An Extensible Visualization Library for Screen Reader Accessibility

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Accessible Visualizations

require implementations that are not re-usable across toolkits, and lack standardized user experiences.

Olli is

an open-source Javascript library that converts existing visualizations from many popular toolkits into standardized, accessible user experiences

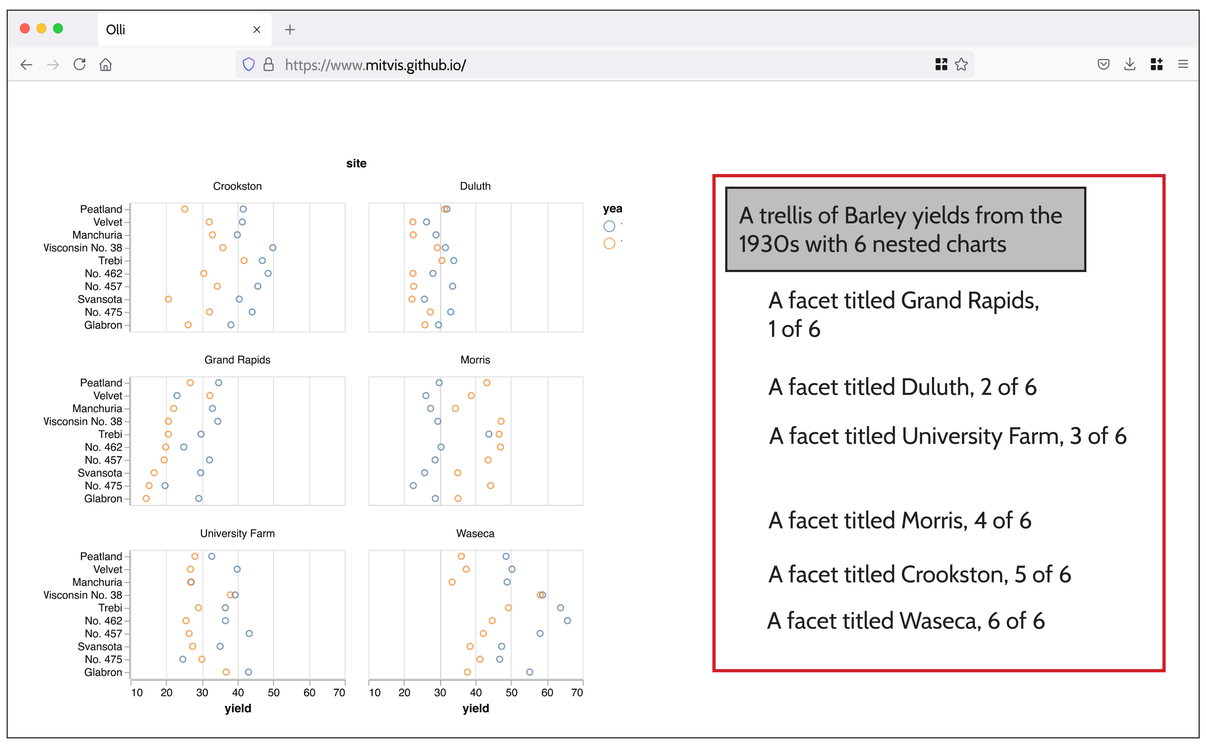
https://mitvis.github.io/olli/

Creating an Accessible Visualization

```
let spec = {
    "$schema": "https://vega.github.io/schema/vega-lite/v5.json",
    "name": "trellis_barley",
    "description": "A small multiples view of barley yields by site and variety.",
    "data": { "url": "https://raw.githubusercontent.com/vega/vega-datasets/next/data/barley.json" },
    "mark": "point",
    "height": { "step": 12 },
    "encoding": {
        "facet": {
            "field": "site",
            "type": "ordinal",
            "columns": 2,
            "sort": { "op": "median", "field": "yield" }
        },
        "x": {
            "field": "yield",
            "type": "quantitative",
            "scale": { "zero": false }
        },
        "y": {
            "field": "variety",
            "type": "ordinal",
            "sort": "-x"
        },
        "color": { "field": "year", "type": "nominal" }
    }
}
let vegaSpec = vegaLite.compile(spec).spec
const runtime = vega.parse(vegaSpec);
const vegaRender = document.getElementById('Visualization-Vega-Lite');
let view = new vega.View(runtime)
    .loglevel(vega.Warn)
    .initialize(vegaRender)
    .renderer('svg')
    .hover()
```

Visualization specifications are passed into an Olli adapter to generate an OlliVisSpec.

```
OlliAdapters.VegaLiteAdapter(spec).then(olliVisSpec => {
    document.getElementById("AccessibilityTree-Vega-Lite").append(olli(olliVisSpec))
})
```



A trellis of Barley yields from the 1930s with 6 nested charts

A facet titled Grand Rapids, 1 of 6

A facet titled Duluth, 2 of 6

A facet titled University Farm, 3 of 6

A facet titled Morris, 4 of 6

A facet titled Crookston, 5 of 6

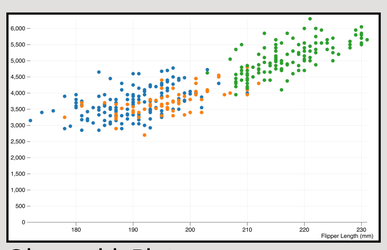
A facet titled Waseca, 6 of 6

From the OlliVisSpec, Olli generates an Accessible Rendering following *HTML Accessible Rich Internet Applications* (ARIA) standards.

