Deneb Notes
3 – General Part 3

An exploration of some general aspects of a Vega-Lite JSON specification for use in the free and certified Deneb custom visual for Power BI. Topics include:

- **Named and Coded Colours**
- **Vega-Lite Colour Schemes**
- **Power BI Themes**
- **Power BI Theme Colours**
- **Gradient Colours**

Deneb:
Declarative
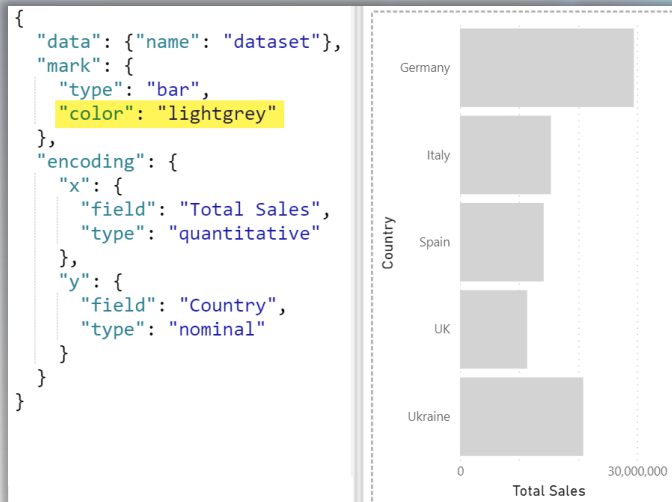**Visualization**
in Power BI

Vega-Lite:
A Grammar
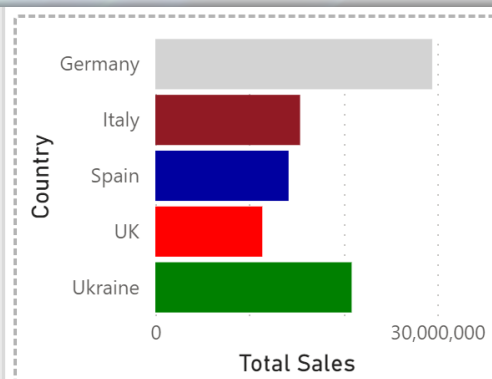**of Interactive**
Graphics

Named/Coded Colours – Standard

4 types of named/coded colours can be used in Deneb/Vega-Lite:

- Direct names
  - e.g., "color": "lightgrey"
- HEX codes (hexadecimal)
  - e.g., "color": "#911A24"
- RGB codes (red, green, blue)
  - e.g., "color": "rgb(0, 0, 160)"
- HSL codes (hue, saturation, lightness)
  - e.g., "color": "hsl(0, 100%, 50%)"

- Can be used either in a mark or in an encoding channel
- Can use multiple methods in same code (i.e., "mix-and-match")

```
{
  "data": {"name": "dataset"},
  "mark": {
    "type": "bar",
    "color": "lightgrey"
  },
  "encoding": {
    "x": {
      "field": "Total Sales",
      "type": "quantitative"
    },
    "y": {
      "field": "Country",
      "type": "nominal"
    }
  }
}
```

```
{
  "data": {"name": "dataset"},
  "mark": {"type": "bar"},
  "encoding": {
    "x": {
      "field": "Total Sales", "type": "quantitative" },
    "y": {
      "field": "Country", "type": "nominal" },
    "color": {
      "value": {"expr":
        "datum['Country'] == 'Germany' ? 'lightgrey' :
         datum['Country'] == 'Italy' ? '#911A24' :
         datum['Country'] == 'Spain' ? 'rgb( 0, 0, 160 )' :
         datum['Country'] == 'UK' ? 'hsl( 0, 100%, 50%)' :
         'green' " } } }
}
```

Named/Coded Colours – Transparency

Each name/code type can implement transparency/opacity in Deneb/Vega-Lite:

% Opacity	HEX 7&8
100	FF
90	E6
80	CC
70	B3
60	99
50	80
40	66
30	4D
20	33
10	1A
0	00

- Direct names – use name "transparent"
  - e.g., "color": "transparent"

- HEX codes (hexadecimal) – add 7th and 8th characters
  - e.g., "color": "#911A2433"
  - *("00" = transparent, "FF" = fully opaque)*

