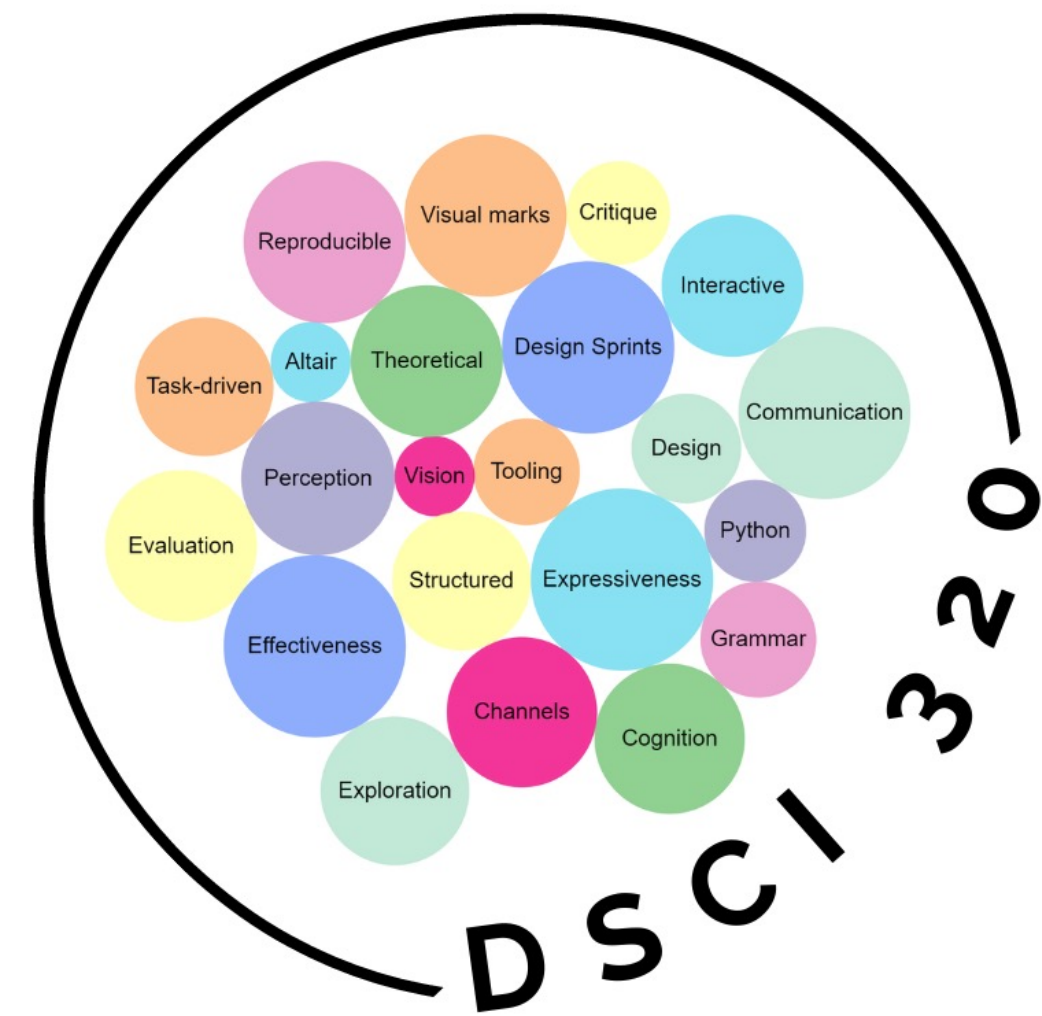# Visualization for Data Science

Discourse with Data II

Interaction

Quiz Updates

- All quizzes are done.

- Make up Quiz for Q1 is Monday/Tuesday. It will replace your Quiz01 score if it is better. You are not required to take it.

