

Vega-Lite

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Agenda

- Concepts Recap
 - Data, Mark, Transform, Encoding
- Live Demo
 - Distribution of different kinds of weather in Seattle
- Exercises
 - Exercise 1: Aggregate mean

Vega-Lite recap

- Data inline
 - JSON Array
 - Each row is an object in the array.

```
{
  "data": {
    "values": [
      {"a": "C", "b": 2},
      {"a": "C", "b": 7},
      {"a": "C", "b": 4},
      {"a": "D", "b": 1},
      {"a": "D", "b": 2},
      {"a": "D", "b": 6},
      {"a": "E", "b": 8},
      {"a": "E", "b": 4},
      {"a": "E", "b": 7}
    ]
  }
}
```

Vega-Lite recap

- Data from source
 - Can be imported through URL
 - Runtime datasource API (not addressed here)

```
{  
  "data": { "url": "https://vega.github.io/editor/data/seattle-weather.csv" },  
}
```

Vega-Lite recap

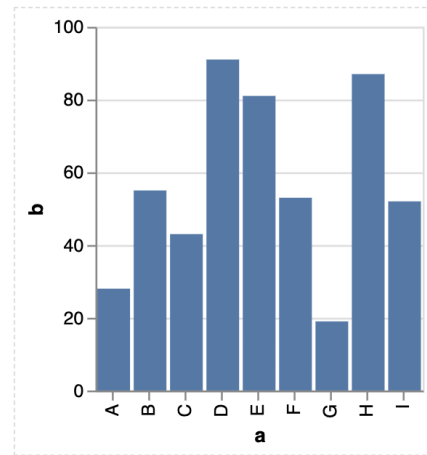
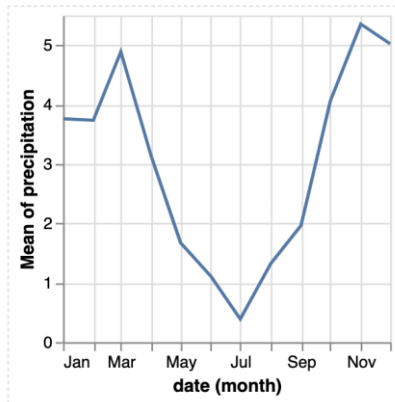
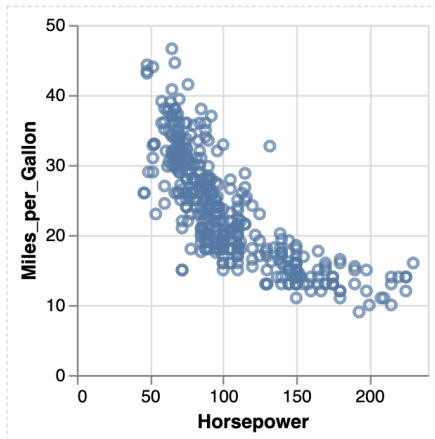
- Marks
 - Shapes to visually encode data

```
{ ...  
  "mark": {  
    "type": ..., // mark Object  
    ...  
  },  
  ...  
}
```

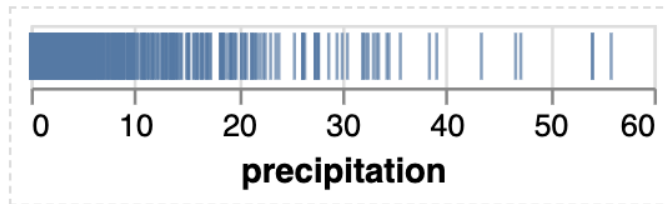
```
{ ...  
  "mark": "...", // mark type  
  ...  
}
```

Vega-Lite recap

- Marks
 - Shapes to visually encode data
 - Primitive types: area, bar, circle, line, point, rect, rule, square, text, tick, and geoshape



[Open in Vega Editor](#)



