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A11Y & the 3 Bears of AI

Glenda Sims

the goodwitch of accessibility

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)

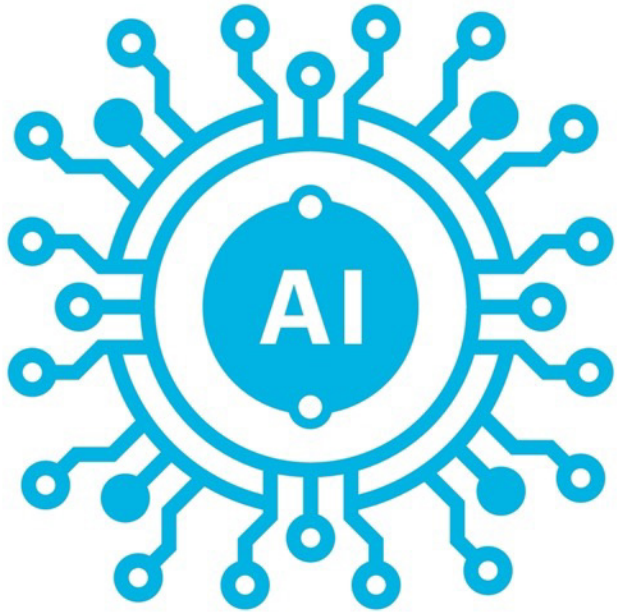
AI Defined

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

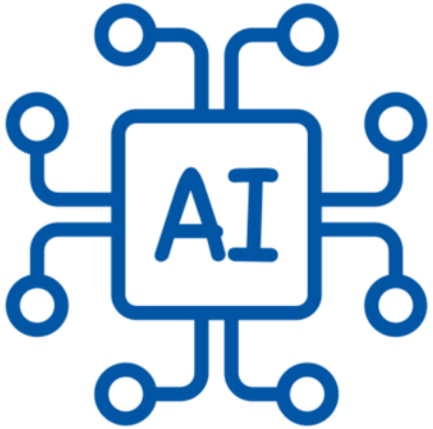
- ScienceDirect



AI Narrow/Weak or General/Strong

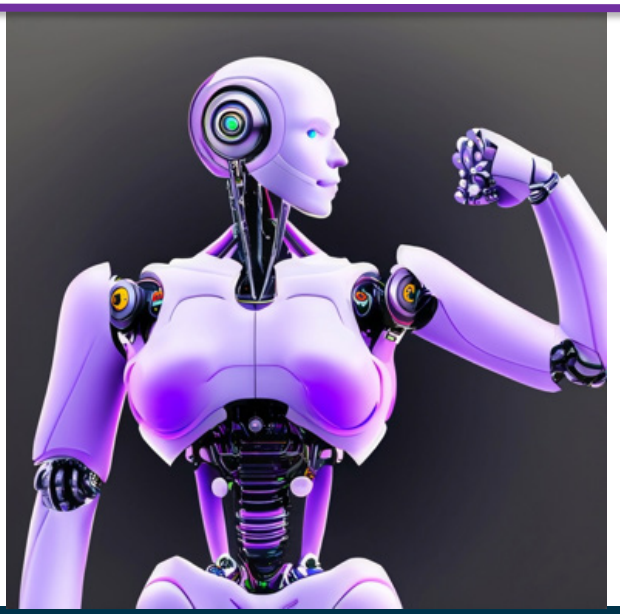
Narrow/Weak AI

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



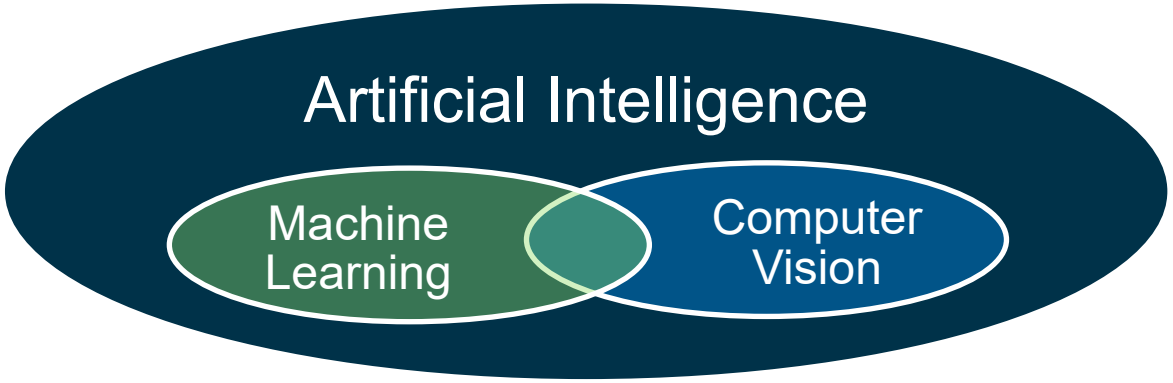
General/Strong AI

- 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**

1 wrong

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

What Narrow/Weak AI Examples Do You Use?

