Adventures with {highcharter} and the Highcharts accessibility module

Mara Averick

2022-03-09

<https://colorado.rstudio.com/rsc/highcharter-a11y-talk/>

About me 👋

- Mara Averick
- Developer Advocate, RStudio 👩‍💻
- Missoula, MT 🏔️

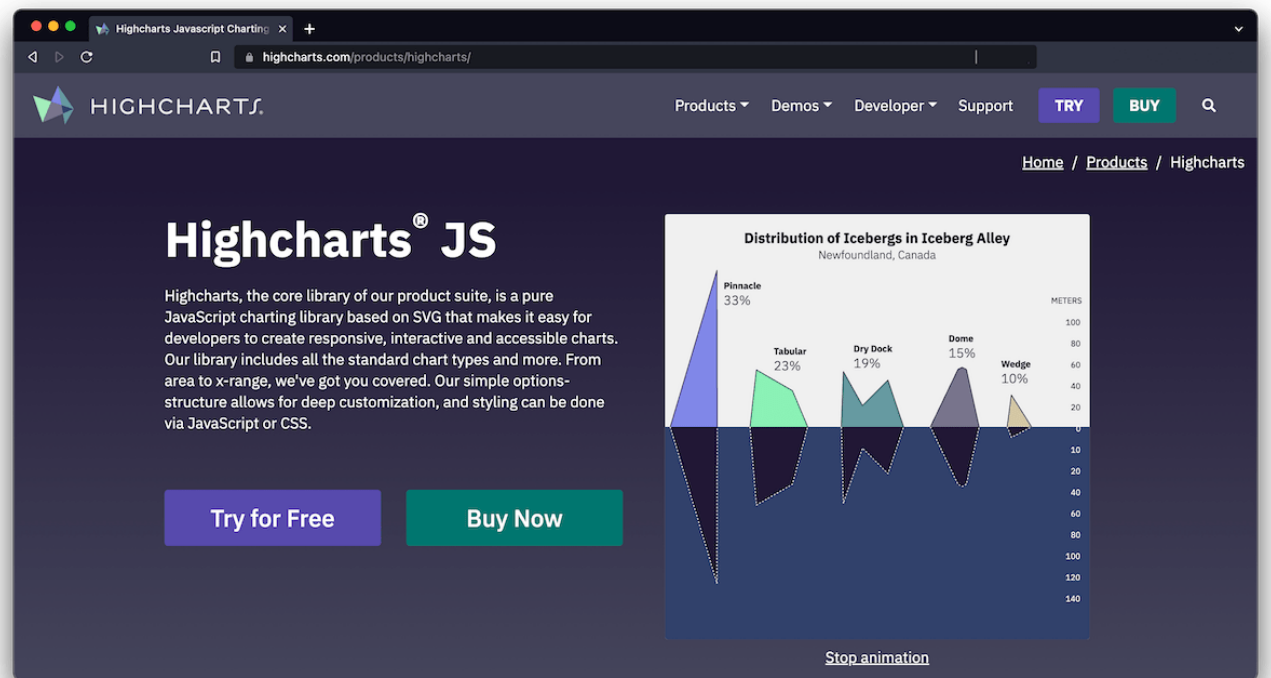
Things I did not create:

- {highcharter} (Kunst 2021)
- Highcharts (Highsoft AS 2021b)

n.b. The above list is not exhaustive.

Highcharts® JS

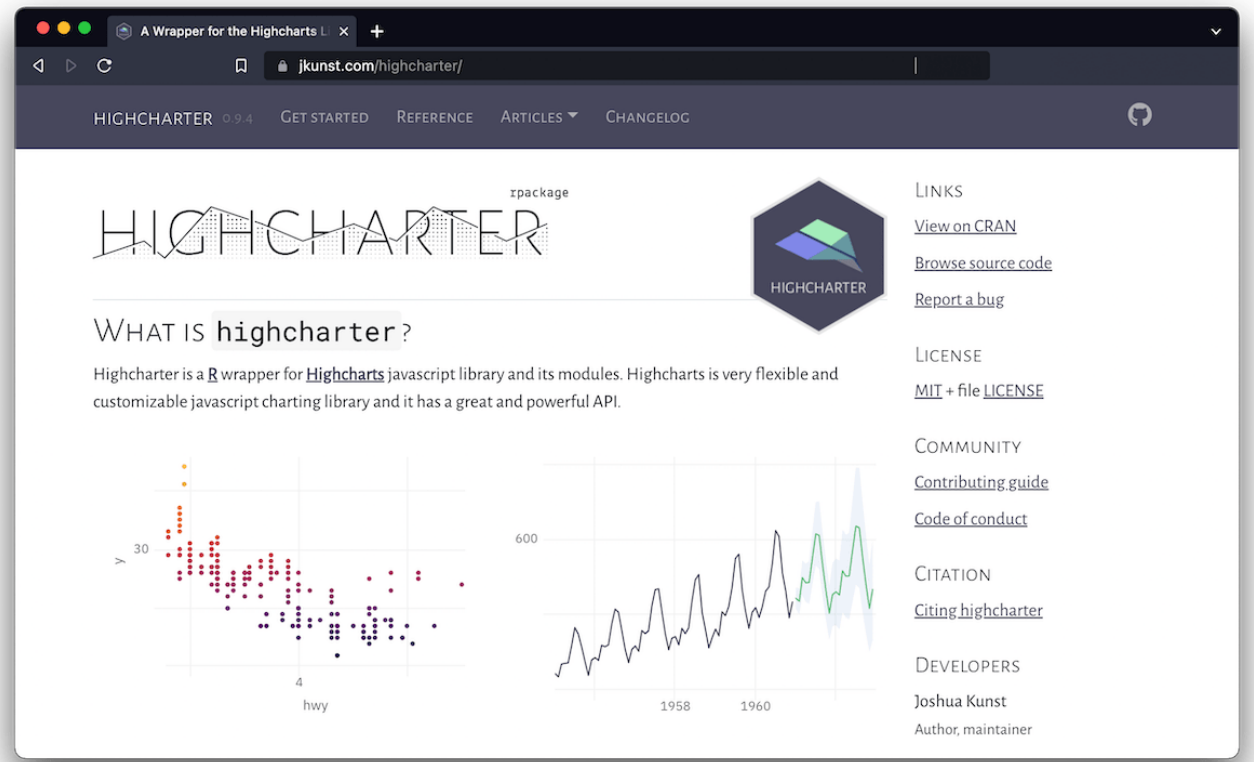
> Highcharts...is a pure JavaScript charting library based on SVG that makes it easy for developers to create responsive, interactive and accessible charts.



