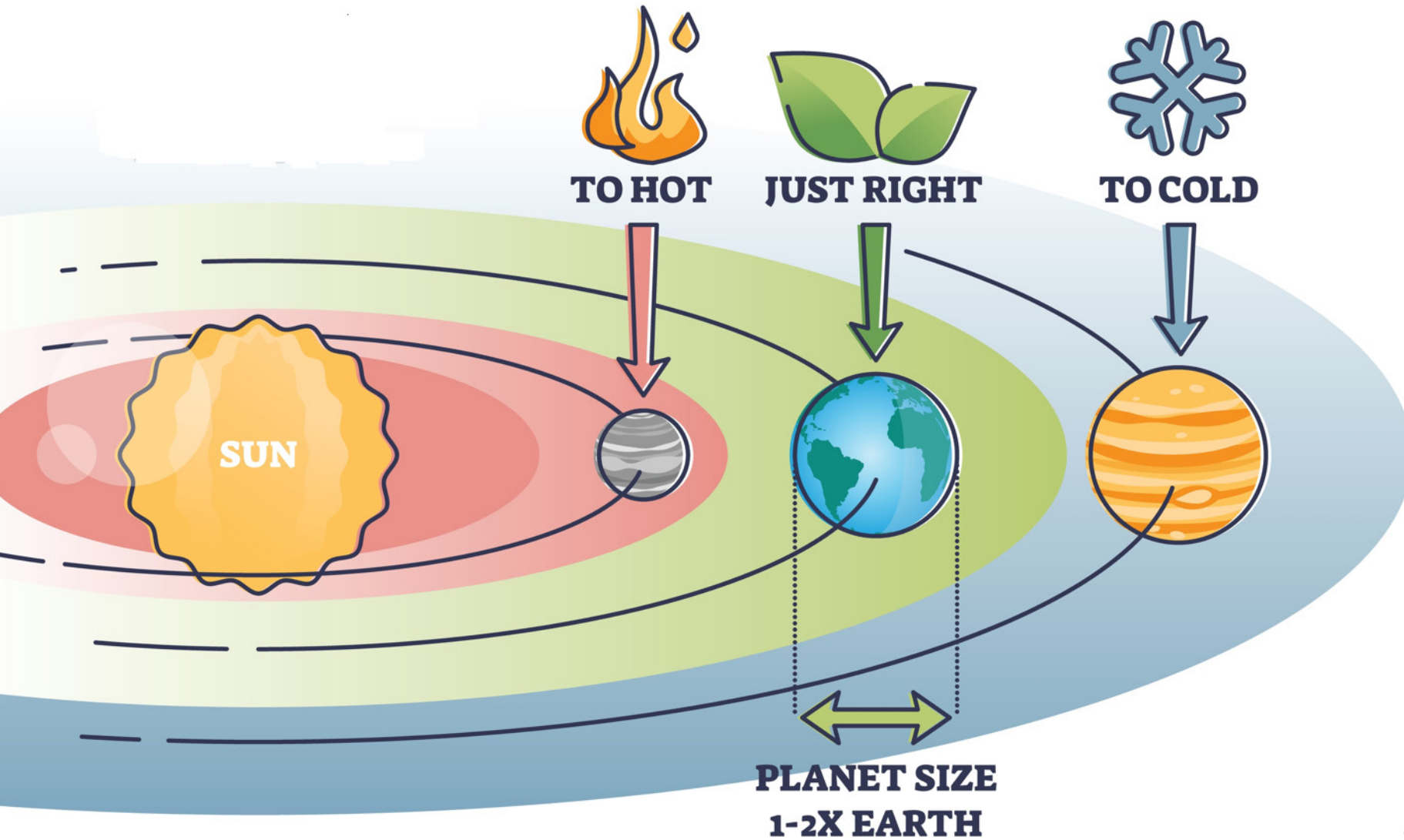




The background features several thin, white, curved lines that sweep across the top of the frame. Three white circles are positioned along these lines: one on the left, one in the middle, and one on the right. The overall aesthetic is clean and modern.

# AI and the Goldilocks Zone

# The Goldilocks Zone



# A11Y & the Goldilocks Zone of AI



**Too Hot**  
**Too Optimistic**

AI can do everything!!!



**Just Right**  
**Pragmatic**

AI cannot do everything, but with ethical human guidance, AI will break down a11y barriers that have been resistance to our human efforts over the past 3 decades.



**Too Cold**  
**Too Pessimistic**

AI cannot do everything perfectly, so we cannot use AI at all.

