

# INTERACTION

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PRESENTATION AND VISUALIZATION – MIREIA RIBERA

DATA SCIENCE MASTER DEGREE

## 2 WHY INTERACTION?

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- Breakthrough from paper visualization
- Let the user explore
- Fits on one screen



### 3 TYPES OF INTERACTIONS

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- Data and encoding manipulation
  - what to show and how to show it
- Exploration and navigation
  - find the way in the visual data space
- Problem-solving
  - answer why and what if questions

## 4 DATA AND ENCODING MANIPULATION INTERACTION PATTERNS

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### WHAT TO SHOW

- Filter / Aggregate or Select
- Layers

### HOW TO SHOW IT

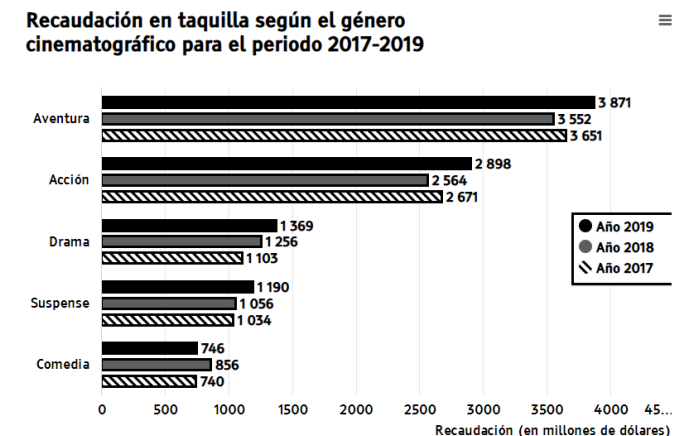
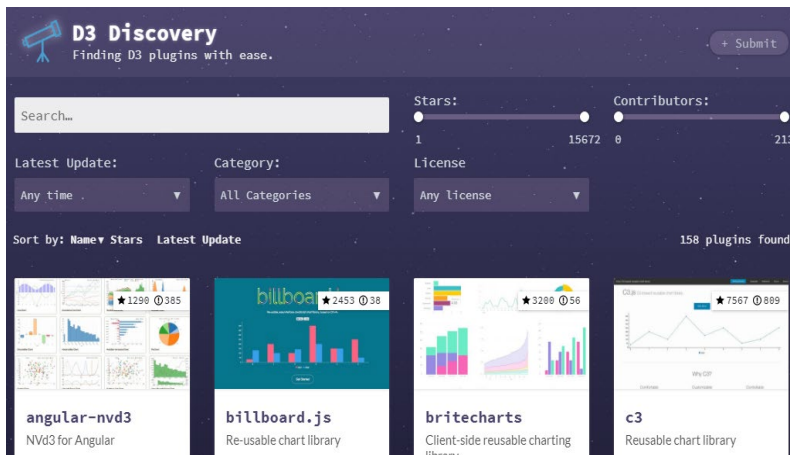
- Ordering
- Styling
- Click and drag
- Projection

