# Critical Reflections of Visualization Authoring Systems

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Presented by Nico Ritschel, November 26th 2019

# Two Contributions

1. Evaluation of 3 Visualization Authoring Systems

2. Critical Reflections methodology in general

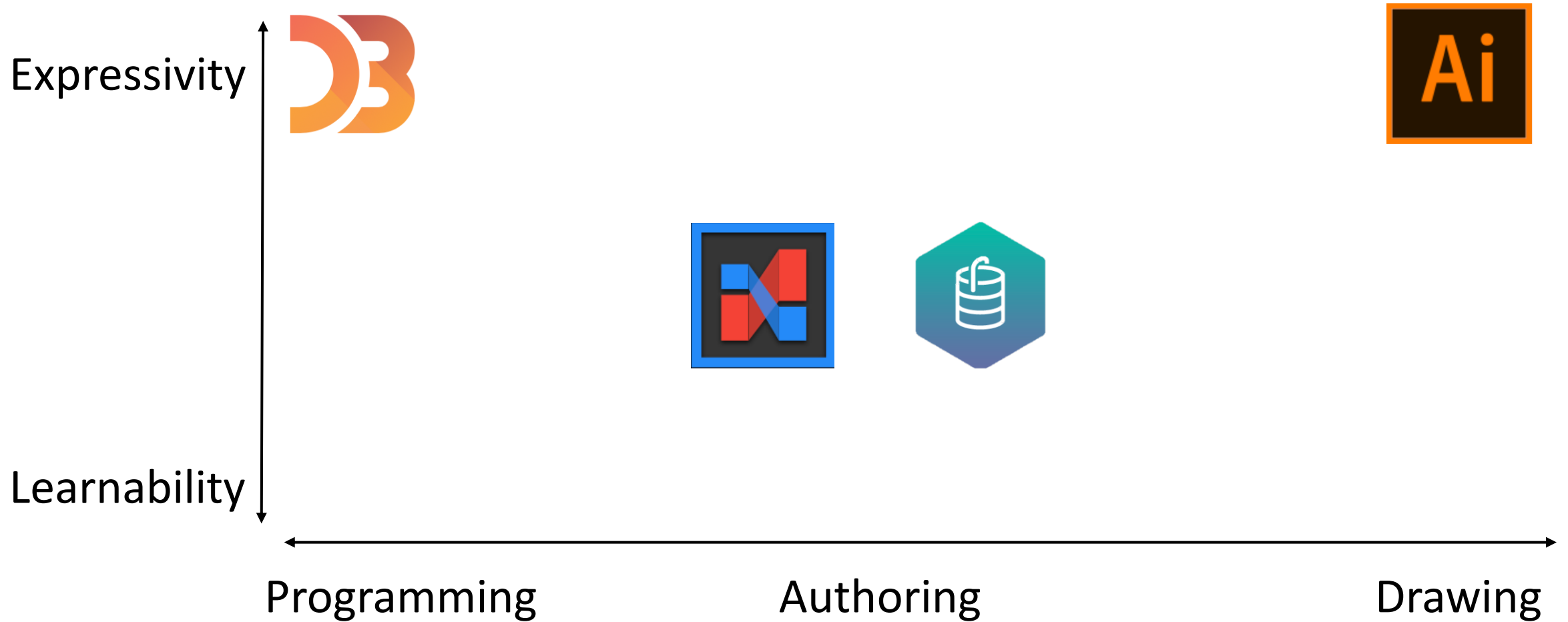# Visualization Authoring Systems



Programming           Authoring           Drawing

# Visualization Authoring Systems

Expressivity

Learnability

Programming          Authoring          Drawing

# Critical Reflections:
# A Novel Evaluation Approach for Vis Tools

| Evaluation Method | Can evaluate expressiveness? | Can evaluate learnability? | Can compare tool to alternatives? | When can it be applied? |
|---|---|---|---|---|
| **Design Gallery** | ✓ | ✗ | ✗ | During development |

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| **Usability Study** | ✓ | ✓ | ✗ | During development |

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| **User Adoption** | ✓ | ✓ | ✓ | Long after release |

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| **User Adoption** | ✓ | ✓ | ✓ | Long after release |
| **Critical Reflection** | ✓ | ✓ | ✓ | Immediately after release |