https://www.highcharts.com/products/highcharts/

highcharter

> highcharter is an R wrapper for Highcharts JavaScript library and its modules.



<https://jkunst.com/highcharter/>

Background / inspiration

Resources for Data Viz Accessibility by Silvia Canelón

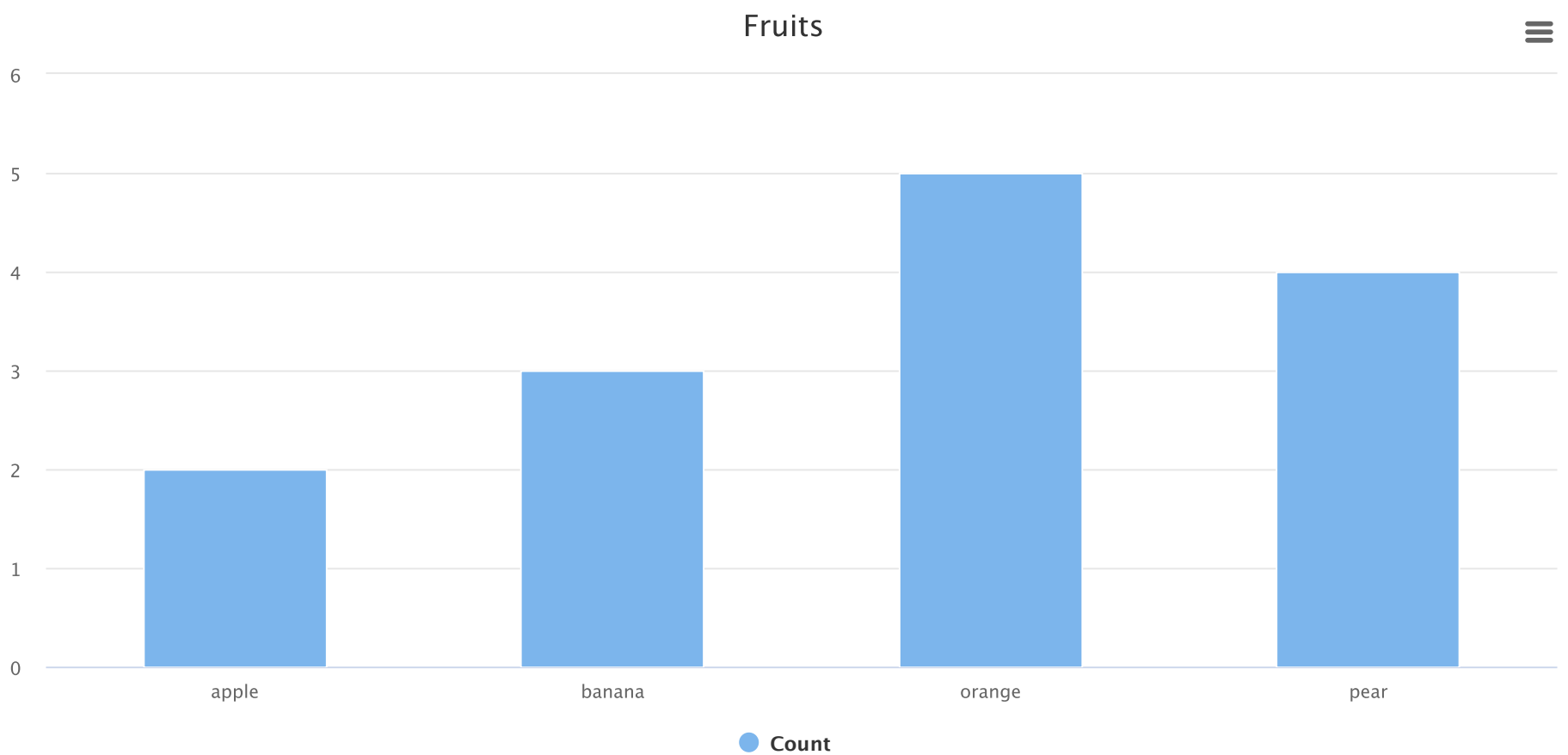
> A selection of general and R-specific resources on how and why to make accessible data visualizations.
> (Canelón 2021)