## 5 WHAT TO SHOW: FILTER/AGGREGATE OR SELECT

## Goal: select items / attributes to display

**Trigger:** select box, mouse selection (l, range, area), text typing

**Action:** the selected items remain in display, not-selected items disappear, or are blurred



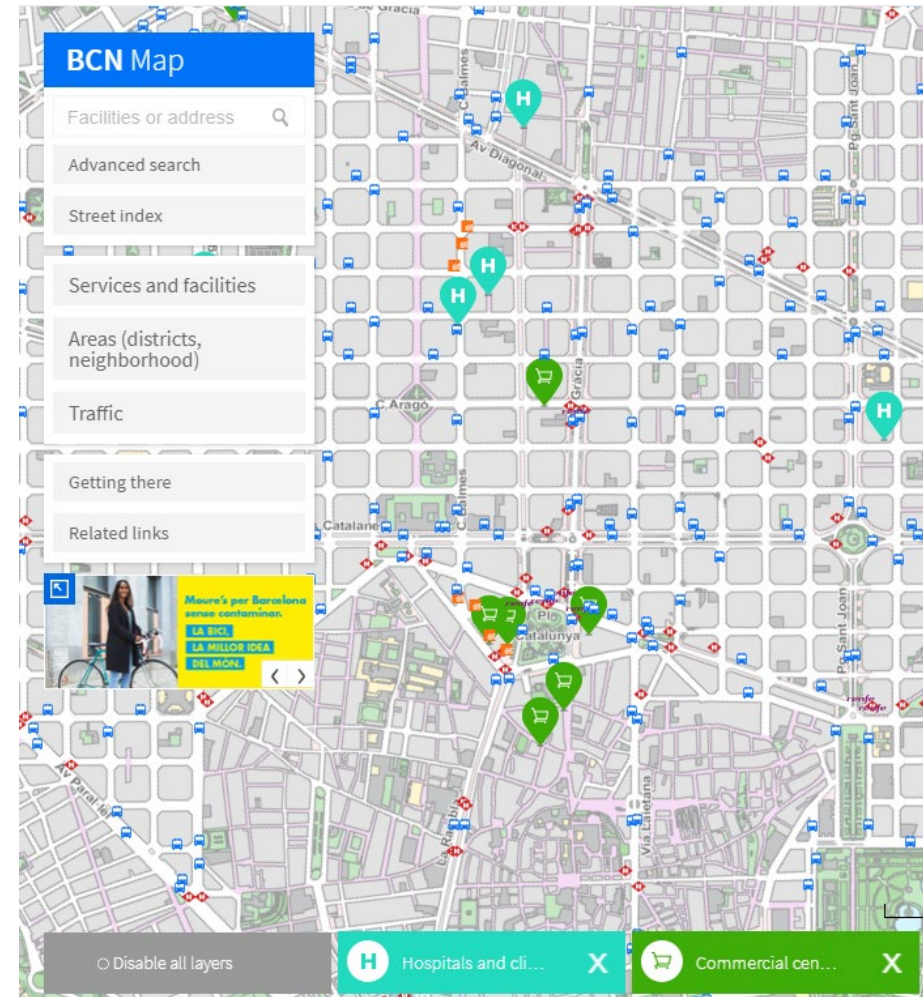
## 6 WHAT TO SHOW: LAYERS

**Goal:** select which attributes to show (usually on maps). Avoid cluttering

**Trigger:** select box

**Action:** a new layer of information is displayed

**Related to:** filter and aggregate



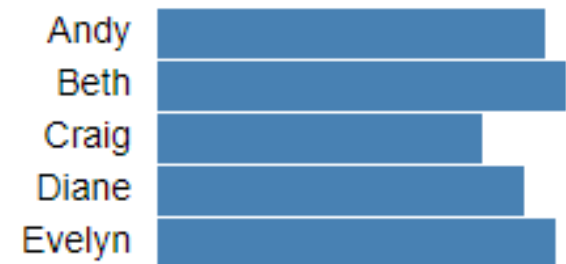
## 7 HOW TO SHOW: SORTING

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**Goal:** display the information in descending / ascending order by any feature for better comparison

**Trigger:** sort button or widget

**Action:** the items are rearranged on the display



Sort

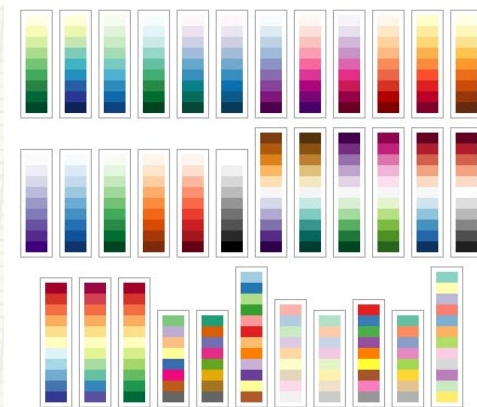
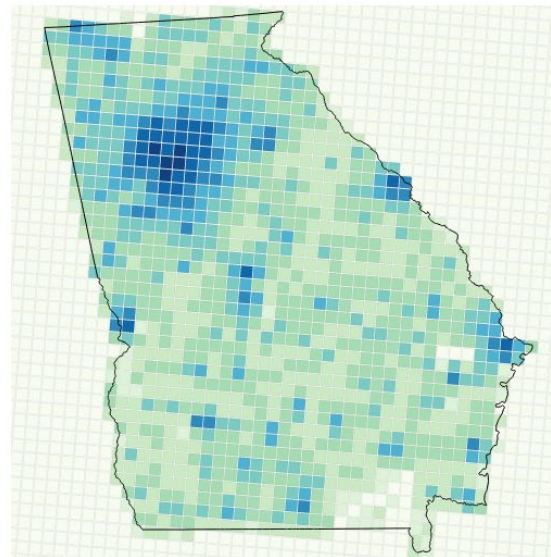
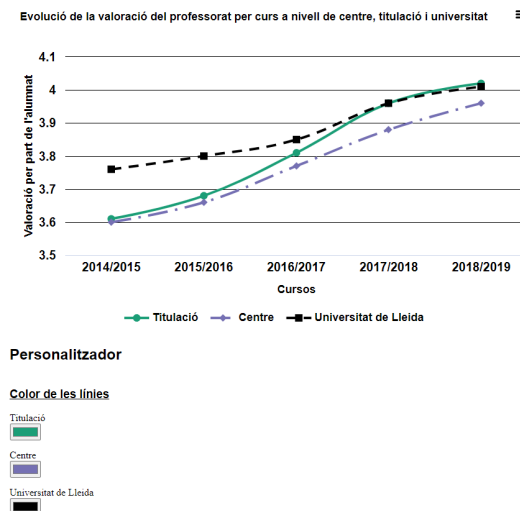