- All quizzes (with the exception of 7) are accessible,

- Quiz 4 has been re-weighted +10

- Quiz 6 has been re-weighted +3

- Remember you drop your lowest two quiz scores.

quiz00	98		42%
quiz01	93		41%
quiz02	98		100%
quiz03	99		90%
quiz04	100		59%
quiz05	102		79%
quiz06	99		93%
quiz07	100		66%

Design Artifact Updates

- We did 2, skipping the third one.
- In lieu of the third one the weight will be moved around
  - DA1 – 4, DA2 – 4 (up from 3 each)
  - Project – 2

Activity	Weight (%)	Details
Quizzes	30	Each worth 6% (drop lowest two). Proctored and must be completed in CBTF
~~Design Challenges~~	~~10~~	~~Worth 3%, 3%, and 4%; started in lab and completed the following week~~
Design Challenges	8	Worth 4%, 4%, started in lab and completed the following week
Project	~~30~~ 32	4 main deliverables, must work in a 3-person group. Project labs are worth 5%, 0/8/15/4
Engagement	0 - 5	Can be used to replace up to 5% of your final exam grade
Final Exam	25 - 30	Scheduled by Registrar: comprehensive assessment

Final Exam

- Final Exam is set by the University
  - December 10th at 3:30pm in CBTF for most students
  - CFA
    - If there is not enough time to support your accommodations, you will write with CFA not CBTF.
    - Reach out to them and book a slot.
    - Keeping in mind that your time slot cannot end before 3:30pm.
    - So earliest start time 1:30 pm.
    - Stop by office hours for more details.

Project Updates

PM2 due October 31st at 6pm. Now moved to November 6th at 6pm.

- EDA analysis
  - One for each member of the team. Jupyter Notebook
  - In your report state what each person EDA covers, this falls under general

Team Member	Numerical Attributes	Temporal Attributes	Ordinal Attributes	Nominal	Type of Analysis
Frodo Baggins	(2) Cost, Emotion,	Age of Middle Earth	Feet size		Univariate on all mentioned. Bivariate on (feet size and cost)
Gandalf	(1) Length of beard,	Age of Universe		(2) Color of beard, Weapons	

  - Then for each person in your report you should include summaries of what you learned from your EDA. Feel free to include figures from your jupyter notebook. Note that we don't expect code in your report.
- INQUIRY FCOUS
  - Theme, questions, and analytic tasks – **SEE UPDATED MILESTONE 2**

Adminstrivia

No lab this week

- I heard you ooooo!!!
  - No DS 3, either split the weight between DS1/2 OR move to project OR final.
- Work on your Project deliverable during this time.

Deadline Shift

- I heard you ooooo!!!
  - The deadline for PD2 will be moved until next week Tuesday at 6pm. Can't move a full week because then you won't get feedback on your questions in time.