Driving:

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

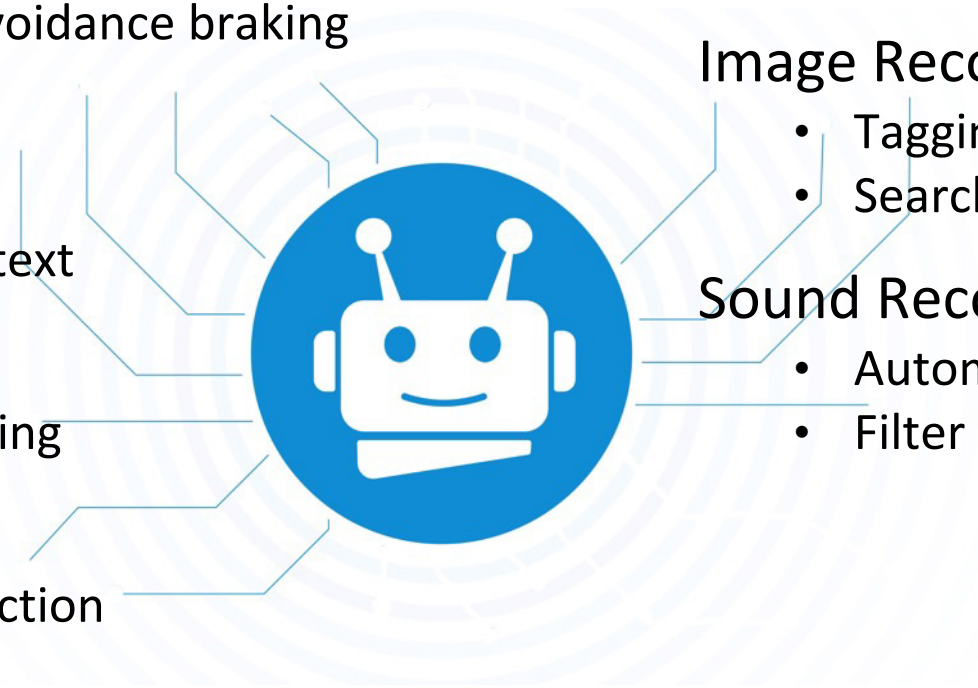
Mobile Phone:

- 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

ChatGPT

GitHub Copilot

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

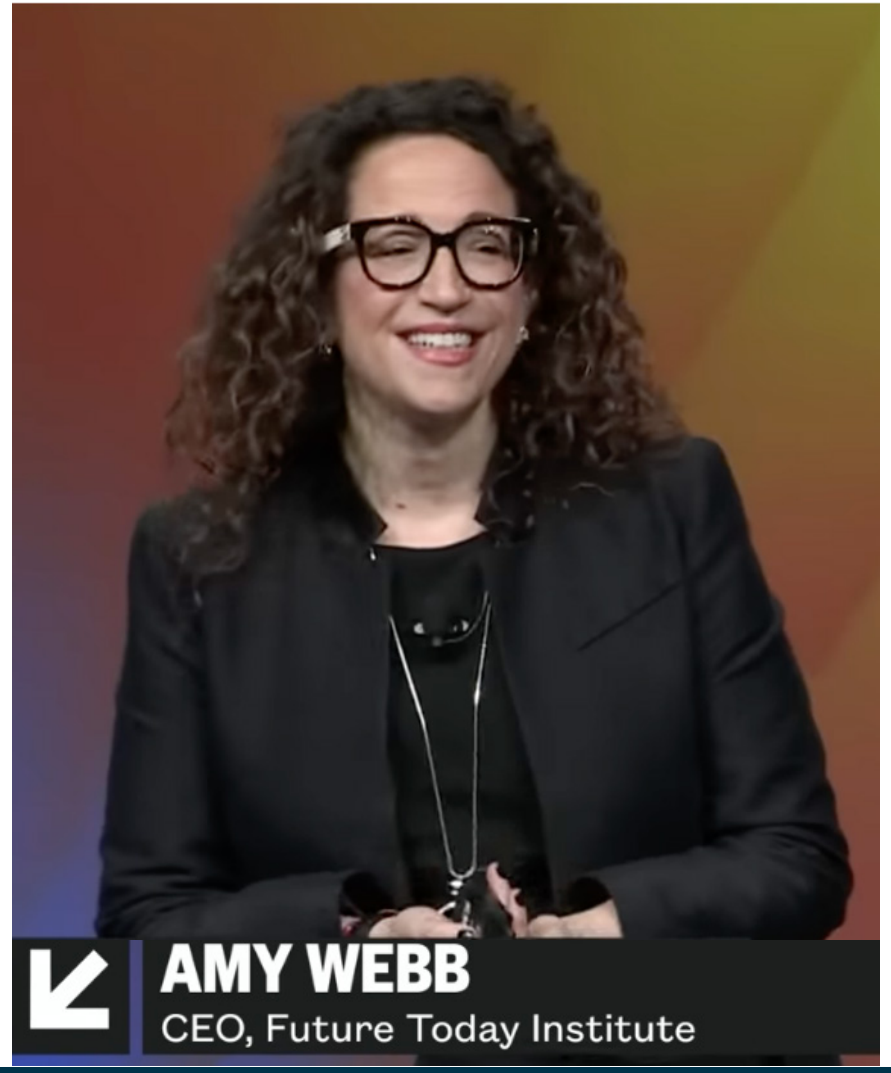
Are you ready for the AI Tsunami?

