

Visualization (Vis)

**Storytelling with
Interactive Data Visualizations**



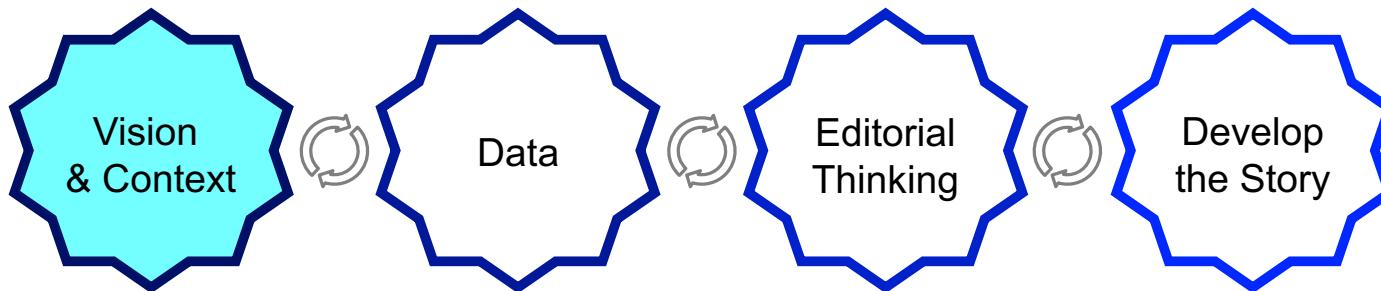
Lecture 2
—
Vision & Context



Photo by Pascal van de Vendel on Unsplash



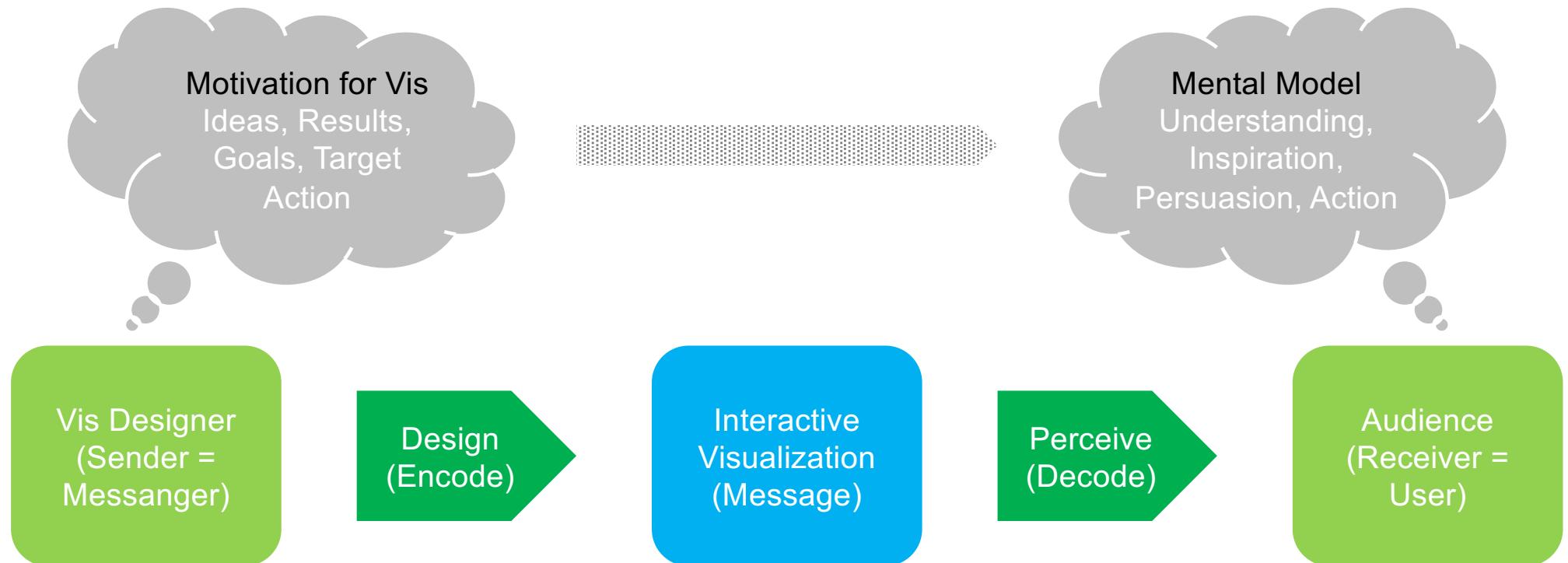
The Vis Process: Vision & Context



- ◆ Purpose, Vision, Mission
 - Why are you producing the Vis (what is your “motivating curiosity”)?
 - What are you trying to accomplish? What is your intended effect?
 - Function of the Vis? Tone of the Vis?
 - 3-minute Story and Big Idea?
- ◆ Audience
 - Whom are you making the Vis for?
- ◆ Constraints
 - Timescale, Budget, Technology, ...



Flow (“Exchange”) of Information





Visualization

Vision & Context

1.  Vision and Mission
2. Audience Analysis
3. Python Vis Libraries



The Reason for Existing

Commissioned Project

Task assigned by a colleague, manager, or client

- ◆ Initial Information
 - Received or read a brief
 - Had initial discussions outlining the requirements
 - Gathered instructions and general idea of expectations
- ◆ Understanding the Project
 - Contextual information provides background, objectives, and audience
 - Projects may range from open-ended to very specific
- ◆ Challenges:
 - Dealing with initial ideas and vague requests
e.g., “cool charts”, “make it fancy.”
 - Managing specific style requests
e.g., “Edward Tufte style.”

Self-Initiated Project

Motivated by personal interest or curiosity:
Based on a dataset you found or a theory you want to test

- ◆ Flexibility and Autonomy
 - Entirely self-defined and self-determined
 - More flexible context compared to commissioned projects
- ◆ No External Constraints
 - No client, brief, or set instructions
 - No restrictions on scope, timescales, or audience
- ◆ Creative Freedom
 - A blank canvas to explore your initial motivation and interests