Lecture Flow

- Technical: We've spent roughly half of the class time on tooling, this will shift. There will be some tutorials, but we expect most of your programming learning to come outside of class.
- Theory: We will start spending more time on the WHY of info. Viz so expect to sometimes being required to have assigned readings before class.
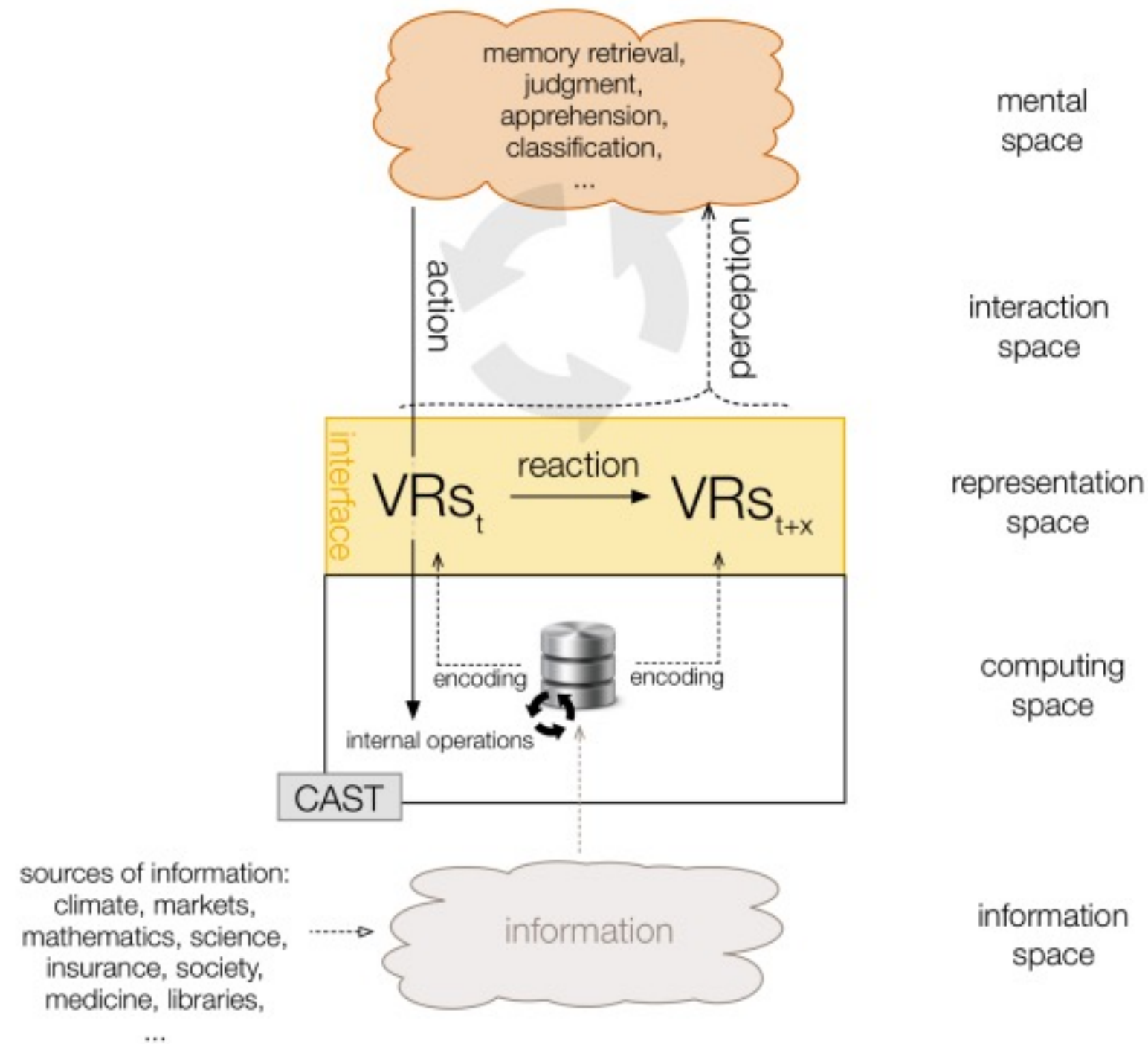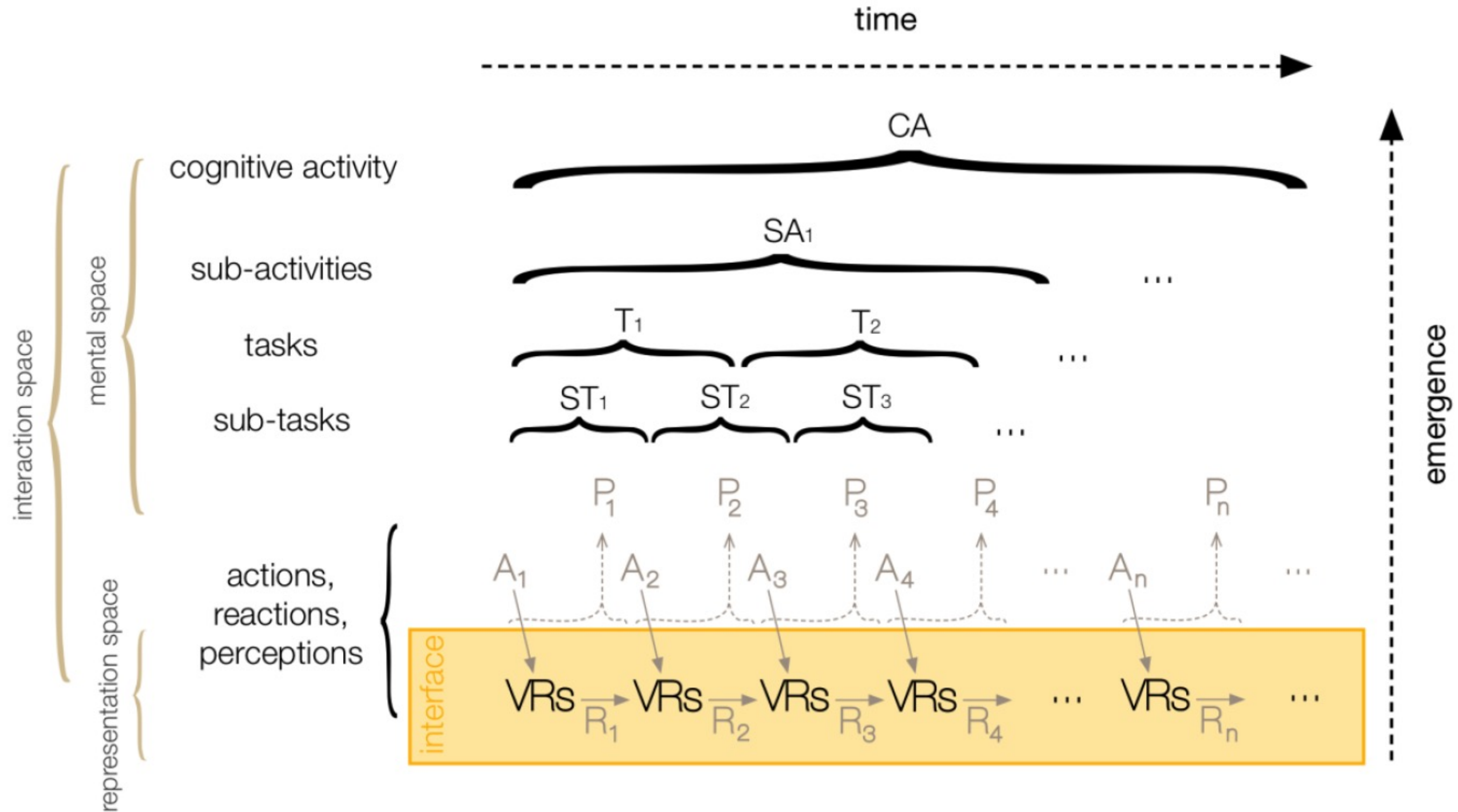
The Human-Information Interaction Epistemic Cycle