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

ACT Risk without Action!	Decide Near-Term Opportunity or Risk	Monitor Long-Term Opportunity or Risks
• Previously unseen immediate benefit to A11Y • Inflection point is imminent • New threat or risk is imminent	• Could disrupt A11Y • Meaningful impact on A11Y • Near-term financial, operational, regulatory risk or opportunity	• Potential for financial, operational or regulatory disruption • Knock-on effects could shape A11Y • Could pose novel A11Y risks
What requires action now?	**What needs a decision?**	**What must we monitor?**

A11Y cannot be an AI spectator this year

A11Y cannot be an AI spectator this year

or ever again

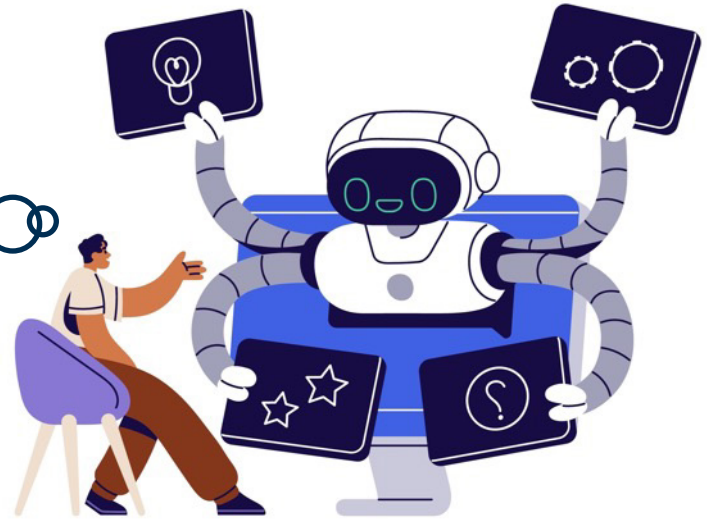
What can AI do for A11Y?

Narrow AI Can Optimize A11Y Testing

Computer Vision can “look” at rendered UI

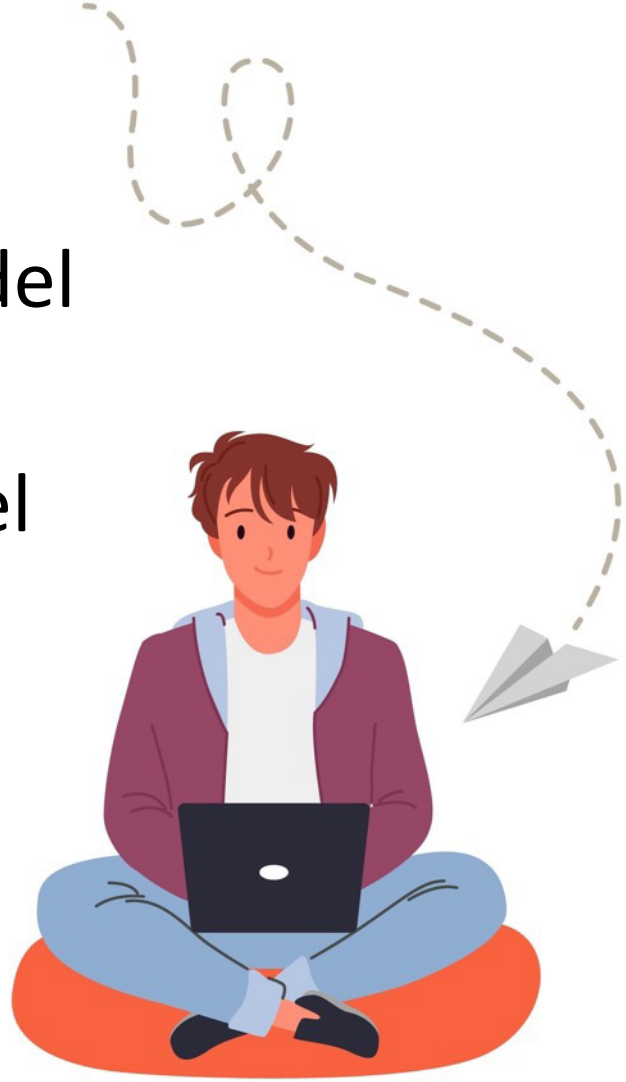
- **Table cell** looks like a header but not marked as <th>
- Looks like a **button** but is not keyboard accessible
- **Text in image** does not meet color contrast and more…

