1. Overview

This project implements an interactive visualization system combining a Parallel Sets with a scatterplot for exploring multidimensional housing data. The visualization enables users to explore relationships between categorical attributes and identify patterns through coordinated selection and filtering.

Key Features

- Interactive parallel sets visualization
- Interactive scatterplot showing price vs. area relationships

2 Architecture

The application follows a modular React + D3 architecture. we put the logic of the 2 plots inside folders located inside of the components folder. `scatterplot` for the scatterplot logic and `parset` for the parallel sets logic.

2.1 Parallel Sets (Parset)

The parset visualization displays relationship across multiple dimensions:

Key Components:

- **Layers:** Vertical dimension representing categories (bedrooms, bathrooms, stories, etc.)
- **Ribbons:** Flow paths connecting categories across Layers with width proportional to data frequency/amount. Each ribbon have all the categories (bedrooms, parking, ...)
- **Interactive Layer Controls:** Checkboxes to toggle layers, arrow buttons to reorder them.
- **Selection:** When clicking on a value inside a layer, this value is added/remove from the selection set. All ribbons within this caracteristic set is highlighted.

Technical Features:

- **Category aggregation:** Small values (< 1% of data) grouped as 'Others' to reduce clutter
- **Drag-to-reorder:** Values can be manually reordered within each layers
- **Ribbon grouping:** Ribbon inside the selection groups themselfs for better readability
- **Ribbon Organizer:** Clicking the `Organize Ribbon` button optimize the ribbon ordering, limiting overlaps.

2.2 Scatterplot

The scatterplot displays quantitative relationships:

Axes:

- X-axis: Living area (square feet)
- Y-axis: Price (USD)

Interactions:

- **Brush selection:** Click and drag to select data points in a rectangular region

- **Brush maneuver:** the brush region can be resized and moved. (also reset itself when clicking outside the region)
- **Point highlighting:** Selected points are emphasized

2.2 Interaction

1. **Scatterplot → Parset:**
    - User select an individual element on the scatterplot
    - Values of cathegorie is selected (allows to see characteristics)
    - Corresponding ribbon in parset is highlighted
2. **Parset → Scatterplot:**
    - User clicks a category in the parset
    - All data points matching that exact combination across all displayed axes are selected

3. Advanced Features

3.1 Manual Reorganization

"Organize ribbons" button applies a multi-pass barycentric heuristic:

- Iteratively reorders categories to minimize ribbon crossings
- Considers both left and right neighbor positions
- Preserves user's manual adjustments as tie-breakers
- Typically runs 3 iterations for balanced optimization

3.2 Dynamic Layer Management

- Add/remove axes using checkboxes
- Reorder axes using ← → arrow buttons

4. Known Limitations & Future Work

Current Limitations

1. **No animated transitions** - Layout changes are instant rather than smoothly animated

Potential Enhancements

1. **Visual Improvements:**
    - Add smooth D3 transitions for category reordering
    - Add legend explaining color mapping
2. **Analysis Features:**
    - Statistical summary panel showing counts, percentages