## 8 HOW TO SHOW: STYLING

**Goal:** users customize the display to their preferences

**Trigger:** style button or widget

**Action:** the display changes colour or appearance





## 9 HOW TO SHOW: REPOSITIONING

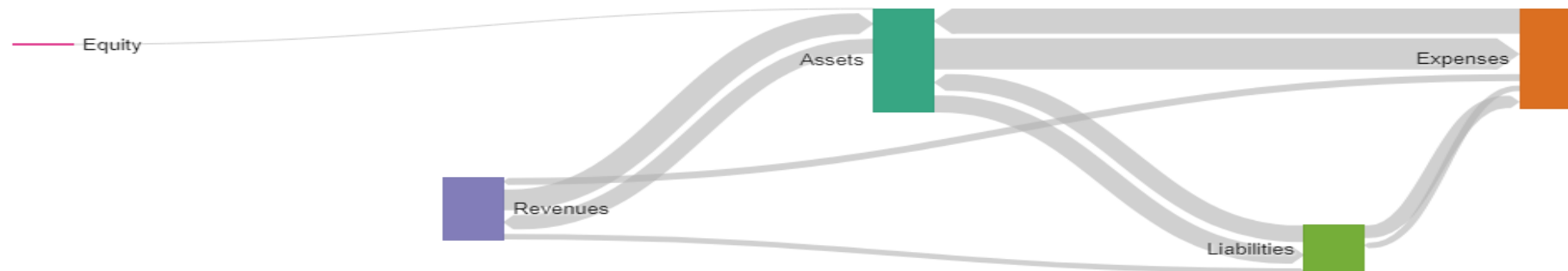
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**Goal:** users customize the position of elements to their preference

**Trigger:** click and drag

**Action:** the elements selected change their positions. Other elements may rearrange

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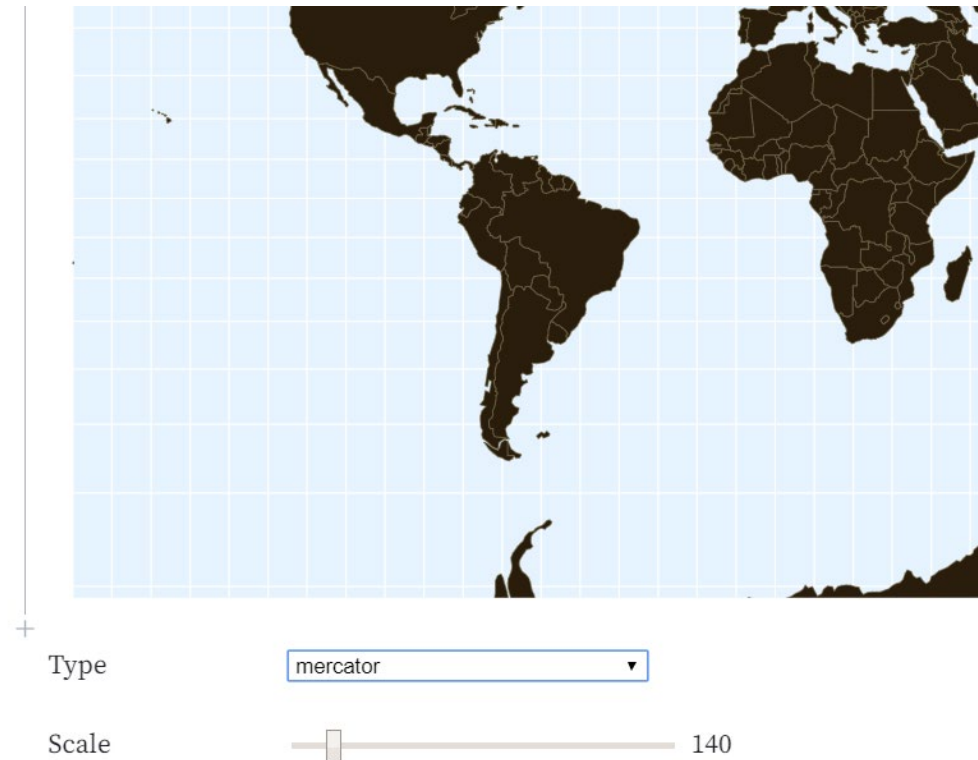
## 10 HOW TO SHOW: PROJECTION