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

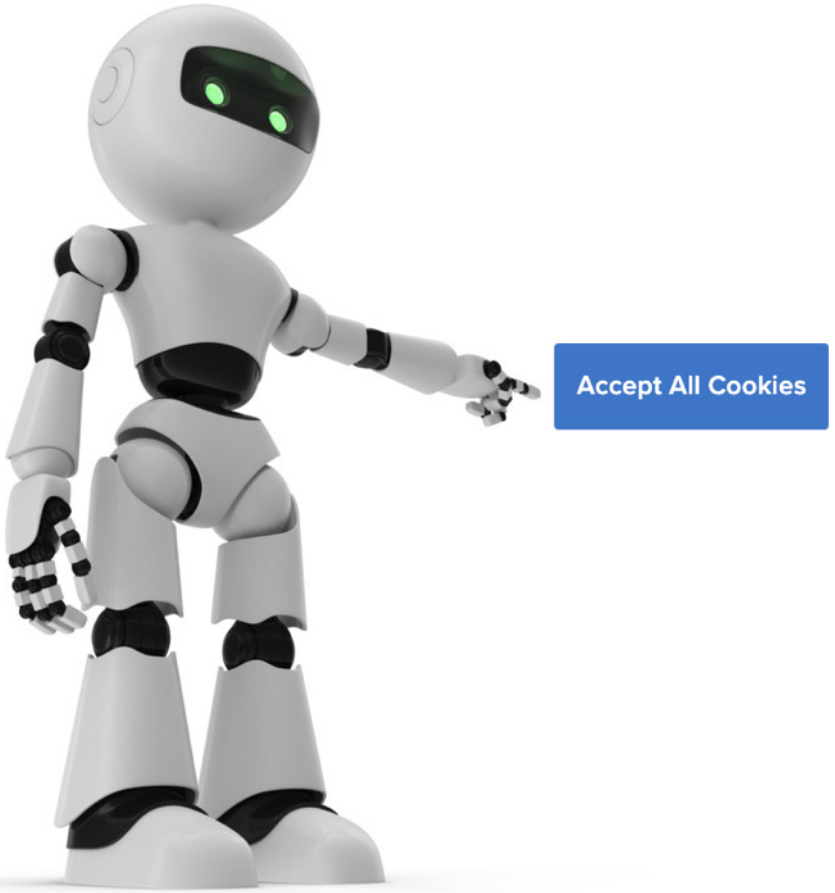


Narrow AI finds keyboard inaccessible “button”

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.”

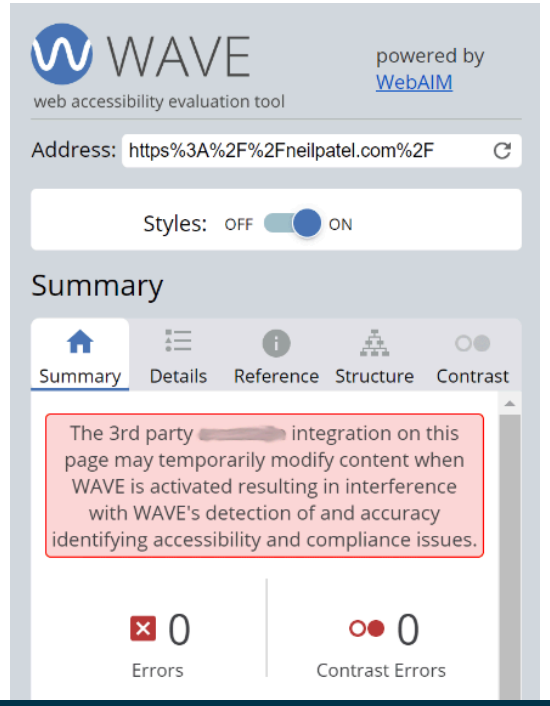
– UNESCO

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 3rd 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



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?

EVERY
NOTHING

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

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

- Noé Barrell

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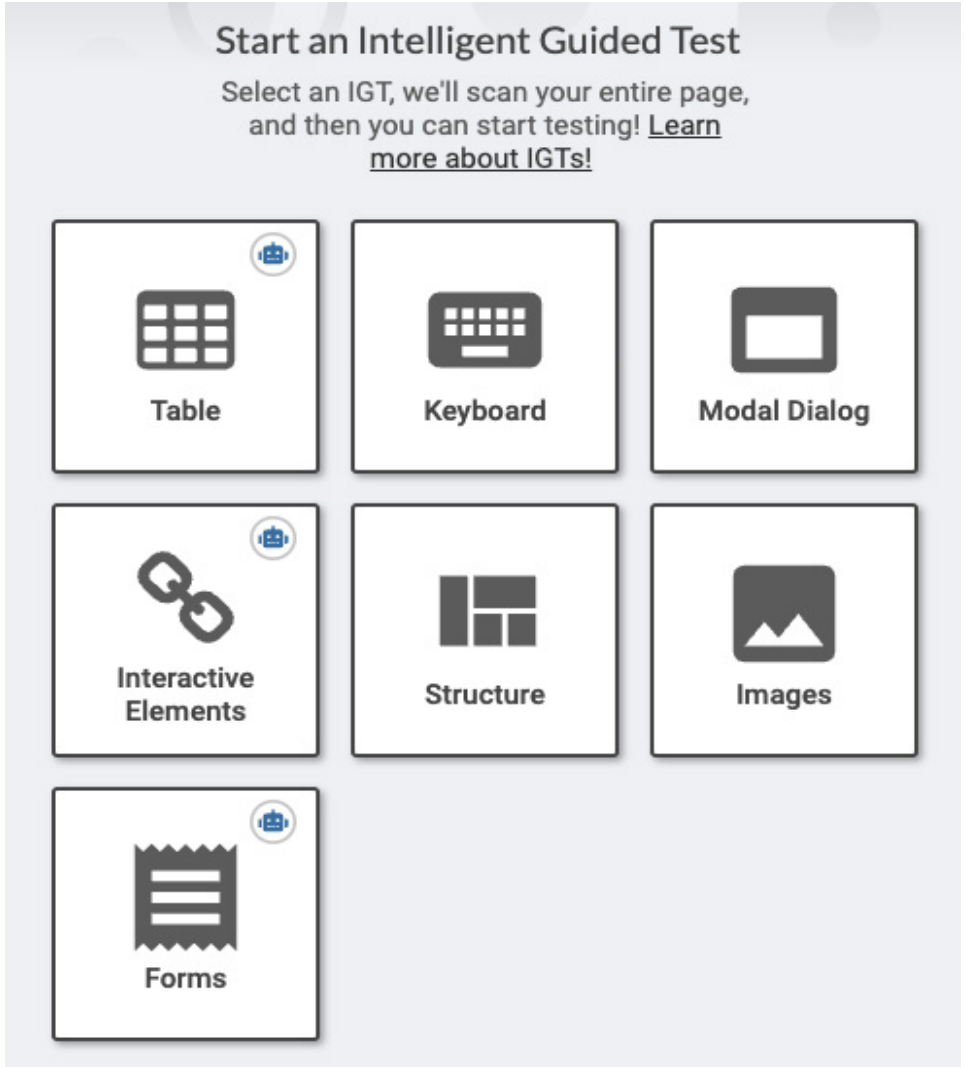
Axe DevTools Intelligent Guided Tests (IGTs) & AI