<https://www.silviacanelon.com/blog/2021-data-viz-a11y/>

Motivating example

Keyboard navigation (accessibility setting) not working #707

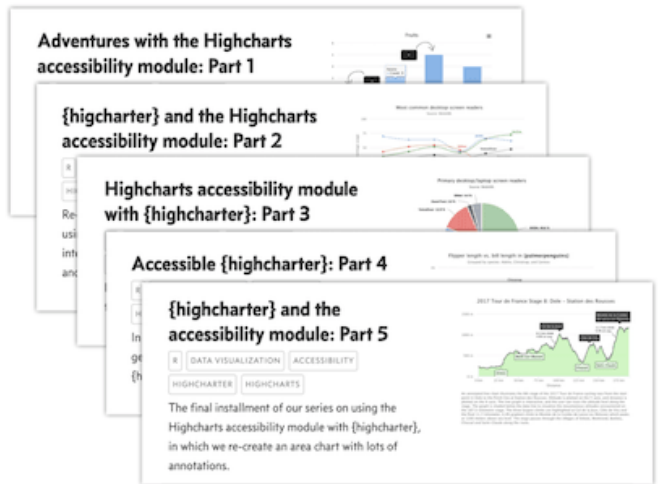
Now with working keyboard navigation! 🎉



My journey

Start

Finish



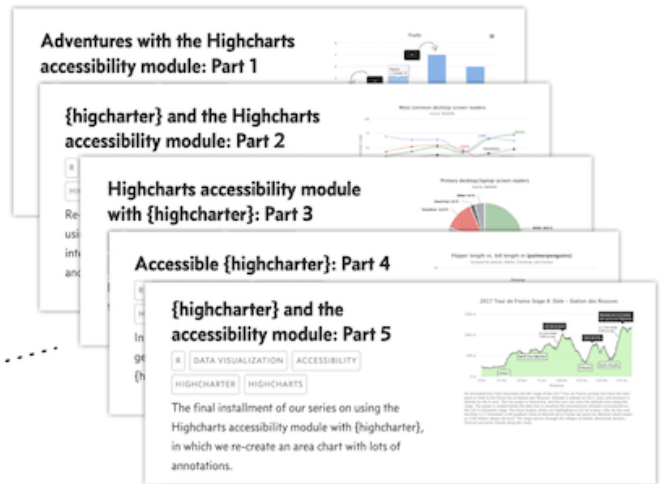
Start: Reading Silvia's Resources for Data Viz Accessibility.

Finish: Writing a 5-part series on highcharter and the Highcharts accessibility module.

My journey

Start

Finish



Accessible Highcharts examples created with {highcharter} and working R code

Blog post series: Accessible Highcharts examples re-created in R using the {highcharter} package, with code and commentary!

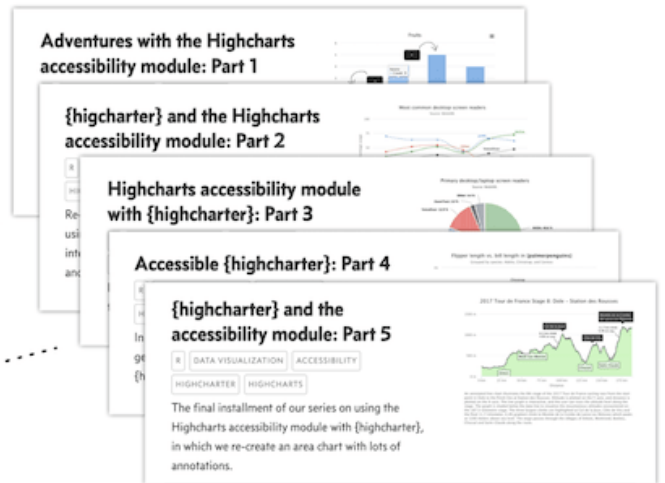
My journey

Start

Me learning things along the way

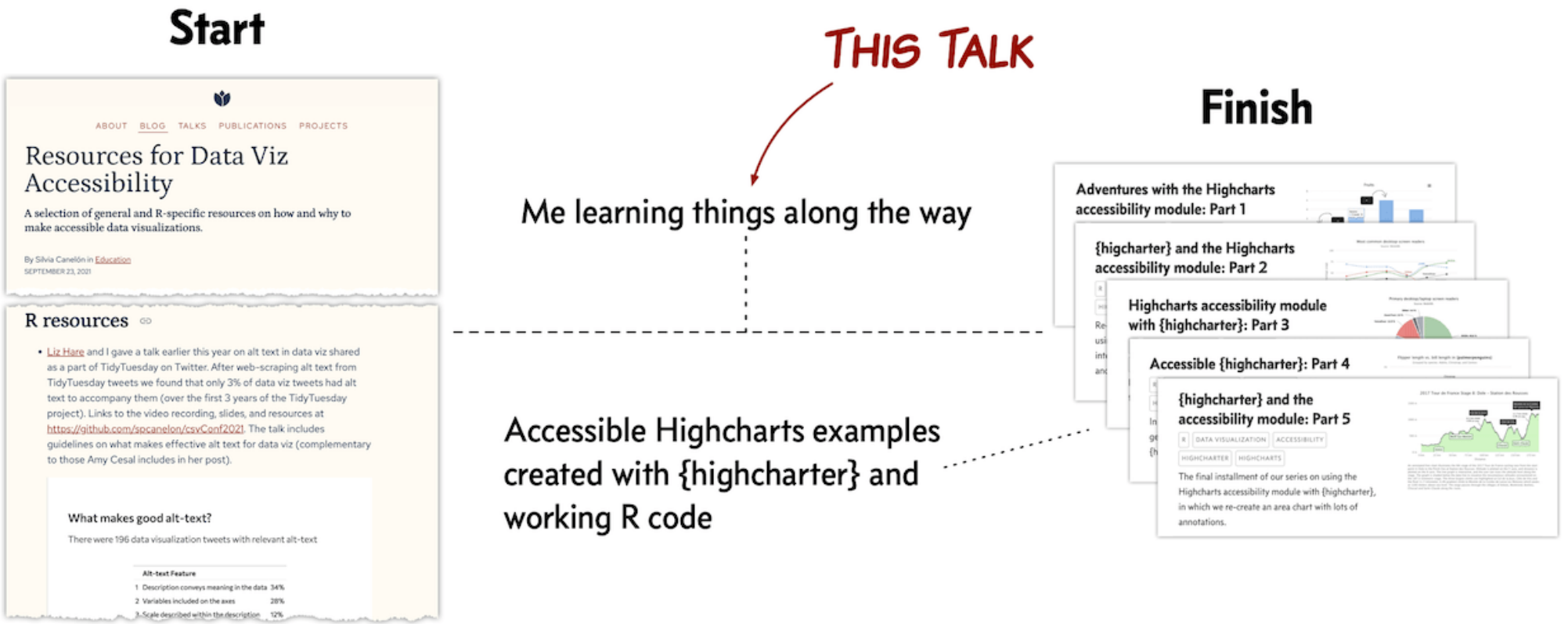
Accessible Highcharts examples created with {highcharter} and working R code