- RGBA codes (red, green, blue, alpha)
  - e.g., "color": "rgba(0, 0, 160, 0.3)"
  - *Alpha from 0 (fully transparent) to 1 (fully opaque)*

- HSLA codes (hue, saturation, lightness, alpha)
  - e.g., "color": "hsla(0, 100%, 50%, 0.8)"
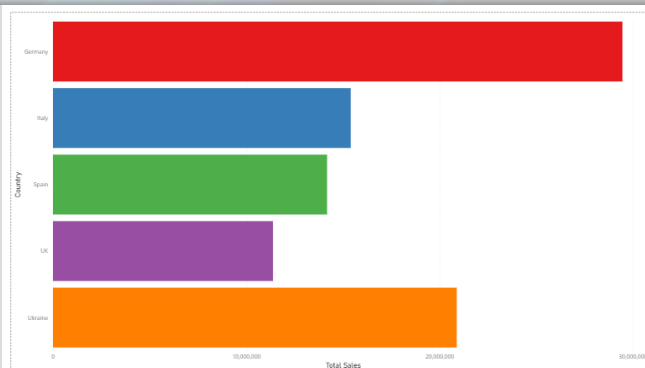 - *Alpha from 0 (fully transparent) to 1 (fully opaque)*

Vega-Lite Colour Schemes

- There are several colour schemes built-in to Vega-Lite, including category20b, dark2, set1, set2, etc.
- For a full listing of available colour schemes in Vega and Vega-Lite, see https://vega.github.io/vega/docs/schemes/
- To use a Vega-Lite colour scheme, add a **scale**-**scheme**-**scheme_name** block to the color block

```
{
  "data": {"name": "dataset"},
  "mark": {"type": "bar"},
  "encoding": {
    "x": {
      "field": "Total Sales", "type": "quantitative"},
    "y": {
      "field": "Country", "type": "nominal"},
    "color": {
      "field": "Country",
      "scale": {"scheme": "set1"},
      "legend": null
    }
  }
}
```
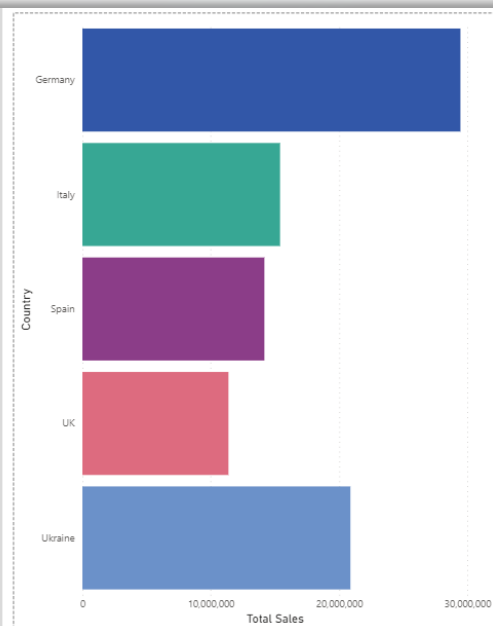
Power BI Themes

There are 4 integrations with the Power BI theme colours in Deneb:

- **pbiColorNominal**: matches the current theme colours
- **pbiColorOrdinal**: uses a ramped scale from the MAX to MIN divergent colour of the current theme, and EXCLUDES the MIDDLE colour
- **pbiColorLinear**: uses an interpolated gradient from the MAX to MIN divergent colour of the current theme, and EXCLUDES the MIDDLE colour
- **pbiColorDivergent**: same as pbiColorLinear, but INCLUDES the MIDDLE colour

- To use a Power BI Theme colour scheme, add a **scale-scheme-deneb_scheme_name** block to the color block

```
{
  "data": {"name": "dataset"},
  "mark": {"type": "bar"},
  "encoding": {
    "x": {
      "field": "Total Sales", "type": "quantitative"},
    "y": {
      "field": "Country", "type": "nominal"},
    "color": {
      "field": "Country",
      "scale": {"scheme": "pbiColorNominal"},
      "legend": null
    }
  }
}
```