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

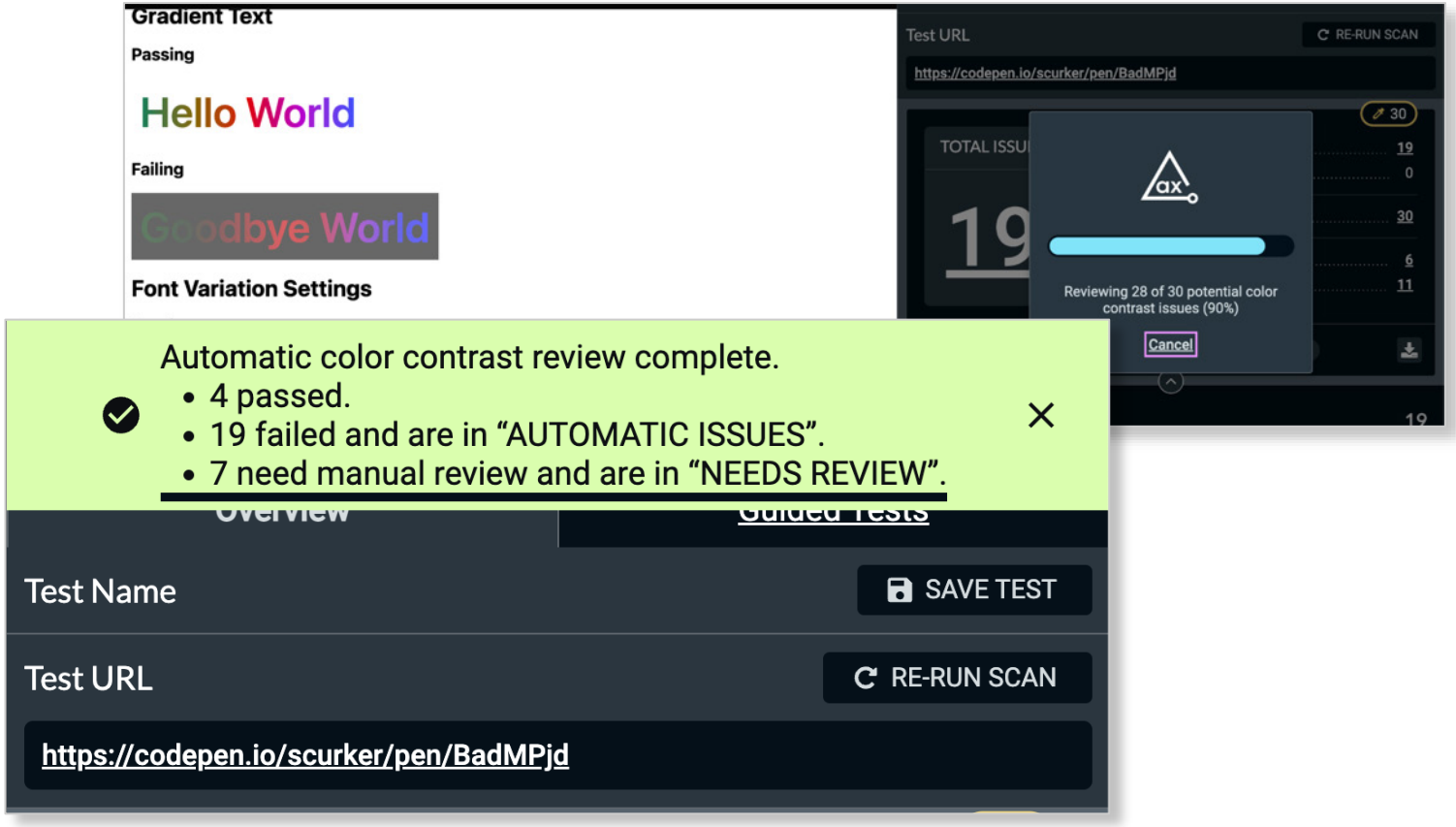
- More checks are automated
  - and accurate!
- A11Y testing can be faster
- YOU get to focus your brainpower on items that Narrow AI can't learn *(or hasn't learned yet)*