# Critical Reflections:
# A Novel Evaluation Approach for Vis Tools

**General Idea:**

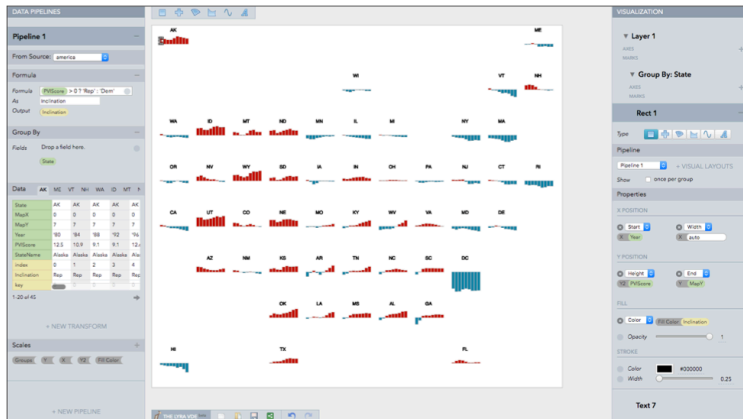- Authors of different tools discuss their work and reflect on their design choices

**Here:**

- Weekly 1-2-hour video conference for 3 months
- Focus on differences in handling marks, data binding, scales, axes, legends and layout

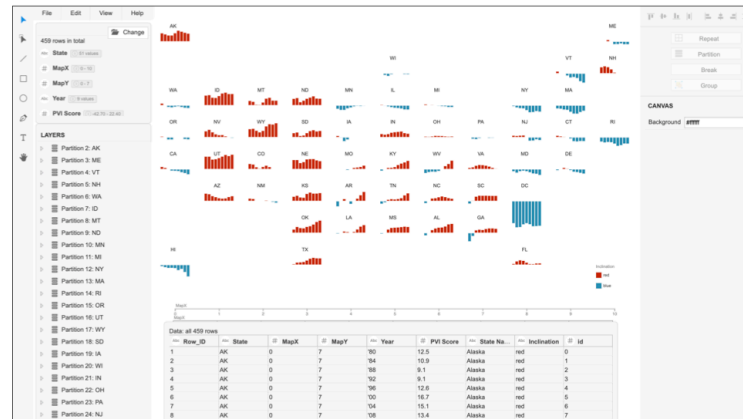# Visualization Authoring Systems in this Paper
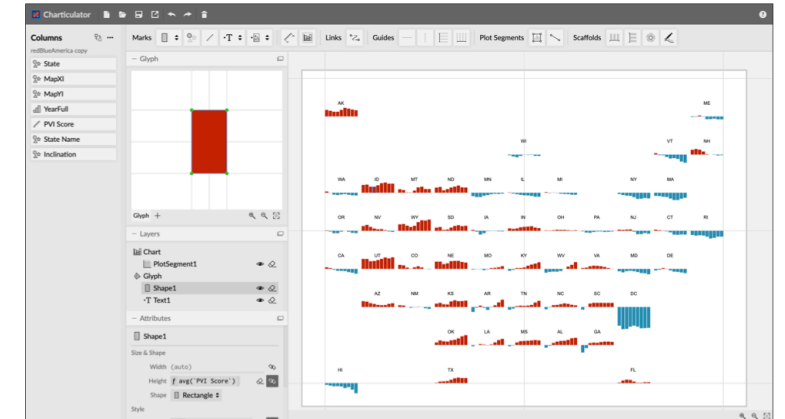
**Lyra**