Finish



Between the start and finish, I learned a bunch of useful (non-code or framework-specific) things about accessibility...

My journey



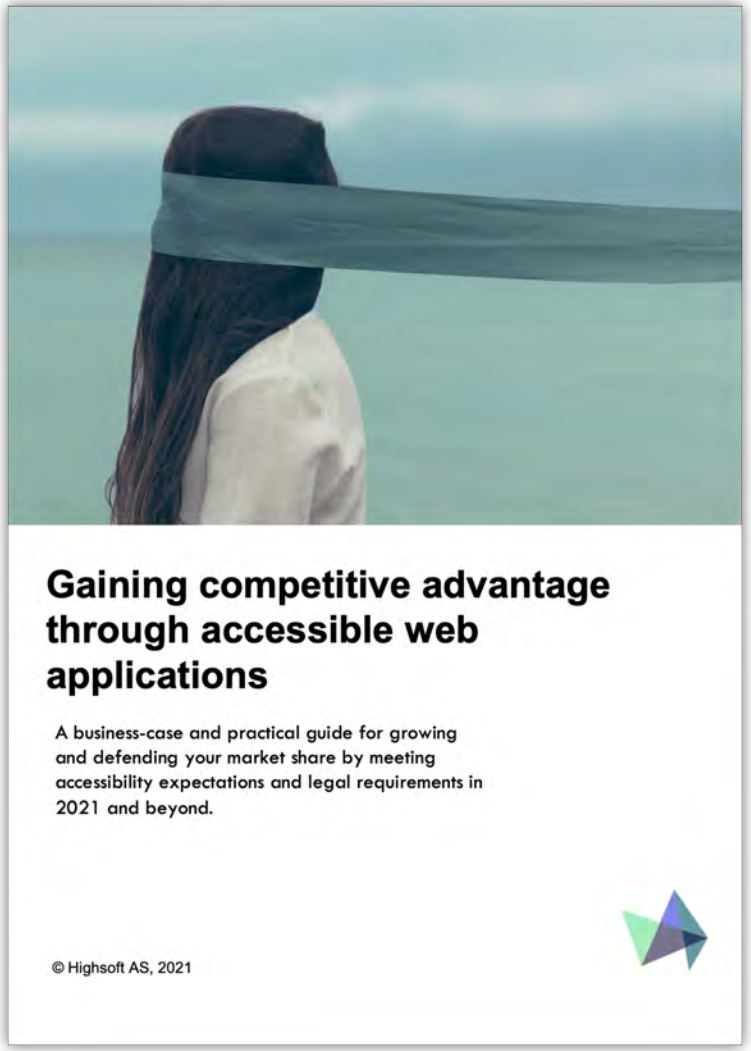
Spoiler alert: This talk focuses on those lessons learned.

Highcharts & accessibility: Product

Key selling point! (Highsoft AS 2021a)

Features:

- Keyboard navigation
- Screen-reader optimization
- Low-vision features
- Sonification
- Voice input
- Tactile export



<https://www.highcharts.com/accessibility/>

Highcharts & accessibility: Background

Collaboration with Elsevier, feat. Øystein Moseng (Highsoft) and Ted Gies (Elsevier)

- Accessibility-Expert and **User Testing**

> “This innovation allows me to interact with the chart and understand the relationships of all the components of the chart to all other components rather than just getting a description of the chart”

— Lucy Greco, Web Accessibility Evangelist, Highcharts test user (in (Bert and Hayes 2018))

Highcharts & accessibility: Background

Øystein Moseng and Ted Gies presentations at CSUN Assistive Technology Conference(s)

- Accessible SVG Charts Using ARIA (Moseng and Gies 2016)
  - ➙ Video interview
- Highcharts - The Next Chapter (Gies and Moseng 2019)
- Accessible Visualizations: Maps, Annotations, and Spark lines (Gies and Moseng 2020)

Highcharts & accessibility: Background

Collaboration with Georgia Tech Sonification Lab (Cantrell, Walker, and Moseng 2021)

- Highcharts Sonification Studio (Cantrell, Walker, and Moseng 2021)