Problem: Understanding complex color contrast situations

We use **visual text and background rendering**

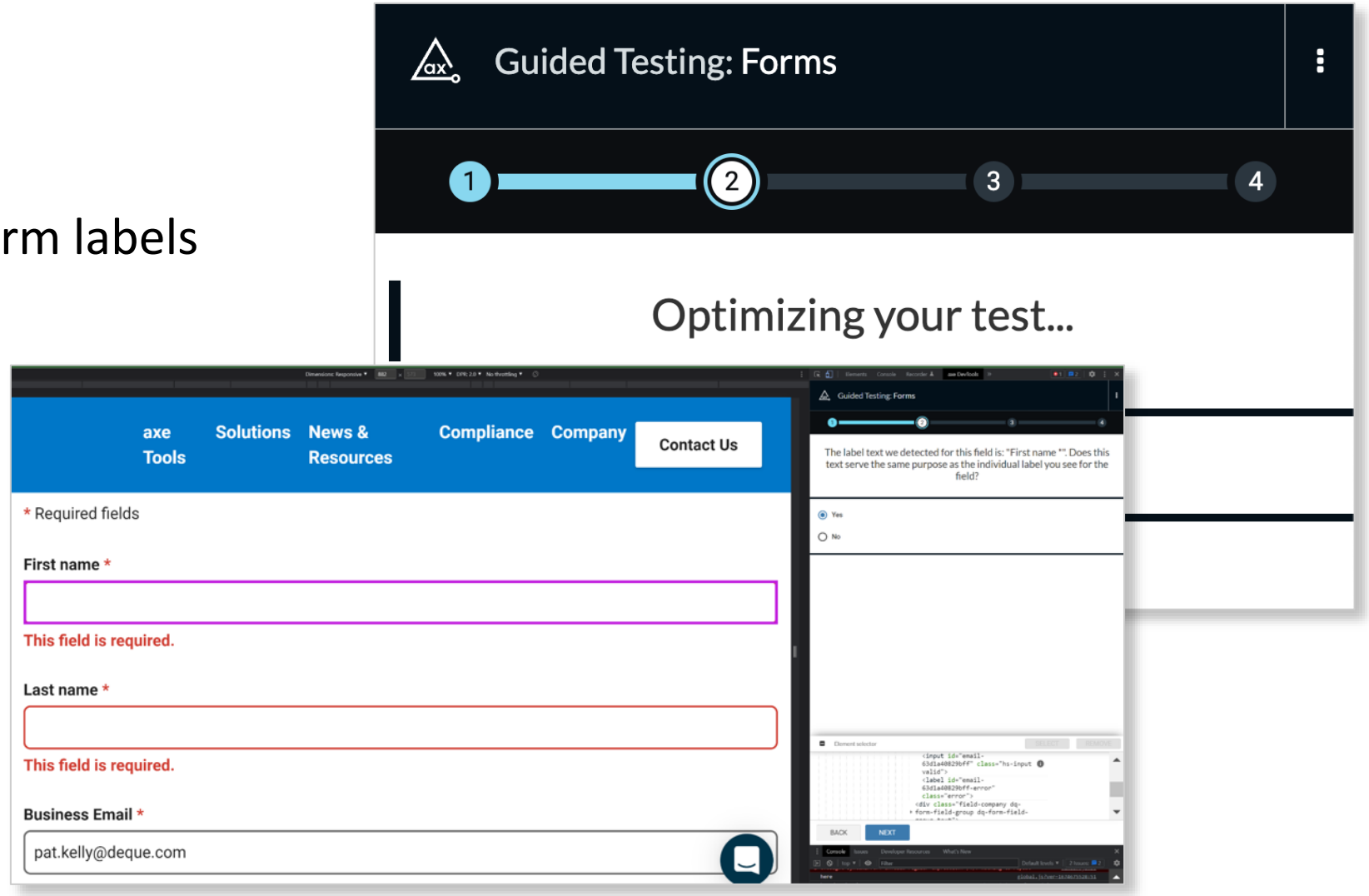
- Automatically calculate the range of color contrast values

- CV components use the range to determine whether there is an issue



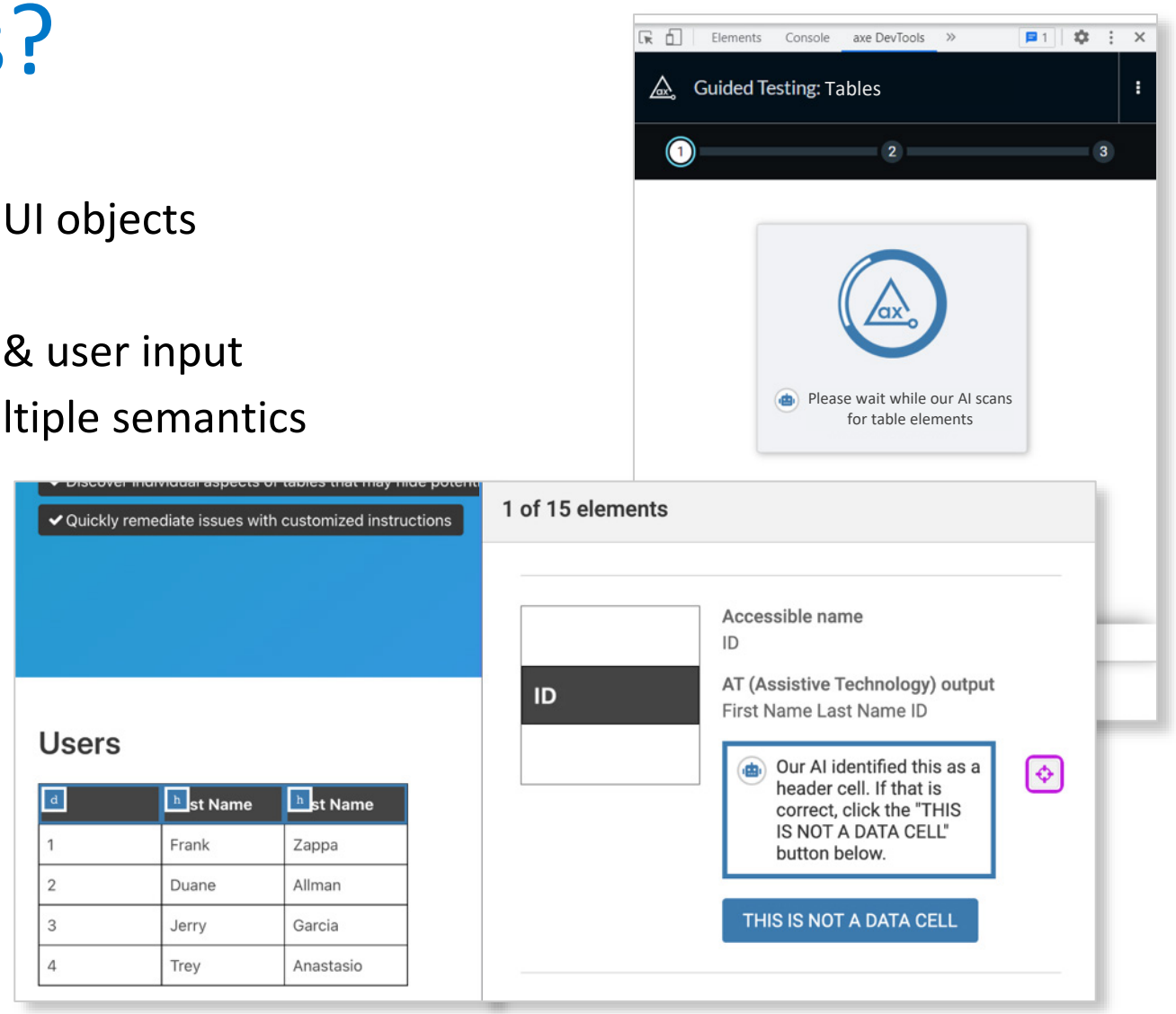
Problem: What goes with what?

