1 Lecture 11: Infographics, interactivity, other tools, specialized plots

Data Visualization · 1-DAV-105

Lecture by Broňa Brejová

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1.0.1 Several examples of infographics

Several examples that are close to data visualization:

- Income by religious group in US (image, website)
- Deadliest pandemics (website)
- War casualties (website)
- Game of Thrones relationships (website)
- Emergency medical services in Slovakia 2019 (website)

Some explain other types of information:

- Sitting and standing is bad (website)

1.1 Data visualization (DV) vs infographics (IG)

- **Target audience:** IG general public, DV often experts
- **Storytelling:** often in IG, can be created from multiple DV
- **Design and aesthetics:** more elaborate in IG, includes graphics elements and clipart (considered chart junk in DV)
- **Process of creation:** many simple tools for DV, IG time consuming, often created by collaboration of data analysis, domain experts and graphic designers

See also https://www.statsilk.com/blog/real-difference-between-infographics-and-data-visualizations

1.2 Interactivity

Interactive visualization engages audience, allows them to explore data in depth and according to their interest.

1.2.1 Examples

- PhD gender gap (website)
- Making it big (website)
- US cities with the same name (website)

1.2.2 Techniques in interactivity visualization

Similar to decisions made in designing a static plot:

- Selecting variables (x, y, color, …)
- Filtering data (selecting table rows)
- Highlighting points or groups

- Aggregating (display countries or region summaries)
- Zooming / panning
- Rescaling (log-scale) / reexpressing (e.g. % instead of counts)
- Sorting (e.g. bars in bargraphs)
- Displaying details (tooltips)
- Annotating
- Bookmarking

(Stephen Few)

1.2.3 Dashboard

- A display consisting of mutiple plots, summarizing current state of important indicators (e.g. of a business, pandemics, …)
- Inspired by dashboards in cars and planes
- Often interactive, but main features in default view

Two SARS-CoV-2 examples:

- WHO
- Nextstrain
  - many options: selecting color, filtering, highlighting, aggregating, zooming and panning (maps and tree), rescaling (time vs divergence), tooltips, bookmarking

1.2.4 Interactivity in Plotly Express

All Plotly plots by default have some interactivity:

- Filtering groups
- Zooming / panning
- Details
- Spike lines

Example 1: Country indicators from World Bank, https://databank.worldbank.org/home under CC BY 4.0 license.

Regions can be switched on and off.

[1]:
```
import plotly.express as px
import pandas as pd
url = 'http://compbio.fmph.uniba.sk/vyuka/viz/images/9/9d/World_bank.csv'
countries = pd.read_csv(url)

px.scatter(
        countries, x="GDP2018", y="Expectancy2018", color="Region",
        hover_data=['Country'],
        title="Country indicators 2018", log_x=True,
        width=800, height=500
    )
```

Example 2: Life expectancy data provided free by the Gapminder foundation under the CC-BY license.

Compare data along the x coordinate.

[2]:
```
url="http://compbio.fmph.uniba.sk/vyuka/viz/images/3/33/
  ↪Gapminder_life_expectancy_years.csv"
orig_expectancy = pd.read_csv(url)
expectancy = pd.melt(orig_expectancy, id_vars=["country"], var_name="year")
expectancy['year'] = expectancy['year'].astype(int)
```

[3]:
```
selected = expectancy.query("country=='Slovak Republic' or country=='France'")
fig=px.line(
        selected, x="year", y="value", color="country",
        title="Life expectancy", width=800, height=500
    )
fig.update_layout(hovermode="x unified")
```

1.2.5 More interaction with Dash by Plotly

- Dash library by Plotly allows adding control elements (selectors, sliders, buttons, …)
- We have seen an example in L01

1.3 Other visualization tools

Non-programmers typically create plots in spreadsheets:

- Excel (examples)
- Google sheets (examples)

System R: programming language for statistical computing

- Together with Python, very popular in data science
- Built-in plots
- Also other libraries, notably ggplot2 based on system called Grammar of Graphics (cheat-sheet)

Javascript

- Programming language popular in web programming
- Google charts for Javascript (examples)
- D3.js library (Data-Driven Documents)

Tableau

- Advanced visualization tools, commercial
- Gallery

Microsoft Power BI

- Interactive data visualization software with a focus on business intelligence
- An example

1.4 Several specialized visualization types

1.4.1 UML diagrams in computer science

- Display relationships between different classes or other components and aspects of software

https://commons.wikimedia.org/wiki/File:UML_diagrams_overview.svg Derfel73; Pmerson

1.4.2 Waterfall chart

- Used in bussiness analysis: financial, inventory, human resources etc.
- Displays effects decreasing or increasing a given value
- The first and last columns are bars displaying starting and final value
- Intermediate columns float, displaying changes from previous total
- Description

https://commons.wikimedia.org/wiki/File:Waterfallchart_ex2.jpg FusionCharts Blog, CC BY-SA 4.0

1.4.3 Funnel charts

- Display losses within a business process, e.g from website visit to actual purchase
- Horizontal bar chart with centered bars
- Beware: different from funnel plot in medical meta-analyses of multiple publications

[4]:
```
# example from https://plotly.com/python/funnel-charts/
data = dict(
    number=[39, 27.4, 20.6, 11, 2],
    stage=["Website visit", "Downloads", "Potential customers", "Requested␣
 ↪price", "invoice sent"])
fig = px.funnel(data, x='number', y='stage')
fig.show()
```

1.4.4 Gantt chart

- Used in management to display project schedule with different tasks and their planned duration
- Can also display current status of tasks and their dependencies

https://commons.wikimedia.org/wiki/File:GanttChartAnatomy.svg

1.4.5 Candlestick chart

- Similar to boxplot, used in financial data, e.g. stocks, currency exchange rates
- Line: minimum and maximum, box: opening and close, color: increase or decrease

https://commons.wikimedia.org/wiki/File:Candlestick_Chart_in_MetaTrader_5.png