University of Washington, 2014



**Data Illustrator**

Adobe Systems/Georgia Tech, 2018



**Charticulator**

Microsoft Research, 2018

File   Edit   View   Help

Presidential Voting Ma    📁 Change

459 rows in total

Abc **State**  ⓘ 51 values

\# **MapX**  ⓘ 0 - 10

\# **MapY**  ⓘ 0 - 7

Abc **Year**  ⓘ 9 values

\# **PVI Score**  ⓘ -42.70 - 22.40

**LAYERS**

Repeat

Partition

Break

Group

**CANVAS**

Background   #ffffff

Data: all 459 rows

| Abc Row_ID | Abc State | # MapX | # MapY | Abc Year | # PVI Score | Abc State Name | Abc Inclination |
|---|---|---|---|---|---|---|---|
| 1 | AK | 0 | 7 | '80 | 12.5 | Alaska | red |
| 2 | AK | 0 | 7 | '84 | 10.9 | Alaska | red |
| 3 | AK | 0 | 7 | '88 | 9.1 | Alaska | red |
| 4 | AK | 0 | 7 | '92 | 9.1 | Alaska | red |
| 5 | AK | 0 | 7 | '96 | 12.6 | Alaska | red |
| 6 | AK | 0 | 7 | '00 | 16.7 | Alaska | red |
| 7 | AK | 0 | 7 | '04 | 15.1 | Alaska | red |
| 8 | AK | 0 | 7 | '08 | 13.4 | Alaska | red |
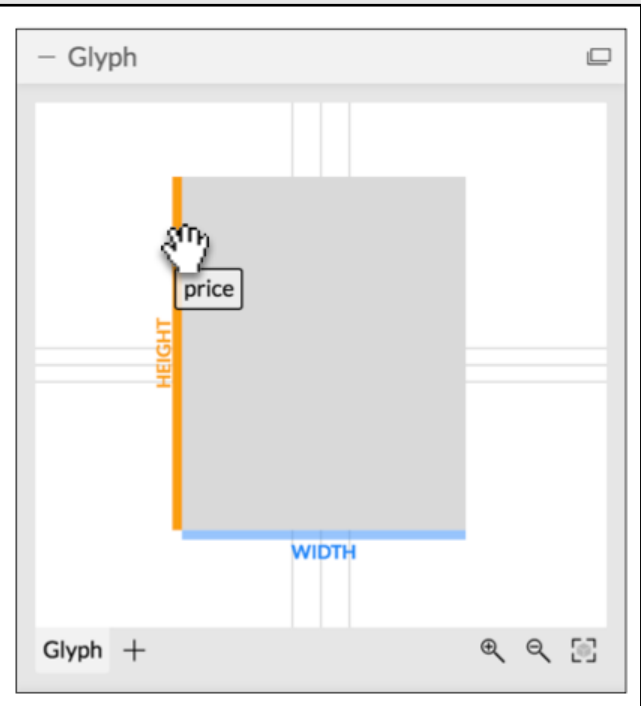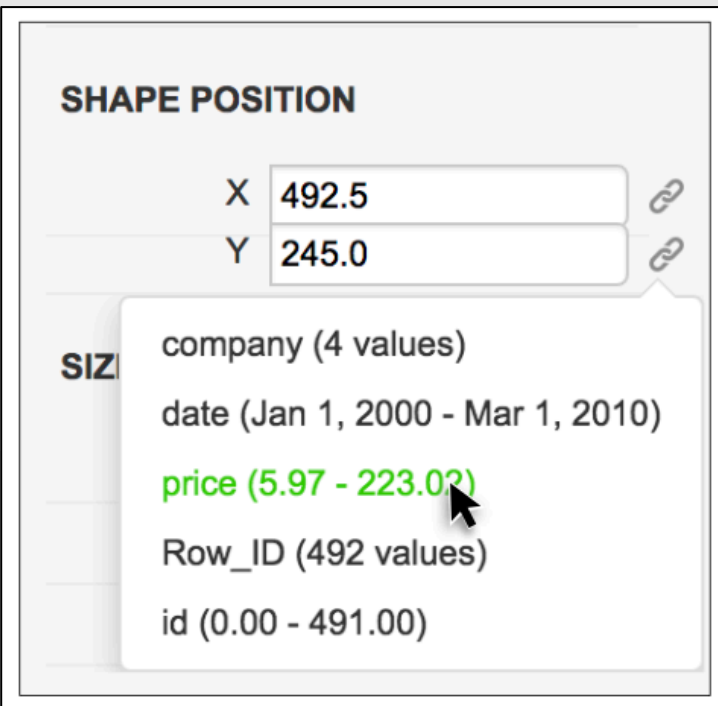
# Marks

| | Lyra | Data Illustrator | Charticulator |
|---|---|---|---|
| **What?** | Predefined marks | Custom vector shapes | Predefined marks |
| **How?** | Drag and drop;<br>Composition on main canvas | Vector-based drawing on canvas;<br>Composition on main canvas | Drag and drop or drawing;<br>Composition in glyph editor |
| **Pros/<br>Cons** | + Simple, direct user interaction<br>- Needs arbitrary default values<br>- "Messy" mark composition | + Highest expressivity<br>- Stateful tool selection<br>- "Messy" mark composition | + Users choose preferred method<br>+ Easiest mark composition<br>- Needs separate glyph canvas |