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**Goal:** Change the way a 3D object is translated into 2D

**Trigger:** widgets

**Action:** the projection of the displayed item changes.



# II EXPLORATION AND NAVIGATION

## INTERACTION PATTERNS

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### ZOOM

- Geographic
- Semantic

### NAVIGATION

- Changing view point
- Pan
- Over time

## I2 ZOOM: GEOGRAPHIC ZOOMING

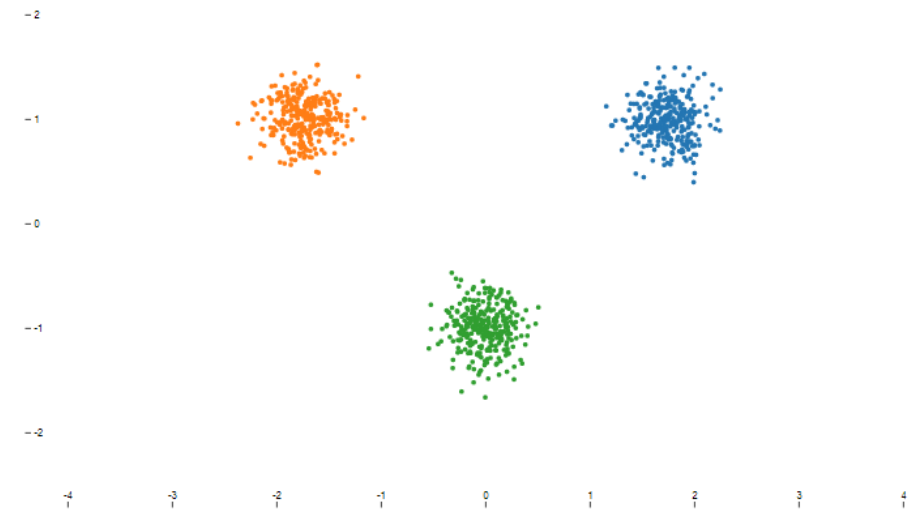
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**Goal:** augment / reduce displayed area  
to focus on details or on the whole

**Trigger:** mouse, spread or pinch  
gesture

**Action:** the scale of the view is  
changed

**Related to:** semantic zoom



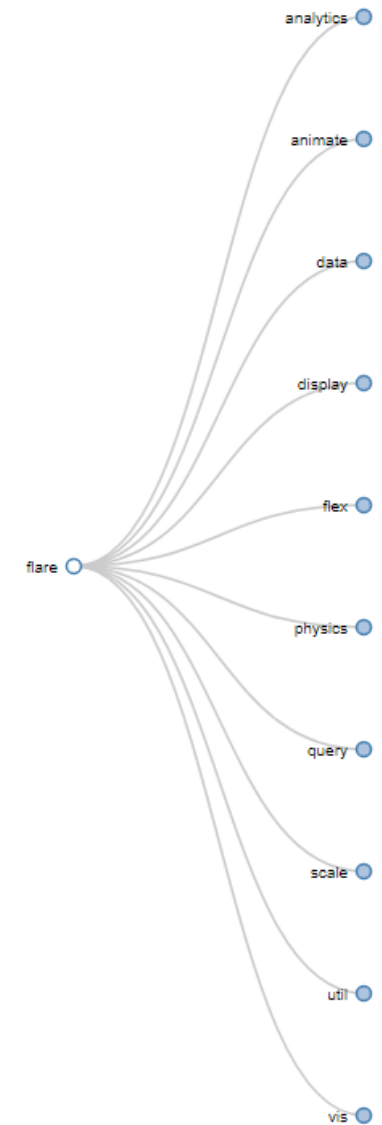
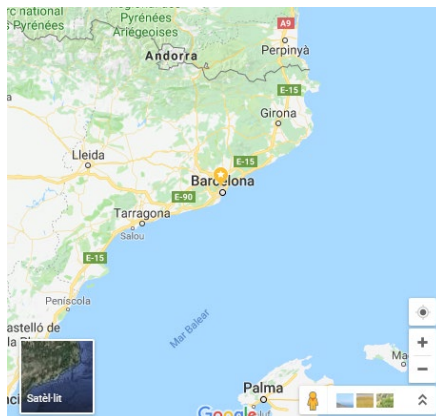
# I3 ZOOM: SEMANTIC