Figure 3: The Human-Information Interaction Epistemic Cycle

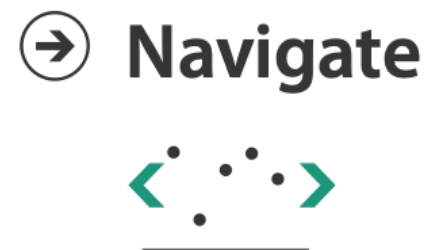# The Hierarchical Structure of a Complex Cognitive Activity

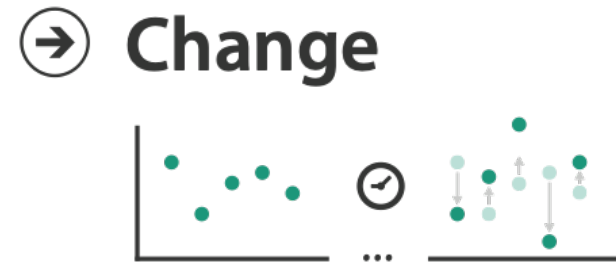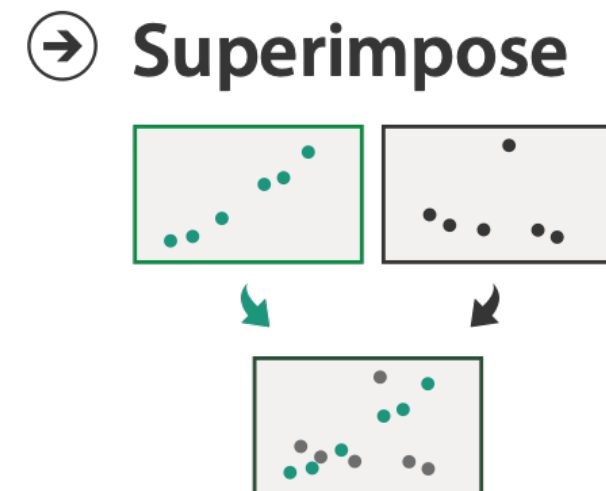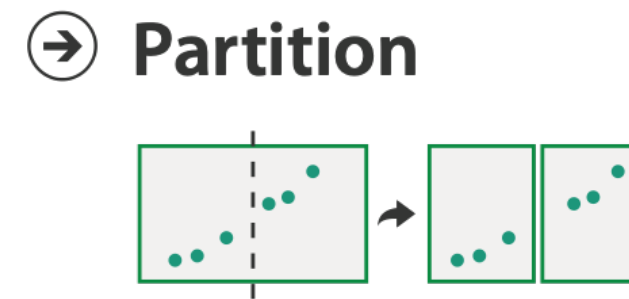# How to handle complexity