  ➙ https://sonification.highcharts.com/

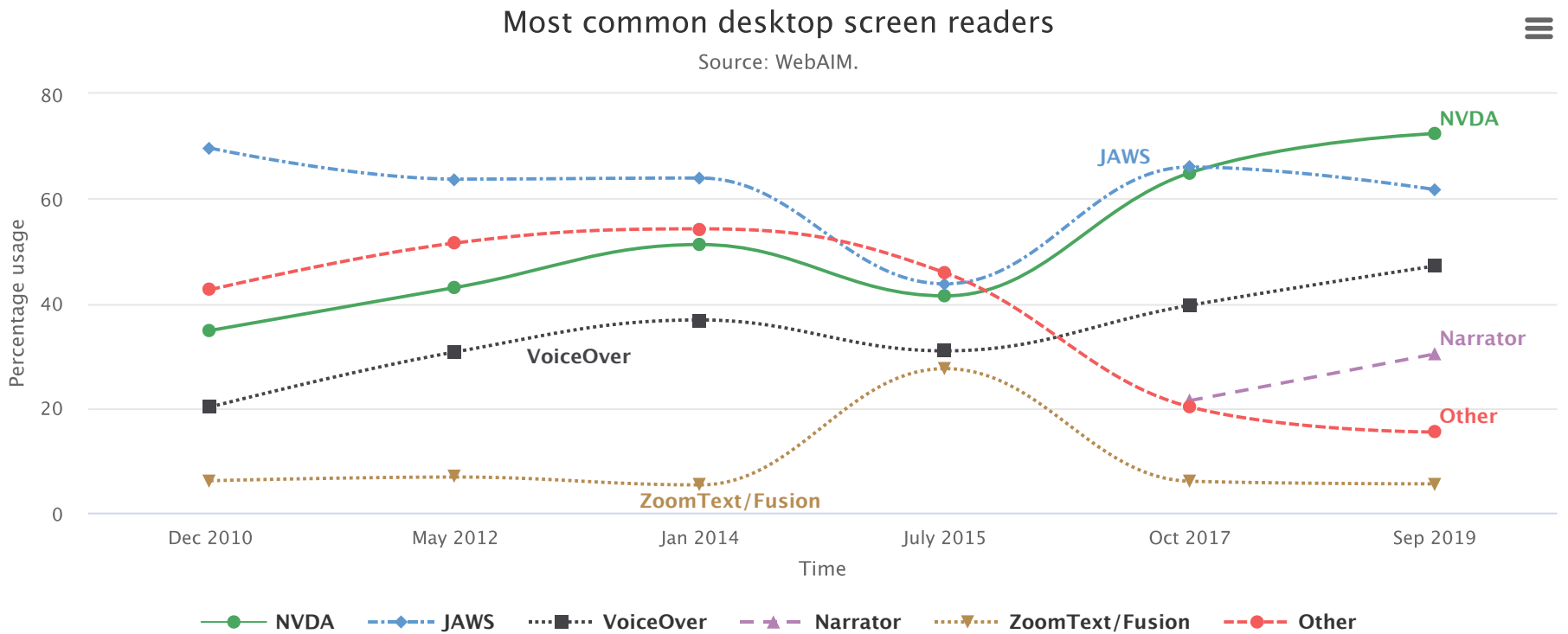
New Browser-Based Chart Builder Gives Line Graphs, Scatterplots Their Very Own Audio Track

Keyboard Navigation

> …users are able to navigate and interact with the

Access to data as table and/or for export

Users preferred this when data was simple (Moseng and Gies 2016).



Line chart demonstrating some accessibility features of Highcharts. The chart displays the most commonly used screen readers in surveys taken by WebAIM from December 2010 to September 2019. JAWS was the most used screen reader until 2019, when NVDA took over. VoiceOver is the third most used screen reader, followed by Narrator. ZoomText/Fusion had a surge in 2015, but usage is otherwise low. The overall use of other screen readers has declined drastically the past few years.

Sonification

https://www.highcharts.com/samples/nonav/highcharts/sonification/chart-earcon

Voice input

Video: Accessible interaction with chart controls using Dragon voice input and Highcharts.