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

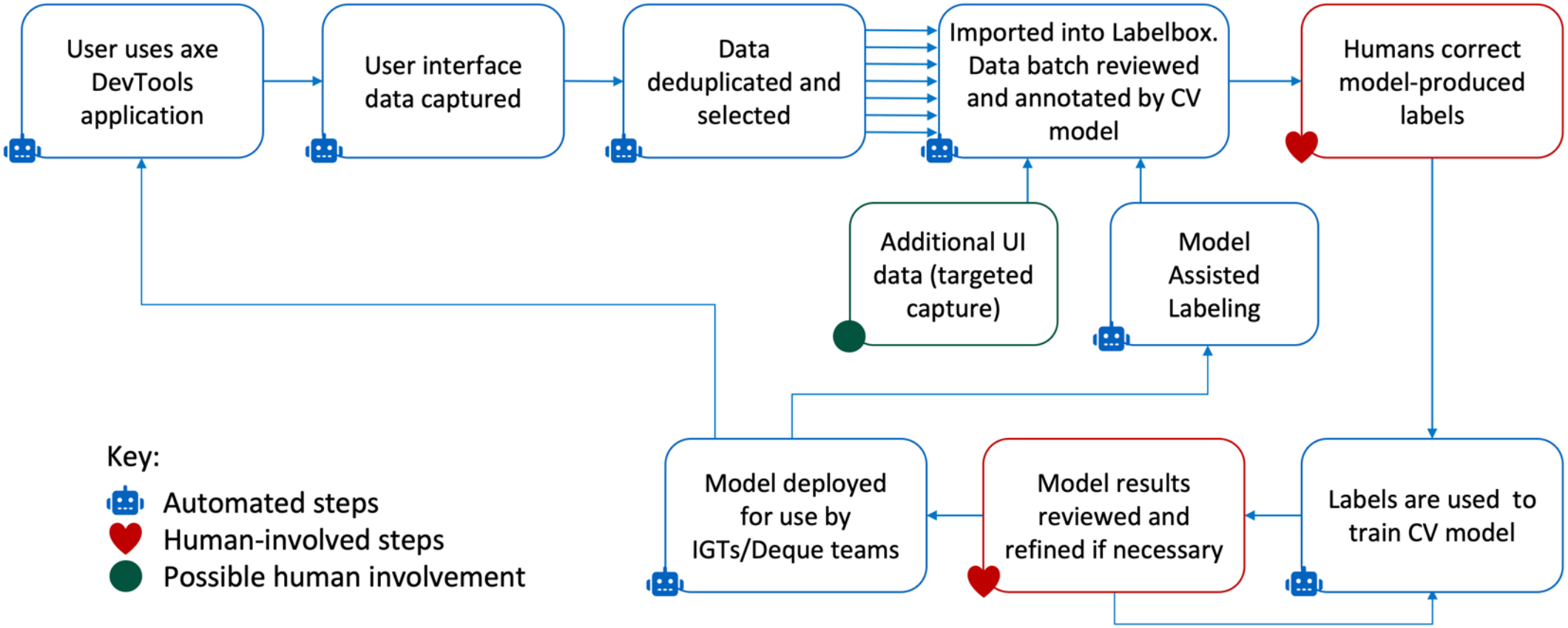


Problem: What is this?

- Our **object detection model** ids & 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!