- derive new data to show within view
- change view over time
- facet across multiple views
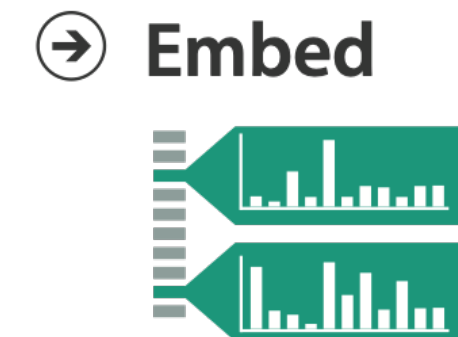- reduce items/attributes within single view

Selection

Select

- selection: basic operation for most interaction
- design choices
  - how many selection types?
    - interaction modalities
      - click/tap (heavyweight) vs hover (lightweight but not available on most touchscreens)
      - multiple click types (shift-click, option-click, …)
      - proximity beyond click/hover (touching vs nearby vs distant)
    - application semantics
      - adding to selection set vs replacing selection
      - can selection be null?
        - ex: toggle so nothing selected if click on background
      - primary vs secondary (ex: source/target nodes in network)
      - group membership (add/delete items, name group, …)
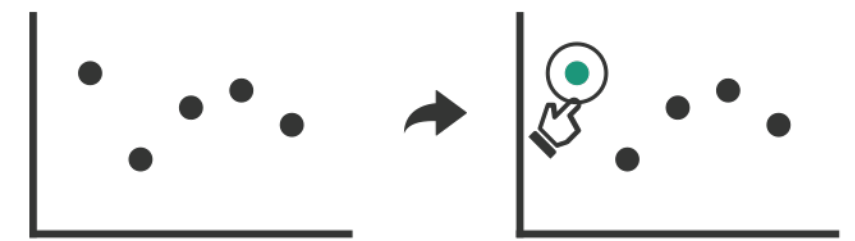
Highlighting

- highlight: change visual encoding for selection targets
  - visual feedback closely tied to but separable from selection (interaction)

- design choices: typical visual channels
  - change item color
    - but hides existing color coding
  - add outline mark
  - change size (ex: increase outline mark linewidth)
  - change shape (ex: from solid to dashed line for link mark)

- unusual channels: motion
  - motion: usually avoid for single view
    - with multiple views, could justify to draw attention to other views
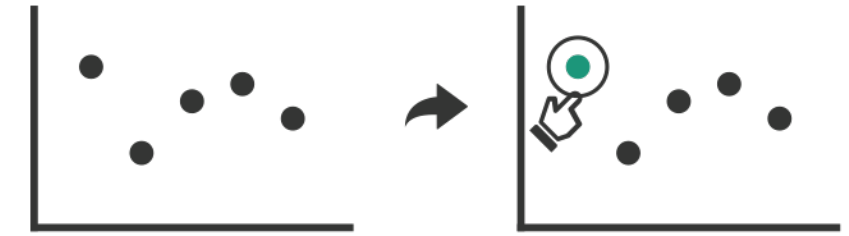
Examples: Slider Cutoff