# Data Binding

| | Lyra | Data Illustrator | Charticulator |
|---|---|---|---|
| **What?** | 1+ data points per glyph; attributes map to visual channels | 1+ data points per glyph; attributes map to visual channels | 1+ data points per glyph; attributes map to visual channels |
| **How?** | One glyph for all data, then grouping by attribute; binding via "drop zones" | One glyph for all data, then "partition and repeat" by attribute; binding via menus | One glyph for each point, then grouping by attribute; binding via "drop zones" or menus |
| **Pros/ Cons** | + Drop zones are very direct<br>- No filtering of categorical and quantitative data<br>- Grouping feature unintuitive<br>- Long drags/small drop zones | + Filtering of categorical and quantitative data<br>+ "Partition and repeat" allow uniform nesting operations<br>- Menus are less direct | + Users choose preferred method<br>+ Filtering of categorical and quantitative data<br>- Limited nesting depth |

# Data Binding

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|---|---|---|---|
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# Scales, Axes and Legends

| | Lyra | Data Illustrator | Charticulator |
|---|---|---|---|
| **What?** | Full customization | Based on one or more attributes | Based on one attribute |
| **How?** | Scales/axes/legends generated manually or from data bindings and can be freely edited | Scales/axes/legends generated from data bindings; scales can be reused or merged; | Scales/axes generated from data bindings; scales can be reused; |
| **Pros/ Cons** | + Maximum design freedom<br>- Complex, indirect UI and overwhelming set of choices | + Simple UI<br>+ Some flexibility for experts<br>- Introduces hidden scale dependencies | + Simplest UI<br>- Lowest design freedom |

# Shared Assumptions of all Tools

- Familiarity with similar design tools (e.g. Adobe Illustrator)

- Concrete, mature design ideas in users' minds
  - None of the tools support non-linear design iteration

- Cleaned, pre-processed data set
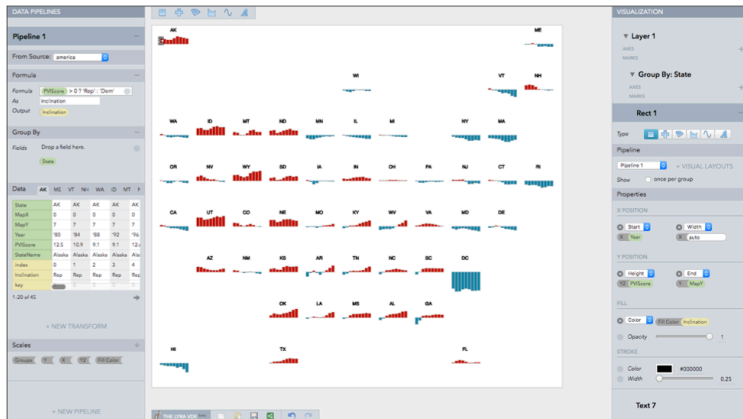  - Lyra supports some data wrangling, but limited and not easy to learn

# Opinion on the Paper

+ Promising new evaluation approach
    + Analysis refers to related work on HCI and cognition

+ Interesting selection of highly related high-profile tools
    + Gathering so many industry people is an achievement in itself

- Non-empirical evaluation

    - Actual impact on usability/learnability unclear

- Does not consider time-line of development

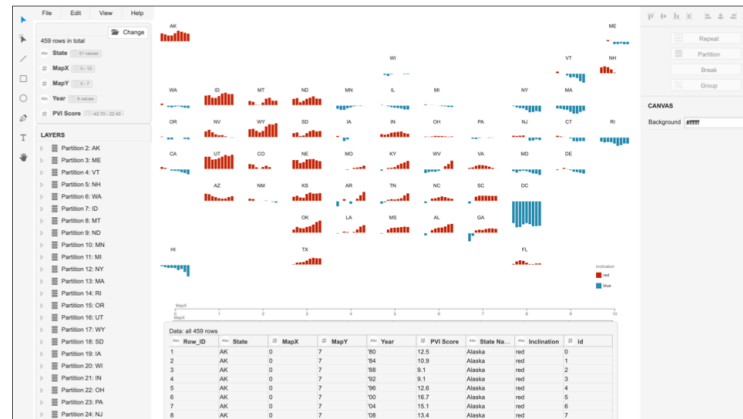    - Missed chance to discuss design inspirations and motivations

# Questions?

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Microsoft Research, 2018

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