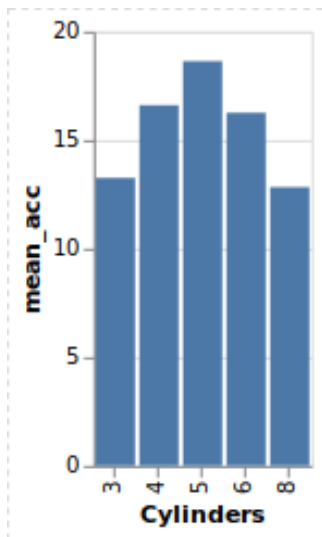
Vega-Lite Recap

- Transform
 - Describe transformations on the data
 - **Transform property** or **field**
transforms inside “encoding” (more on that later)
 - View-level are executed **in order**
- Some examples
 - Filter, Aggregate, Bin

```
{          // view-level transforms
  ...
  "transform": [
    { ... : { ... } },
    { ... : { ... } }
  ],
  ...
}
```

Vega-Lite Recap

- Transform example - view level
 - data/cars.json
 - Aggregate mean of acceleration, group by number of cylinders



Name:	"chevrolet chevelle"
Miles_per_Gallon:	18
Cylinders:	8
Displacement:	307
Horsepower:	130
Weight_in_lbs:	3504
Acceleration:	12
Year:	"1970-01-01"
Origin:	"USA"

```
{
  "data": { "url": "data/cars.json" },
  "transform": [
    {
      "aggregate": [{
        "op": "mean",    // Operation
        "field": "Acceleration", // Data
        "as": "mean_acc" // Output
      }],
      "groupby": ["Cylinders"] // group
    }
  ],
  "mark": "bar",
  "encoding": {
    "x": { "field": "Cylinders", "type": "ordinal" },
    "y": { "field": "mean_acc", "type": "quantitative" }
  }
}
```


Vega-Lite Recap

- Encoding
 - Maps **encoding channels** to **data fields** or **constant values**
- Encoding channels
 - Position channels
 - x, y, x2, y2
 - Mark property channels
 - color, opacity, shape, size
 - Tooltip, Hyperlink channels
 - Text, tooltip, href

(explained later)

```
// Specification of a Single View
{
  ...,
  "encoding": {
    "x": { // Encoding channel
      "field": ...,
      "type": ...,
      ...
    },
    ...
  },
  ...
}
```

Vega-Lite Recap

- Channel definition
 - Either a **field** definition or a **value** definition
- Field definition
 - Encodes a particular field in the dataset with an encoding channel
 - “field” : String defining the name of the field from which to pull data from
 - “type” : Type of measurement
 - quantitative, ordinal, nominal, temporal

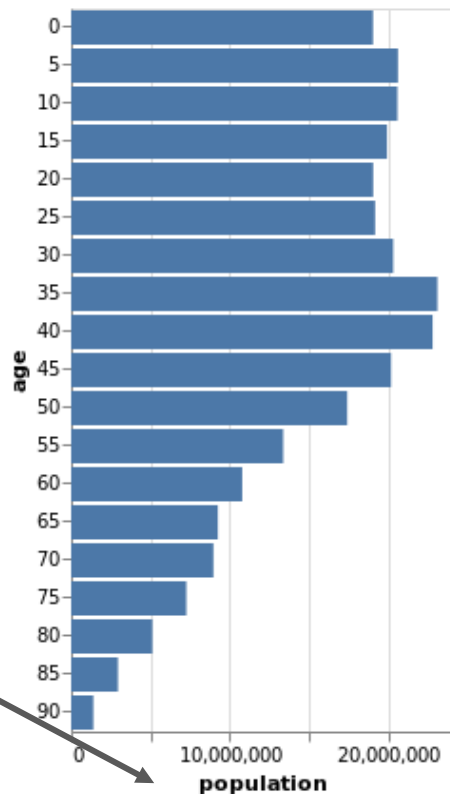
```
{ // Specification of a Single View
  ...,
  "encoding": {
    "x": { // Field definition
      "field": ..., // Required
      "type": ..., // Required
      ...
    },
    ...
  },
  ...
}
```

```
{ // Specification of a Single View
  ...,
  "encoding": {
    "x": { // Constant value definition
      "value": ...
    },
    ...
  },
  ...
}
```

Vega-Lite Recap

- Encoding types
 - Quantitative: for data that expresses **some kind of quantity** (e.g., population number)
 - Temporal: for **dates** and **times**
 - Ordinal: for discrete **ranked data** that can be sorted
 - Nominal: for **categorical data**, doesn't determine magnitude or ordering