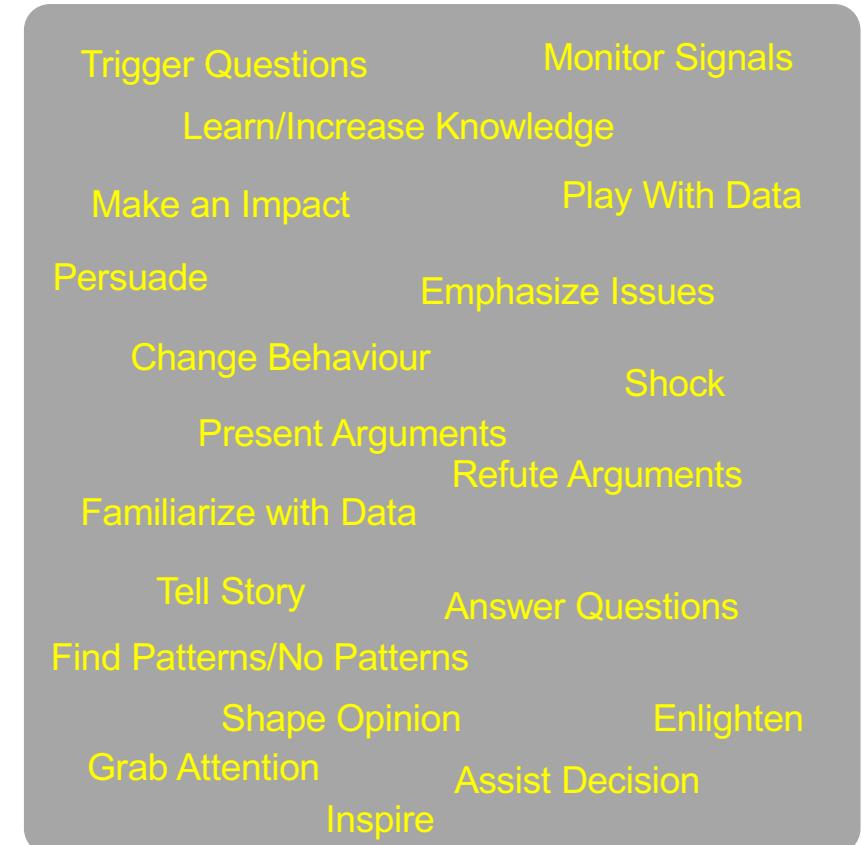
Motivating Curiosity

- ◆ Motivating Curiosity = reason, why the vis projects exists
 - Either the commissioner of the project had it, or the vis designer had it
 - May change or expand during the project, when you understand the data in more depth
- ◆ Often posed as a question
- ◆ Need the “right” kind of specificity
- ◆ Example 1: Election Results
 - How much did the public engage in the previous Australian election? (very broad)
 - What was the percentage turnout across each electoral region of Australia compared with the previous election? (good specificity)
- ◆ Example 2: Runner with a Fitness Watch
 - How good was that run? (good specificity)
 - In what time did I complete the run? (too specific)



The Intended Effect

- ◆ Different visualizations serve different purposes
 - e.g., monitoring data vs. grabbing attention
- ◆ **Identifying Intended Effect:**