**Goal:** augment / reduce displayed area to focus on details or on the whole. When augmented, new details appear

**Trigger:** mouse, finger zoom out/in

**Action:** the scale of the view is changed, new details appear

**Related to:** visual zoom



## I4 NAVIGATION: CHANGING VIEWPOINT

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**Goal:** on 3D objects see another perspective. This may mean cutting or slicing the object.

**Trigger:** mouse direct manipulation, arrow control, drag gesture.

**Action:** the orientation of the displayed item changes.



## 15 NAVIGATION: PAN

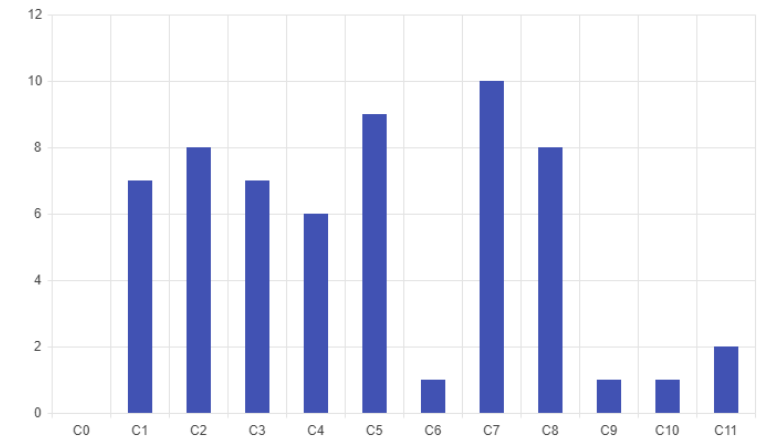
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**Goal:** navigate through the visual area. This is useful for big visualizations that do not fit in the screen. Usually is combined with zoom to get an overview.

**Trigger:** mouse or finger drag

**Action:** the viewbox moves around the whole visualization

**Related to:** zoom



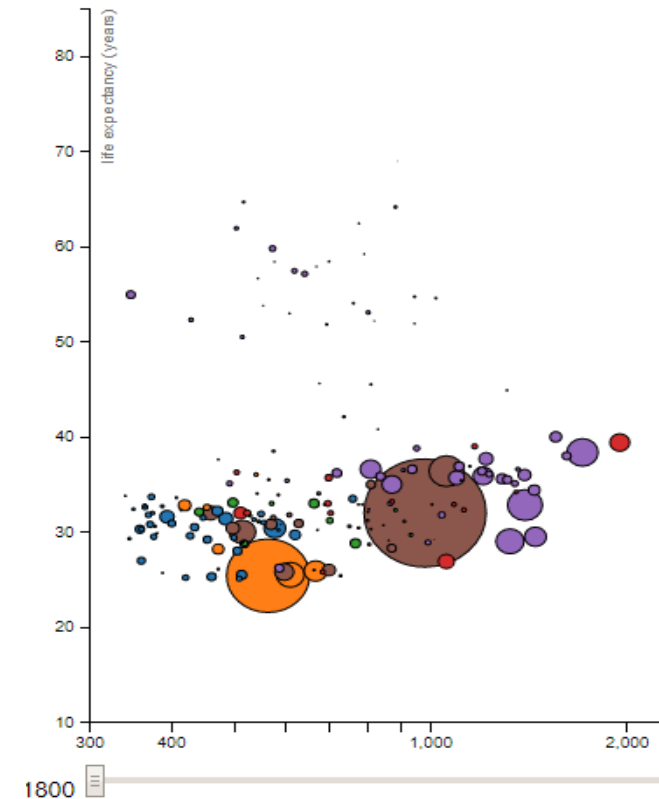


## 16 NAVIGATION OVER TIME

**Goal:** time acts as a third dimension of the data. With this interaction you can move around this dimension.

**Trigger:** select box, or play button.

**Action:** data changes updating the values according to the displayed time.



## 17 PROBLEM-SOLVING INTERACTION PATTERNS

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These patterns let the users test hypothesis and reduce cognitive load