Screen-reader accessibility

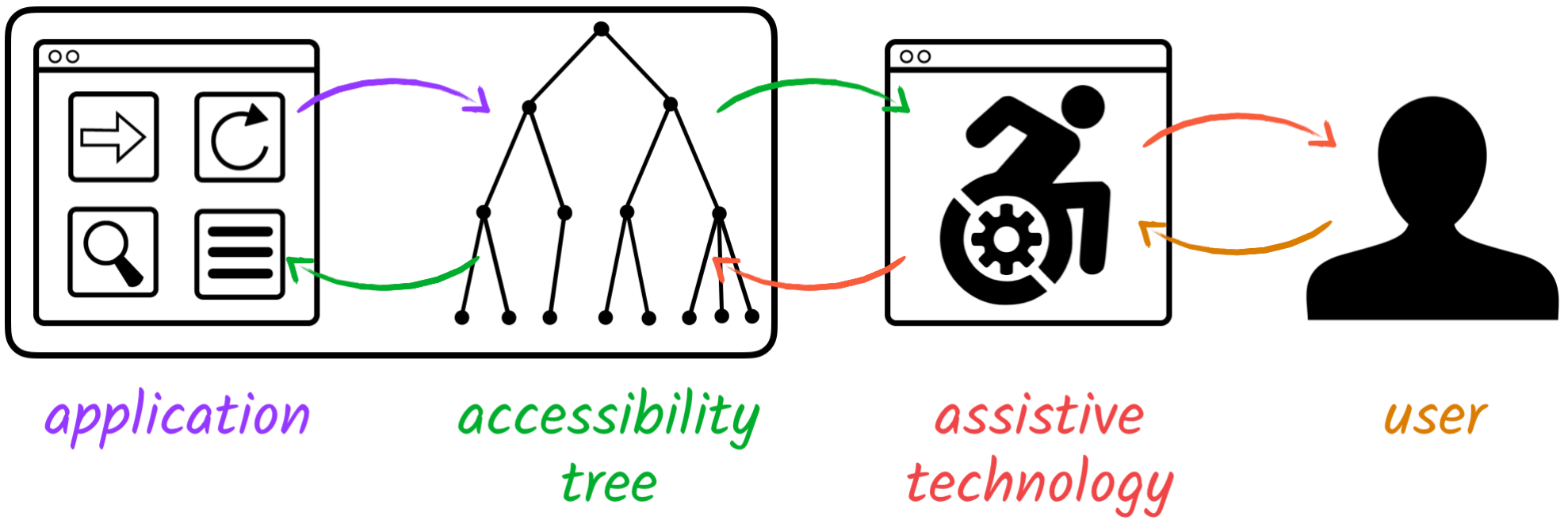
Video: Highcharts A11y Line Chart

Perfect?

Impressive?

* Or at least way better than I’d be able to do myself

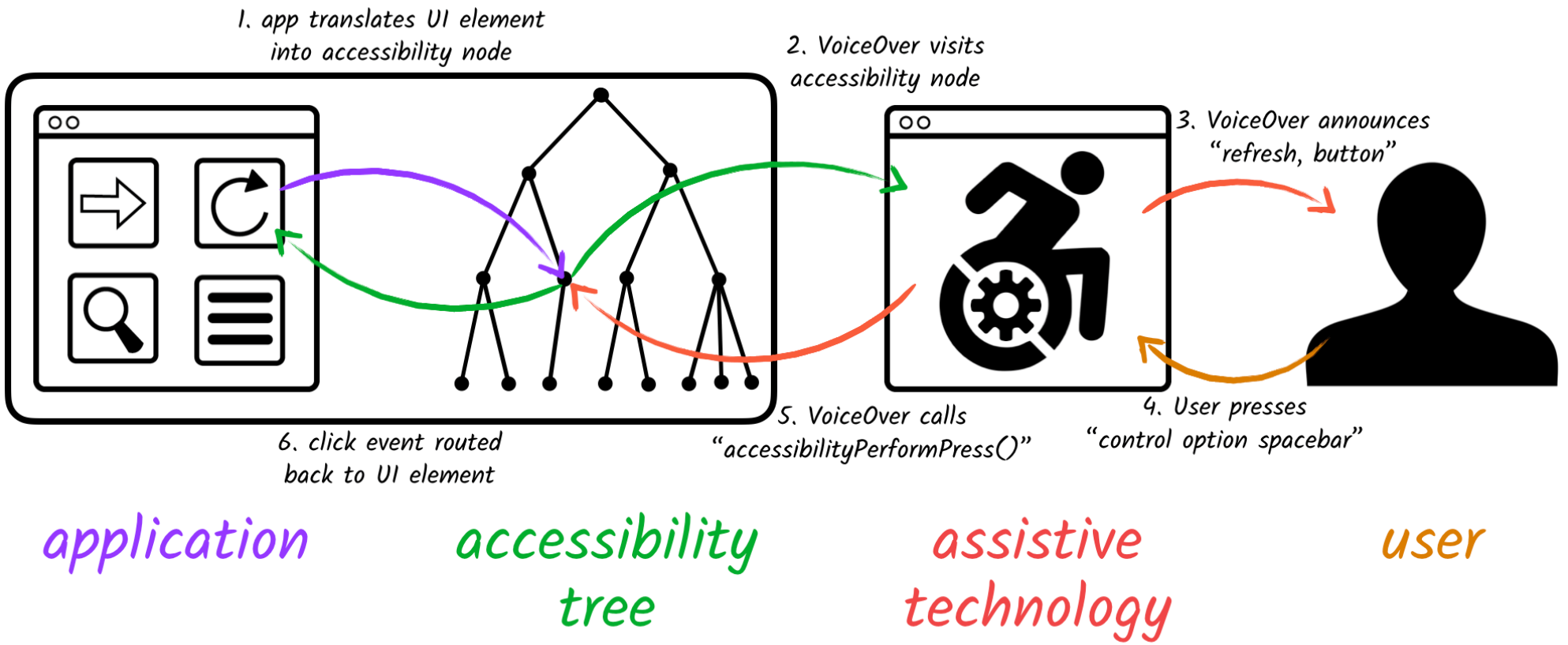
Assistive technology and the accessibility tree



Source: Accessibility Object Model Explainer (Boxhall et al. 2021)