- Selection
  - Type: Slider
  - Semantics: Grouped interval
- Highlight
  - Color hue
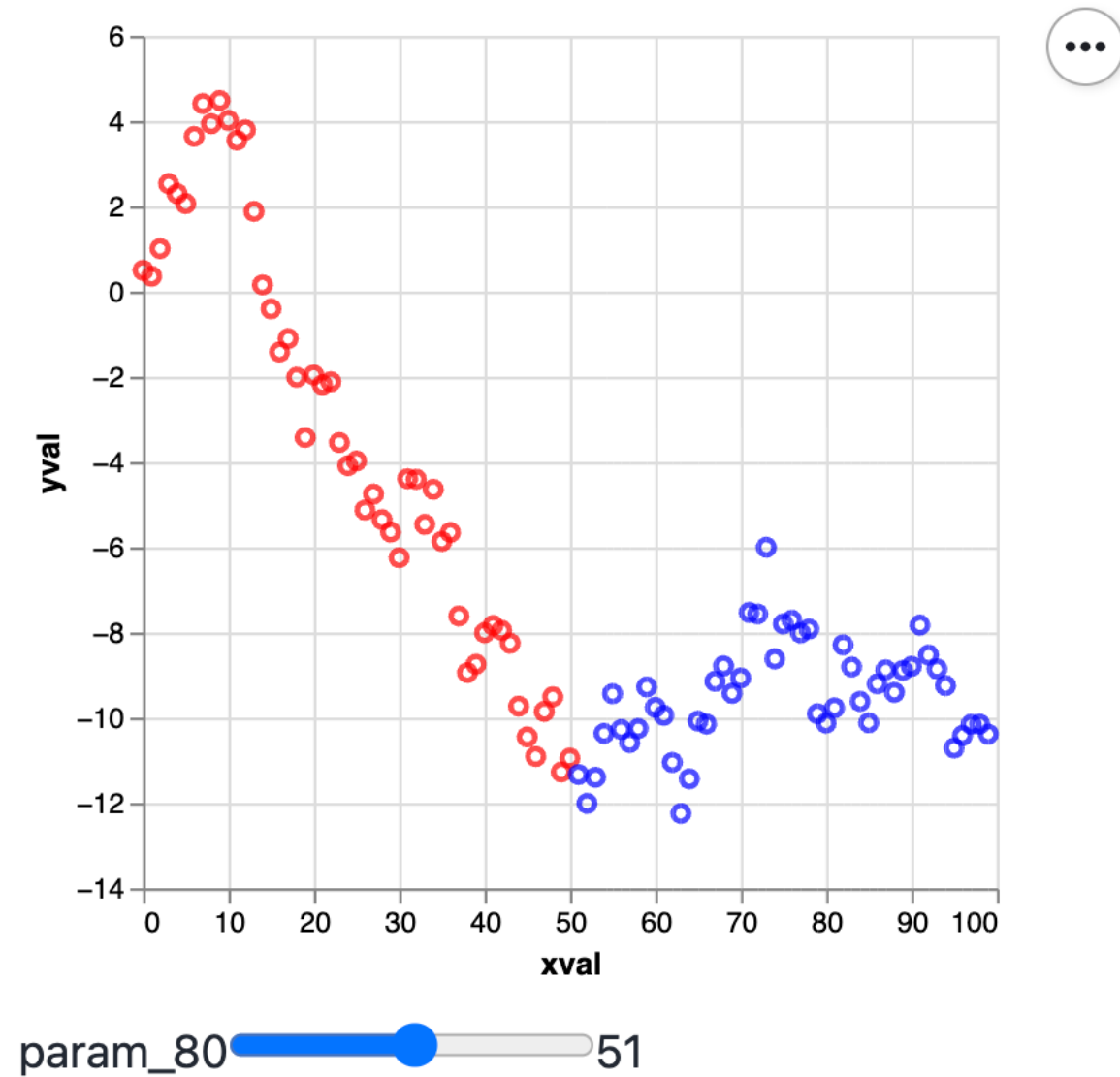
https://altair-viz.github.io/gallery/slider_cutoff.html