- Linked views
- Focus and context
- Overview and detail
- Details on demand

In this case, triggers are not as clear as in previous patterns

## 18 LINKED VIEWS

**Goal:** same data is displayed in several views / encodings to help see different aspects of it.

**Trigger:** any action to any view

**Action:** the interaction (filter, pan, select...) in one view affects the others



## 19 FOCUS AND CONTEXT

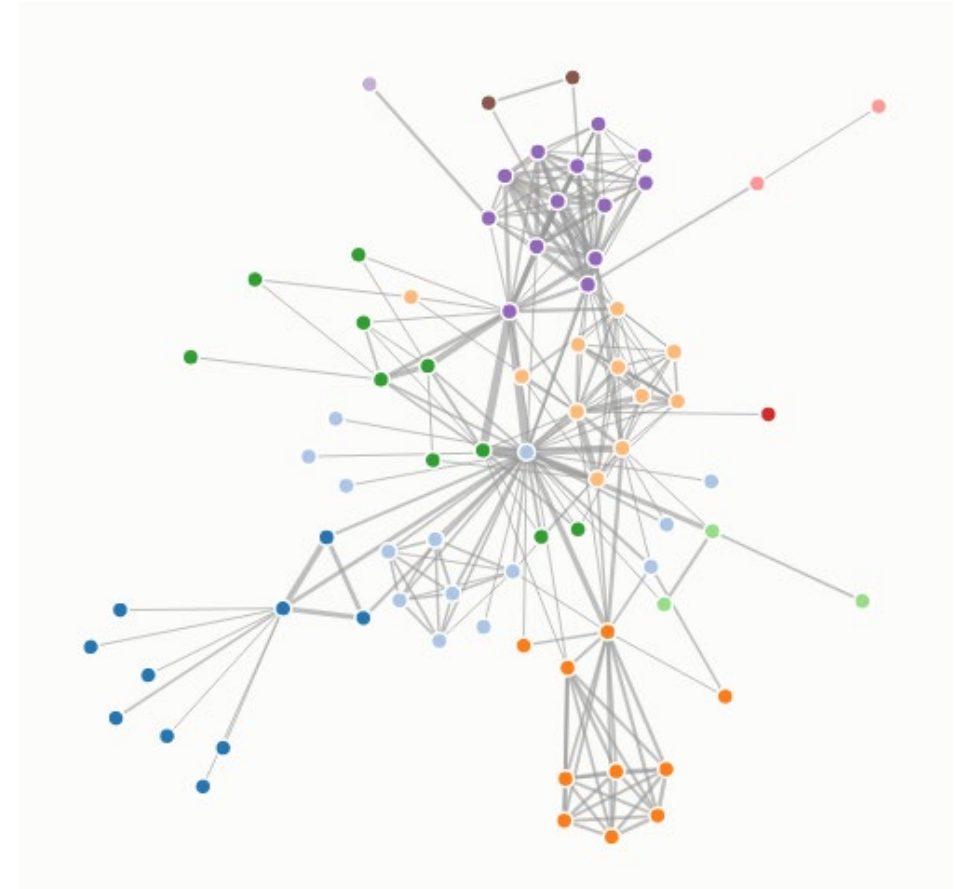
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**Goal:** look with more attention to a specific area while seeing the whole data.