“y” is typed as ordinal in the class population demo



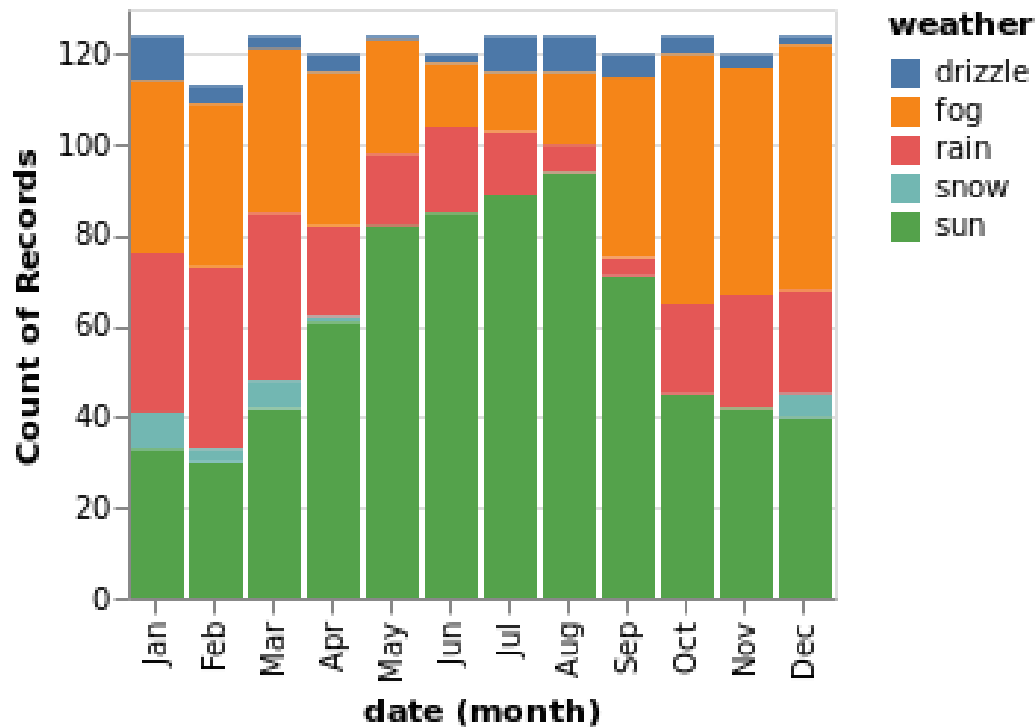
“x” is typed as quantitative in the class population demo

Vega-Lite Recap

- Marks as clickable data points
 - Add properties:
 - Transform
 - Tooltip
 - href

```
{...
  "transform": [{
    "calculate": "'https://www.google.com/search?q=' +
datum.Name", "as": "url"
  }],
  "encoding": {
    ...
    "tooltip": {"field": "Name", "type": "nominal"},
    "href": {"field": "url", "type": "nominal"}
  }
}
```

Vega-Lite Live Demo



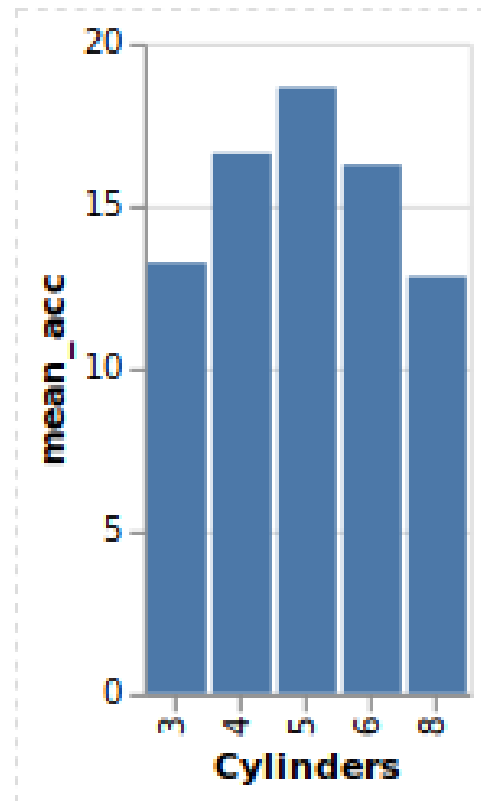
Vega-Lite Exercise 1

- Vega-Lite Docs: <https://vega.github.io/vega-lite/docs/>
- Using data from this URL:
<https://vega.github.io/editor/data/cars.json>,
- Produce a bar chart that aggregates mean of Acceleration grouped by the number of cylinders using **encoding field**

definition

(No transform)