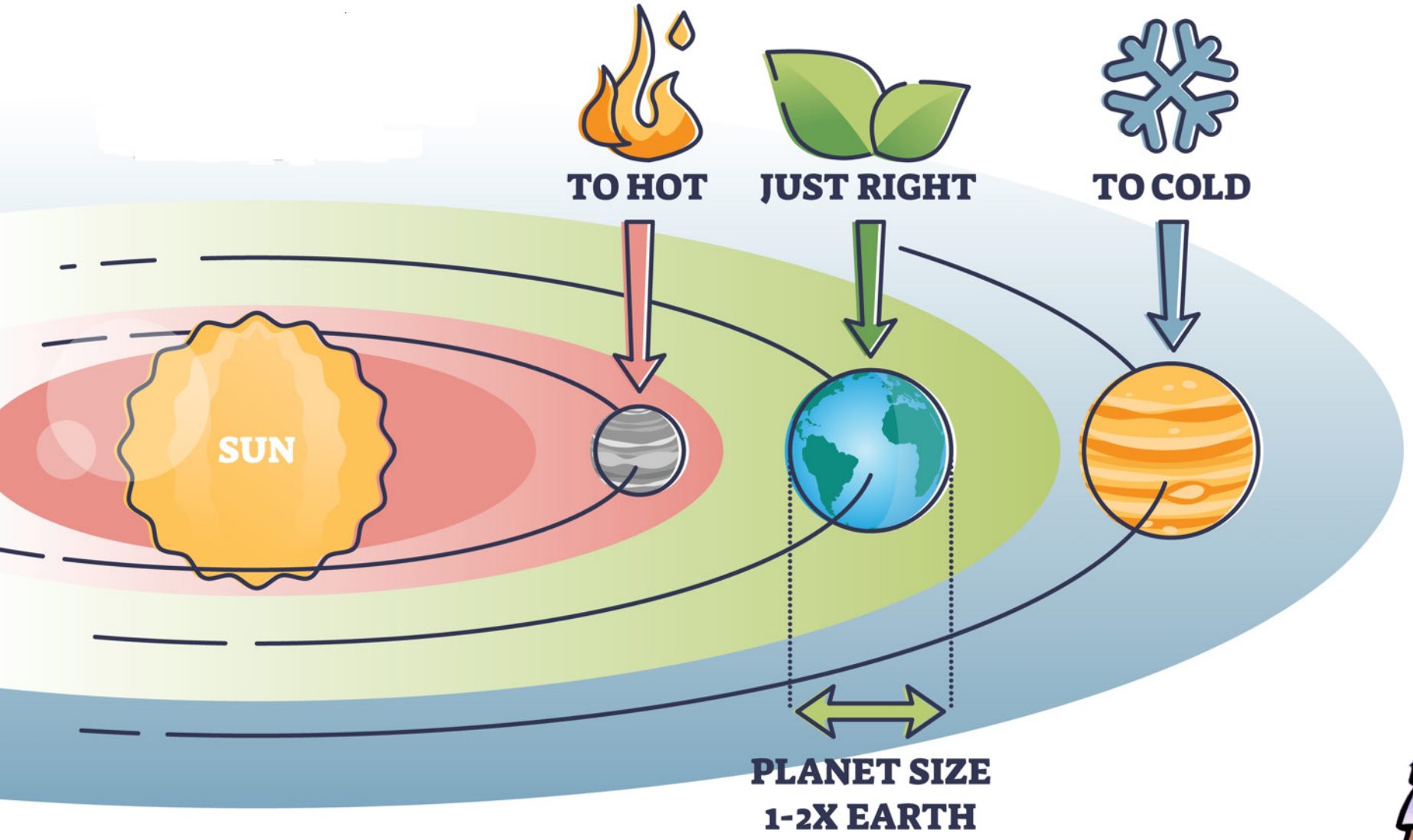


A11Y Data is a Strategic Asset



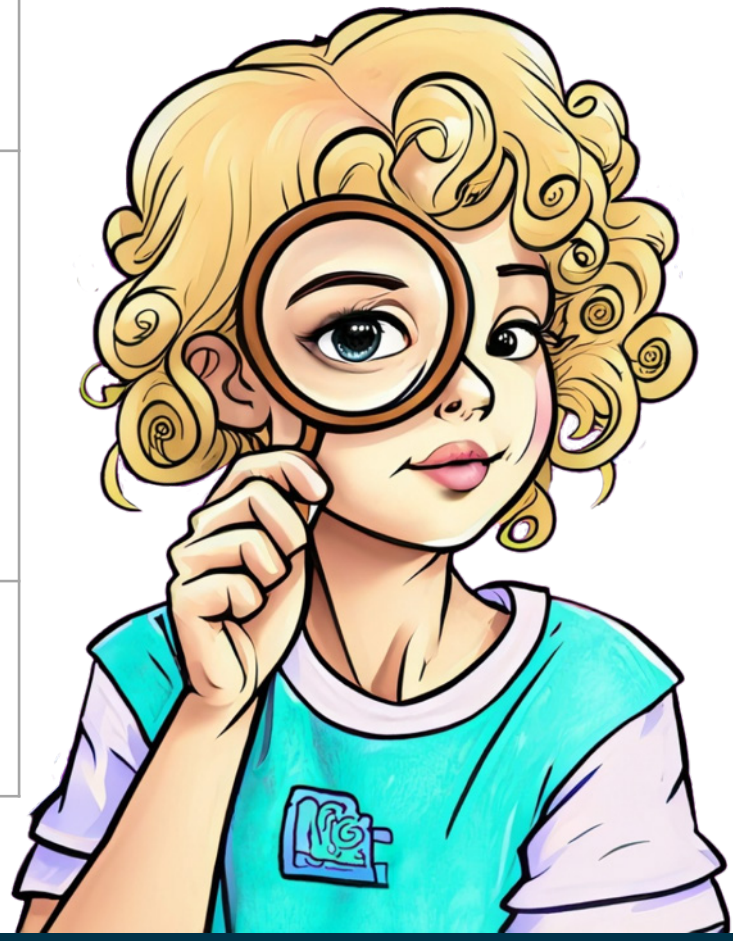
AI and the Goldilocks Zone

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.



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