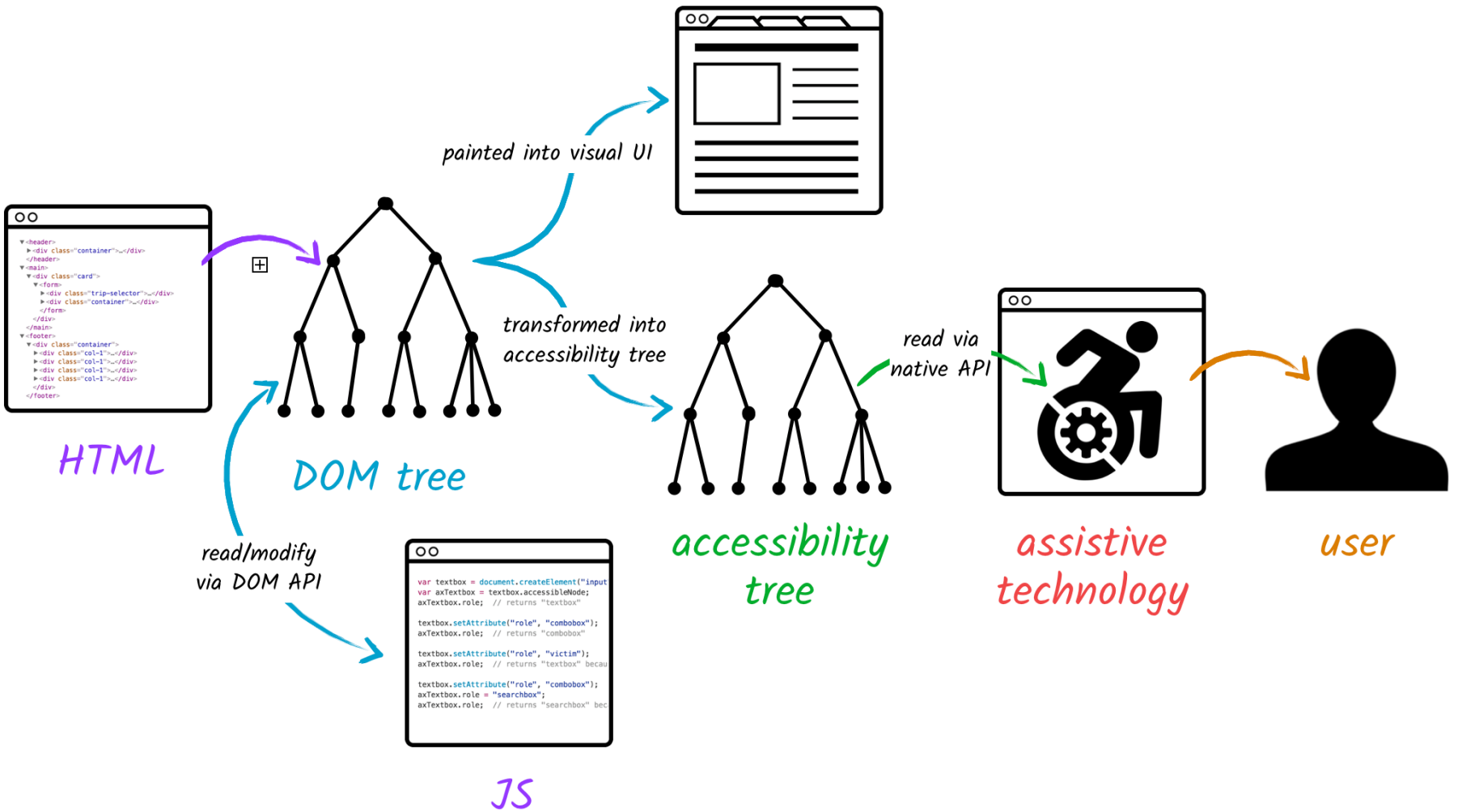
Accessibility Object Model Explainer https://wicg.github.io/aom/explainer.html

UI via assistive technology: example



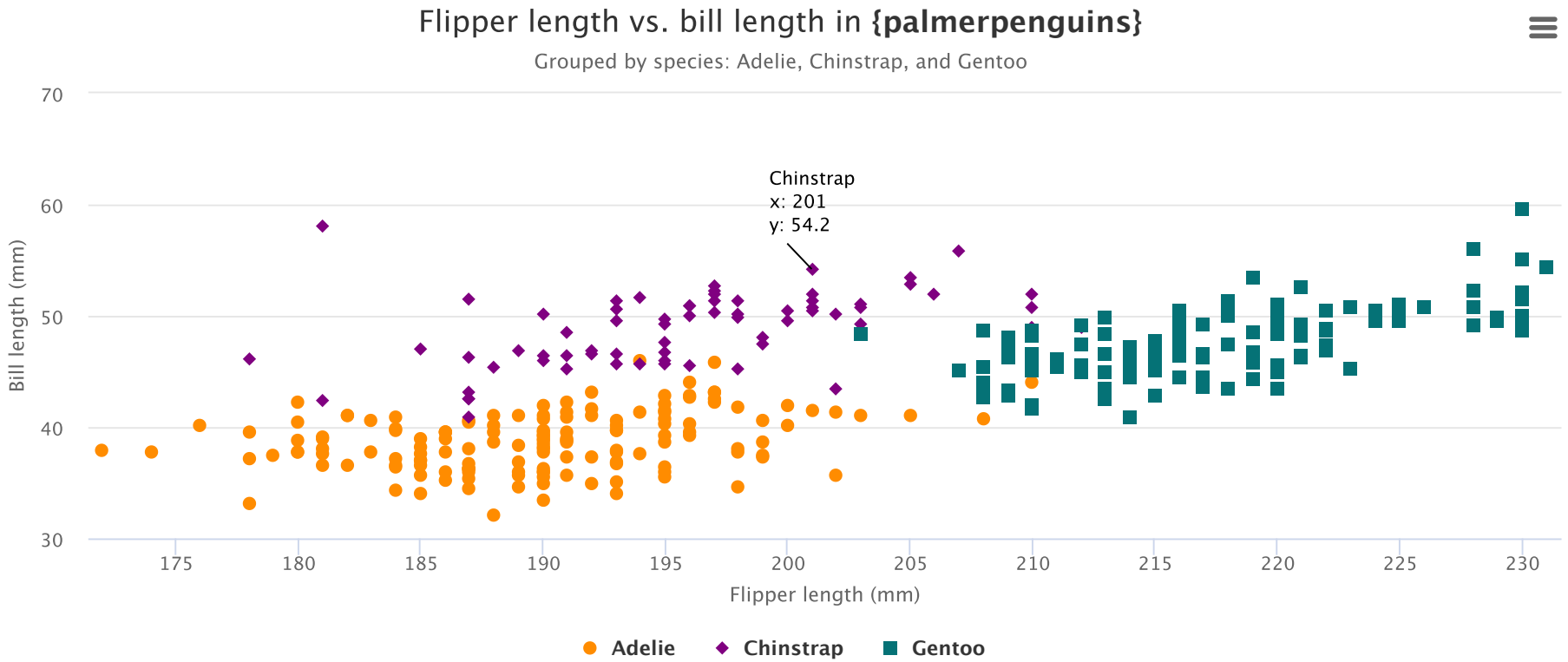
Source: Accessibility Object Model Explainer (Boxhall et al. 2021)