**Trigger:** brushing, selecting, filtering.

**Action:** the focus area is displayed with more detail

**Related to:** zoom, linked views



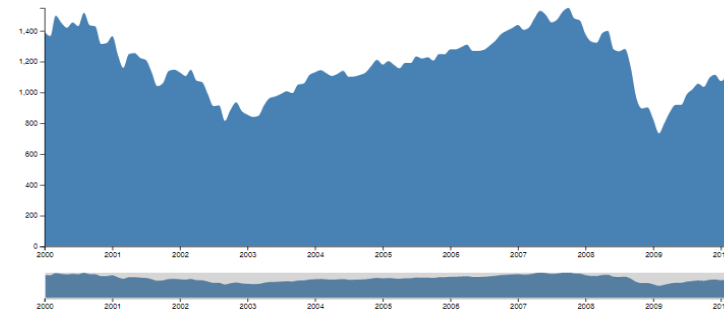
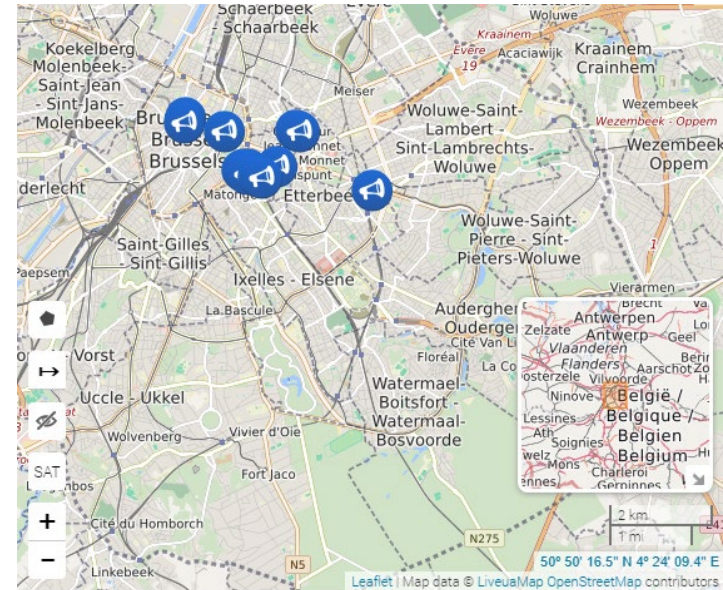
## 20 OVERVIEW AND DETAIL

**Goal:** display the detail , plus give an overview

**Trigger:** zoom and navigation on detail.

**Action:** overview and detail are linked views with different scales

**Related to:** zoom, linked views



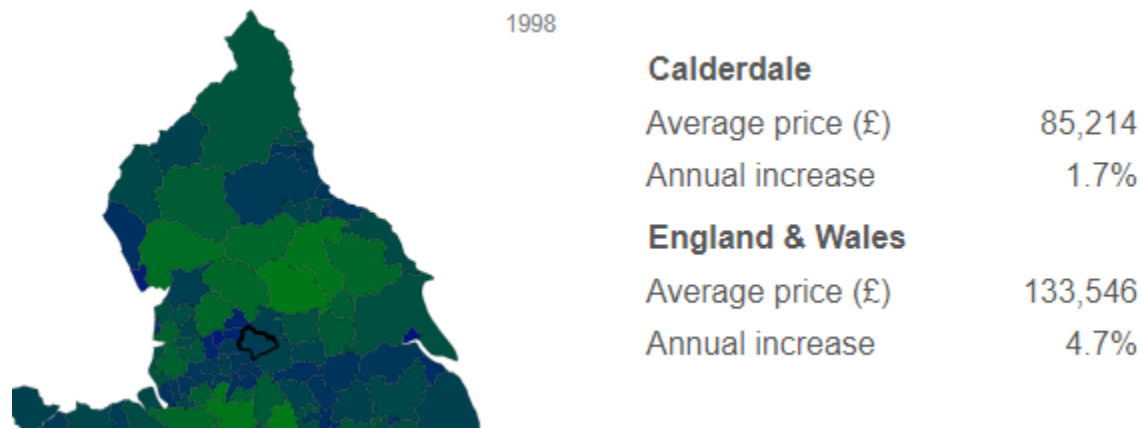
## 21 DETAILS ON DEMAND

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**Goal:** Offer two levels of information, and only show detail when the users asks for it

**Trigger:** select / hover

**Action:** a tooltip or infobox related to the selected items appear or changes its content



## 22 INTERACTION AND HCI

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- Interaction patterns may not be well known, so:
  - You need to include instructions
  - Follow conventions on triggers
  - Give immediate feedback
- Interactions are not free: the user has to think in what to do, act, and resituate in the new display
- Consider the flow of problem solving when incorporating interactions



## 23 SHNEIDERMAN'S INFOVIS MANTRA

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“Overview first,  
zoom and filter,  
details on demand”