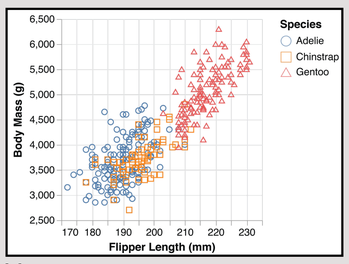
As users navigate with arrow keys, the screen reader narrates descriptions out loud.

The UX is consistent across charts and toolkits.

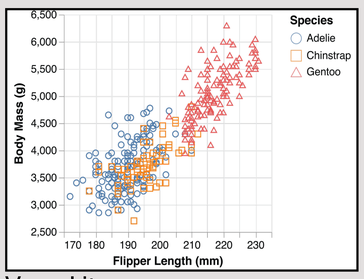
Extending Olli to Support Additional Toolkits



ObservablePlot



Vega



Vega-Lite

Olli encourages reusability through an adapter design pattern with a simple interface.

```
/**
 * Interface describing how a visualization adapter should be created
 */
export type VisAdapter<T> = (spec: T) => Promise<OlliVisSpec>;
```

Olli includes built-in adapters for Vega, Vega-Lite, and Observable Plot.

A scatterplot showing body mass and flipper lengths of penguins. with 2 axes and 1 legend

Y-Axis for a quantitative scale with values from 2700 to 6300

X-Axis for a quantitative scale with values from 172 to 231

Range 170,180, 8 values in the interval

Range 180,190, 70 values in the interval

. . .

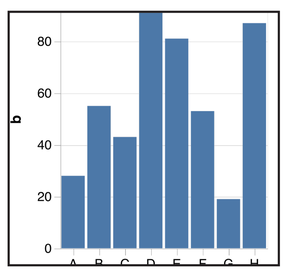
Legend titled 'Species' with 3 values

Grid view of the data

Toolkit developers can extend Olli while re-using its accessible renderer.

Supported Chart Types

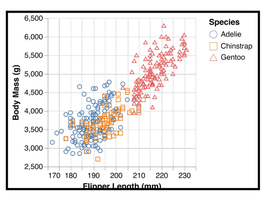
Bar Charts



A simple bar chart with embedded data. with bottom axis

X-Axis for a nominal scale with values from A to H

Scatterplots



A scatterplot showing body mass and flipper lengths of penguins. with 2 axes and 1 legend

Y-Axis for a quantitative scale with values from 2700 to 6300

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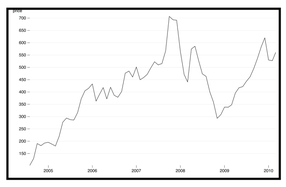
Grid view of the data

Line Charts

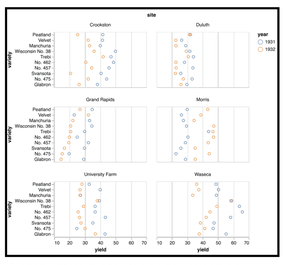


Google's stock price over time. with 2 axes

Y-Axis for a quantitative scale with values from 102.37 to 707

X-Axis for a temporal scale with values from Aug 1, 2004 to Mar 1, 2010

Faceted Charts



A small multiples view of barley yields by site and variety. with 6 nested charts

A facet titled Grand Rapids, 1 of 6

A facet titled Duluth, 2 of 6

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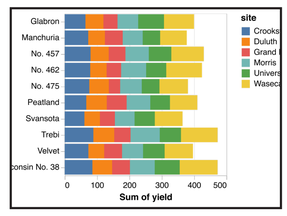
Stacked Bar Charts

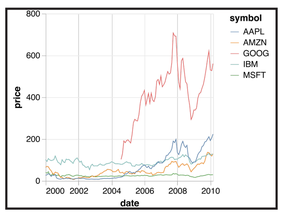


A horizontally stacked bar chart of barley yields with left axis and 1 legend

Y-Axis with values from Glabron to Wisconsin No. 38

Legend titled 'site' with 6 values

Multi-Series Line Charts



Stock prices of 5 Tech Companies over Time. with 5 nested charts

A facet titled MSFT, 1 of 5

A facet titled AMZN, 2 of 5

A facet titled IBM, 3 of 5

A facet titled GOOG, 4 of 5

A facet titled AAPL, 5 of 5