Accessibility tree in the browser



Source: Accessibility Object Model Explainer (Boxhall et al. 2021)

Accessibility-module magic



Scatterplot of the palmerpenguins dataset showing data points clustered by species (Adelie, Chinstrap, and Gentoo) using the highcharter package making it possible to focus on one cluster and identify the x and y values of a specific data point. In this case the data point is a Chinstrap penguin observation mapping to a flipper length of 201mm and bill length of 54.2mm.

Accessibility-module magic

Inspect the HTML → “hidden” screen-reader region

```
<div id="highcharts-screen-reader-region-before-0"
aria-label="Chart screen reader information." role="region"
aria-hidden="false" style="position: relative;"></div>
```

> This is where Ted and the developers added the structure description of chart that could benefit screen reader users, such as the chart type, axis information (automatically generated), and a long description of what is found in the chart (supplied by the chart creator) (Bert and Hayes 2018)

<https://api.highcharts.com/highcharts/accessibility.screenReaderSection>

screenReaderSection

Default format:

```
<{headingTagName}>{chartTitle}</{headingTagName}>
<div>{typeDescription}</div>
<div>{chartSubtitle}</div>
<div>{chartLongdesc}</div>
<div>{playAsSoundButton}</div>
<div>{viewTableButton}</div>
<div>{xAxisDescription}</div>
<div>{yAxisDescription}</div>
<div>{annotationsTitle}{annotationsList}</div>
```

https://api.highcharts.com/highcharts/accessibility.screenReaderSection.beforeChartFormat

Our penguins `screenReaderSection`

Title and chart info:

```
<p>Flipper length vs. bill length in {palmerpenguins}</p>
<div>Scatter chart with 3 data series.</div>
<div>Grouped by species: Adelie, Chinstrap, and Gentoo</div>
```

Axis descriptions and ranges:

```
<div>The chart has 1 X axis displaying flipper length in millimeters. Range
<div>The chart has 1 Y axis displaying bill length in millimeters. Range: 3
```

Annotations:

```
<div>Chart annotations summary
<ul>
<li>A Chinstrap penguin observation mapping to a flipper length of 201mm an
</ul>
</div>
```

https://dataand.me/posts/2021-11-15-accessible-highcharter-part-4/

`{chartLongdesc}`

Where you are most irreplaceable!

What belongs there?

It depends…

> Provide a text summary of the visualization, making sure to describe trends or patterns in the visualization. (Moseng 2021)

Different descriptions, different kinds of content

Accessible Visualization via Natural Language Descriptions: A Four-Level Model of Semantic Content

(Lundgard and Satyanarayan 2022)

1. Elemental and Encoded Properties
2. Statistical Concepts and Relations
3. Perceptual and Cognitive Phenomena
4. Contextual and Domain-Specific Insights

<http://vis.csail.mit.edu/pubs/vis-text-model/>

Different descriptions, different kinds of content

Accessible Visualization via Natural Language Descriptions: A Four-Level Model of Semantic Content

(Lundgard and Satyanarayan 2022)

> Descriptions are important to both [blind and sighted] reader groups

> Reader groups differ significantly on which semantic content they rank as most useful

> Access to meaningful information is strongly reader-specific

<http://vis.csail.mit.edu/pubs/vis-text-model/>

Lessons learned…

- Use tools
- Don’t **rely** on tools
- Accessibility isn’t “one size fits all”
- Look to the experts
- Get feedback
- Keep learning

R code and working examples

- Accessible {highcharter} GitHub repo (rendered demos of my charts, and source `.Rmd`s) ← More useful
- GitHub repo for these slides ← Less useful
- Blog post series:
  - Adventures with the Highcharts accessibility module: Part 1
  - {higcharter} and the Highcharts accessibility module: Part 2
  - Highcharts accessibility module with {highcharter}: Part 3
  - Accessible {highcharter}: Part 4
  - {highcharter} and the accessibility module: Part 5

Resources

- 10 Guidelines for DataViz Accessibility by Øystein Moseng (Moseng 2021)
- Accessible visualization via natural language descriptions by Alan Lundgard and Arvind Satyanarayan (Lundgard and Satyanarayan 2022)
- DataViz Accessibility Advocacy and Advisory Group
- Alt-texts: The Ultimate Guide by Daniel Göransson (Göransson 2017)
- The A11y Project ← Meta resource

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