Name:	"buick skylark 320"
Miles_per_Gallon:	15
Cylinders:	8
Displacement:	350
Horsepower:	165
Weight_in_lbs:	3693
Acceleration:	11.5
Year:	"1970-01-01"
Origin:	"USA"



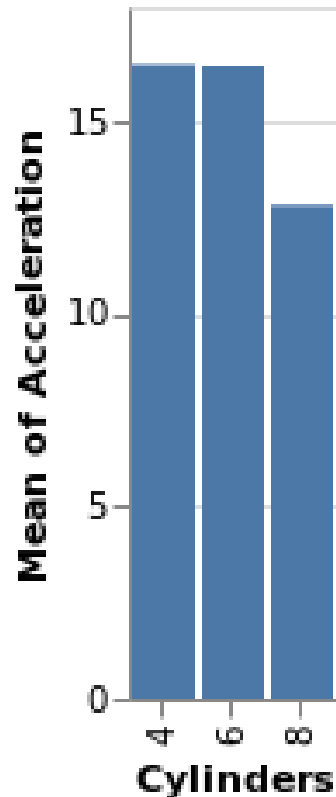
Vega-Lite Exercise 1 Solution

```
{  
  "data": {"url": "https://vega.github.io/editor/data/cars.json"},  
  "mark": "bar",  
  "encoding": {  
    "x": {"field": "Cylinders", "type": "ordinal"},  
    "y": {"aggregate": "mean", "field": "Acceleration", "type": "quantitative"}  
  }  
}
```

Vega-Lite Exercise 1-1

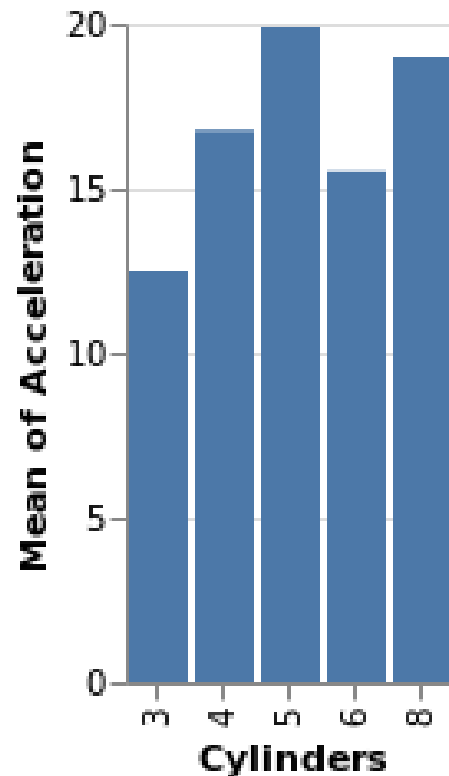
- From the previous exercise 1,
 - Data: <https://vega.github.io/editor/data/cars.json>
- Produce a bar chart that aggregates mean of Acceleration grouped by the number of cylinders using encoding field definition **only for cars produced in the USA**

Name:	"buick skylark 320"
Miles_per_Gallon:	15
Cylinders:	8
Displacement:	350
Horsepower:	165
Weight_in_lbs:	3693
Acceleration:	11.5
Year:	"1970-01-01"
Origin:	"USA"



Vega-Lite Exercise 1-2

- From the previous exercise 1,
- Produce a bar chart that aggregates mean of Acceleration grouped by the number of cylinders using encoding field definition **only for cars produced at or after 1979**



Vega-Lite Exercise Solutions 1-1, 1-2

```
{
  "data": {"url": "https://vega.github.io/editor/data/cars.json"},
  "mark": "bar",
  "transform": [
    //{"filter": {"field": "Origin", "equal": "USA"}} 1-1 Solution
    {"filter": {"timeUnit": "year", "field": "Year", "gte": "1979"}}
  ],
  "encoding": {
    "x": {"field": "Cylinders", "type": "ordinal"},
    "y": {"aggregate": "mean", "field": "Acceleration", "type": "quantitative"}
  }
}
```