using Power BI "Executive" theme

Power BI Theme Colours

- To use a Power BI theme colour, use the **color-expr-pbiColor(index, shade_percent)** syntax
  - theme index is zero-based, so use theme colour – 1
  - shade_percent is optional, and is a decimal value between -1 (100% darker) and 1 (100% lighter)
  - e.g., "color": { "expr": "pbiColor(0, 0.1)" }
- To use a Power BI theme divergent or sentiment colour, use the **color-expr-pbiColor(name, shade_percent)** syntax
  - Divergent names: min, middle, max
  - Sentiment names: negative, neutral, positive, bad, good

```
{
"data": {"name": "dataset"},
"mark": {
  "type": "bar",
  "color": {"expr":
    "pbiColor(0, -0.5)"}},
"encoding": {
  "x": {
    "field": "Total Sales",
    "type": "quantitative"
  },
  "y": {
    "field": "Country",
    "type": "nominal"
  }
}
}
```

```
{
"data": {"name": "dataset"},
"mark": {
  "type": "bar",
  "color": {
    "expr": "pbiColor('positive', 0.5)"
  }
},
"encoding": {
  "x": {
    "field": "Total Sales",
    "type": "quantitative"
  },
  "y": {
    "field": "Country",
    "type": "nominal"
  }
}
}
```
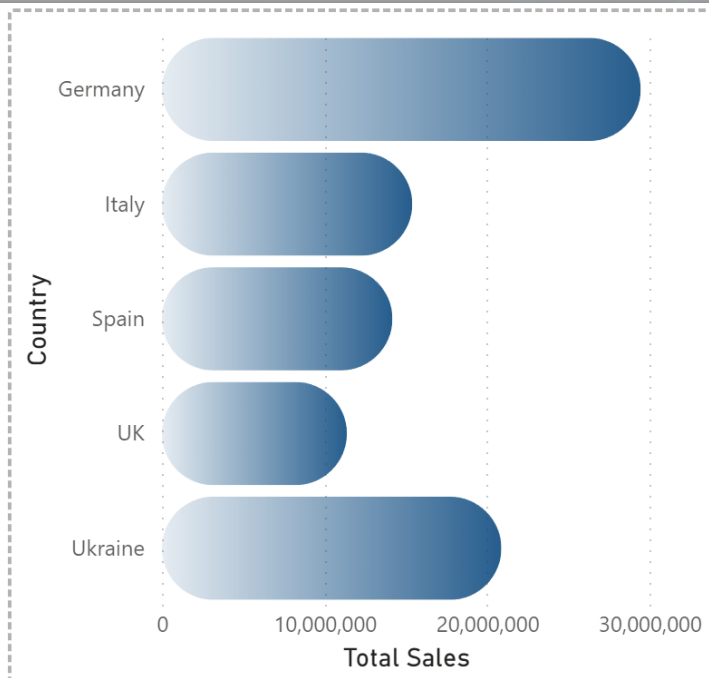
Gradient Colours

- To add gradient colours, indicate the normalized [0-1] coordinates (x1, x2, y1, y2), type (linear, radial), and stops/colours
- In the example below:
  - as y# are both 1 and x# ranges from 0 to 1, gradient will be horizontal
  - type = linear
  - stops = array of gradient stops defining the gradient colour sequence
    - *(note HEX codes with 10% and 90% transparency used for colours)*

```
{
  "data": {"name": "dataset"},
  "mark": {
    "type": "bar",
    "cornerRadius": 50,
    "color": {
      "x1": 0,
      "y1": 1,
      "x2": 1,
      "y2": 1,
      "gradient": "linear",
      "stops": [
        {"offset": 0, "color": "#0F4C811A"},
        {"offset": 1, "color": "#0F4C81E6"}
      ]
    }
  },
  "encoding": {
    "x": {
      "field": "Total Sales",
      "type": "quantitative"
    },
    "y": {
      "field": "Country",
      "type": "nominal"
    }
  }
}
```

Resources

For further information, refer to:
- Deneb website
    - https://deneb-viz.github.io/
- Vega-Lite website
    - https://vega.github.io/vega-lite/
- Vegag-Lite colour schemes:
    - https://vega.github.io/vega/docs/schemes/
- Deneb Cheat Sheet
    - https://app.enterprisedna.co/app/cheat-sheet
- Deneb Showcase section of the Enterprise DNA Forum
    - https://forum.enterprisedna.co/c/deneb-showcase/58

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