Examples: Rectangular Brush
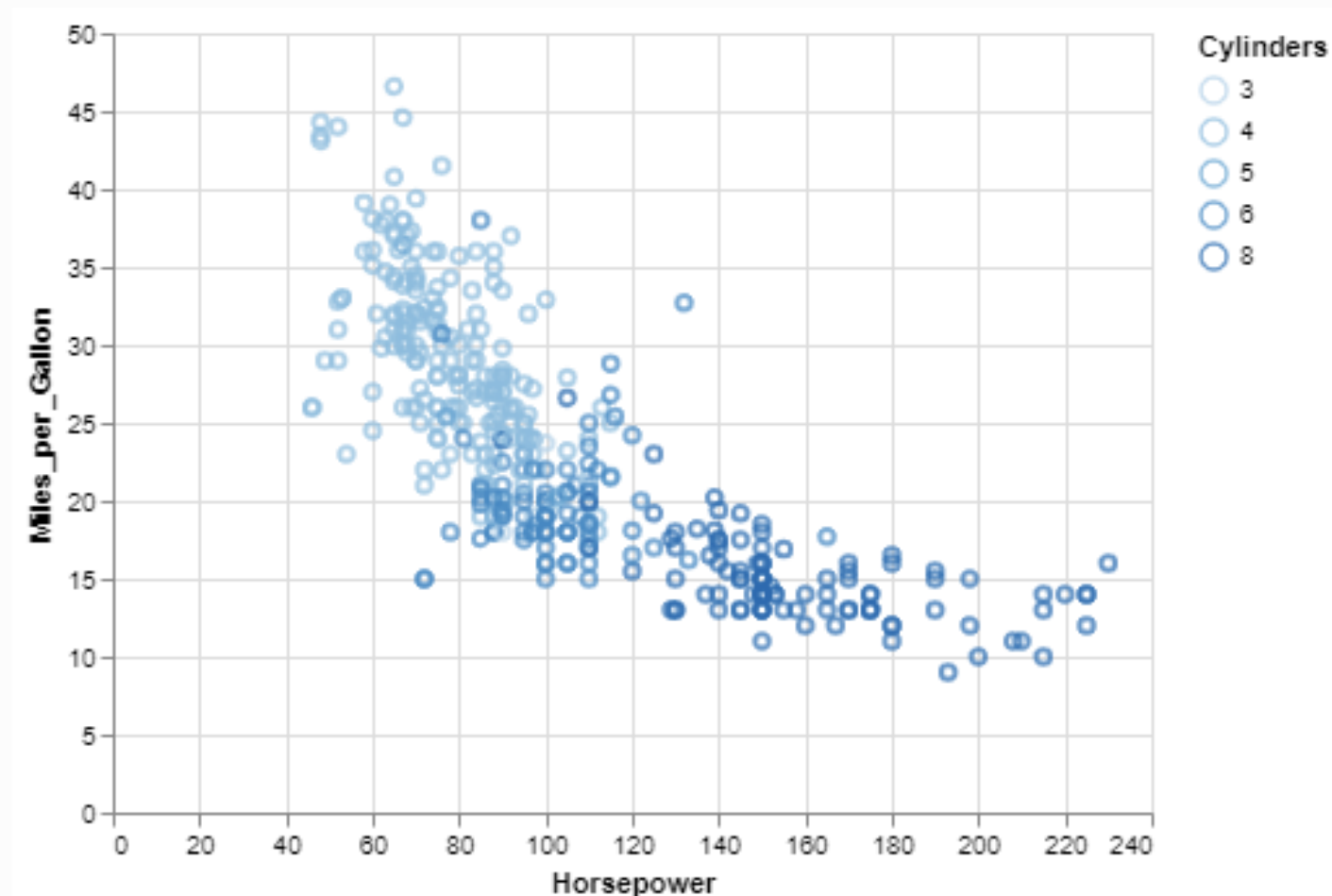
- Selection
  - Type: On shift-click
  - Semantics: Null, Group
- Highlight
  - Color: Transparency

Interactive Rectangular Brush

This example shows how to add a simple rectangular brush to a scatter plot. By clicking and dragging on the plot, you can highlight points within the range.

Interaction benefits

- major advantage of computer-based vs paper-based visualization
- flexible, powerful, intuitive
    - exploratory data analysis: change as you go during analysis process
    - fluid task switching: different visual encodings support different tasks
- animated transitions provide excellent support
    - empirical evidence that animated transitions help people stay oriented
- be active participants in the analysis of data,
- adjust features of the tool to suit the user's needs,
- visualization of large amounts of data,
- extend/amplifies users' sensemaking abilities,
- increase engagement (vis becomes personal to user),

Interaction limitations

- Requires human time and attention
- Increases perceptual and exploration costs
- Limited performance gains
  - studies find no increase in performance (Moscaet al., 2021)
  - users may not interact as planned by designer
    - NYTimes logs show ~90% don't interact beyond scrollytelling - Aisch, 2016
- interaction has a time cost
  - sometimes minor, sometimes significant
  - degenerates to human-powered search in worst case
- remembering previous state imposes cognitive load
- controls may take screen real estate
  - or invisible functionality may be difficult to discover (lack of affordances)

Get Stepping

- That was a lot. On Wednesday we will focus on implementation.

- TUTORIAL 9 is you on your own ooooo

  - Read through https://altair-viz.github.io/user_guide/interactions/index.html and it's subpages (Parameters, Conditions & Filters; Bindings & Widgets; Expressions)

  - Take 3 altair vizzes and re-implement the interaction using your own data. Here are some suggestions.

    - https://altair-viz.github.io/gallery/interactive_legend.html apply this to a bar chart as opposed to area chart.

    - https://altair-viz.github.io/gallery/interactive_bar_select_highlight.html keep as bar chart, but make the highlight more noticeable

    - https://altair-viz.github.io/gallery/selection_histogram.html use your own dataset, just make sure you understand what is going on, try to change the brush so it is constrained to only the x axis.