Decide what you're aiming to achieve and how to achieve it
 - Early decisions shape the creative direction and reduce complexity
- ◆ **Forming a Vision**
 - Start forming a vision of the project (comes naturally)
 - Often influenced by past inspirational works or concepts
 - Capture initial thoughts and ideas:
use sketchbook, tablet, etc.



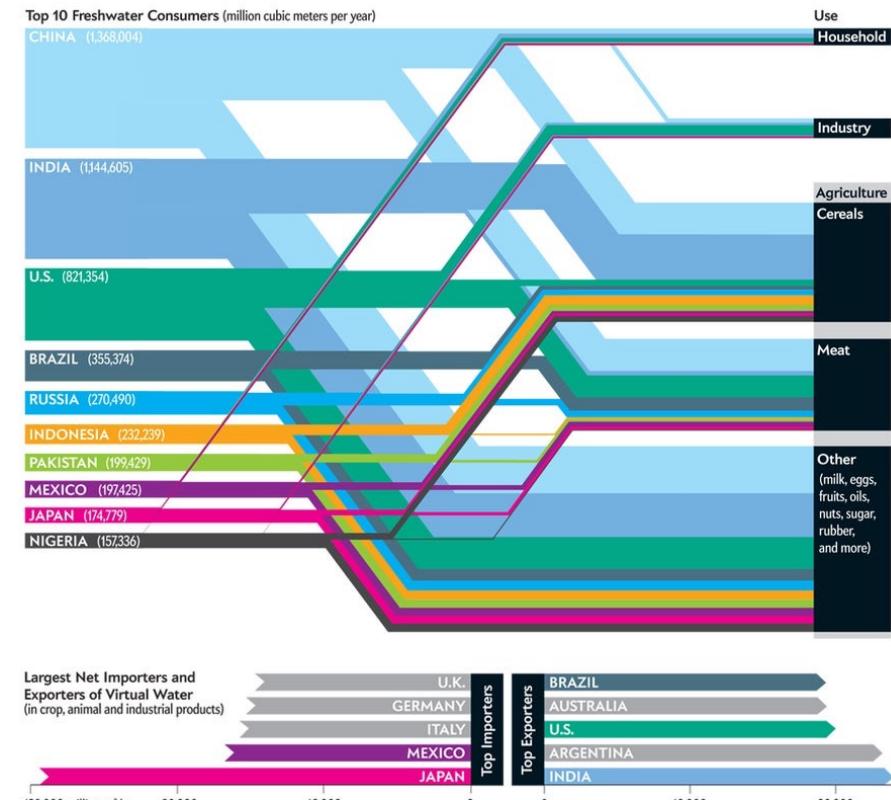
Possible Intended Effects

(inspired by: Andy Kirk, *Data Visualization: Representing Information on the modern Web*)



Function 1: Explain

- ◆ Explain: Convey information through a focused narrative
 - Create visual experience with a clear narrative
 - Use intuitive design to portray key insights
 - ◆ Examples
 - Information dashboards (corporate performance figures).
 - Newspaper graphics (economic crisis complexity)
 - Animated designs (population migration patterns)
 - Physical/ambient visualizations (sugar content in drinks)
- Projects in this Class!

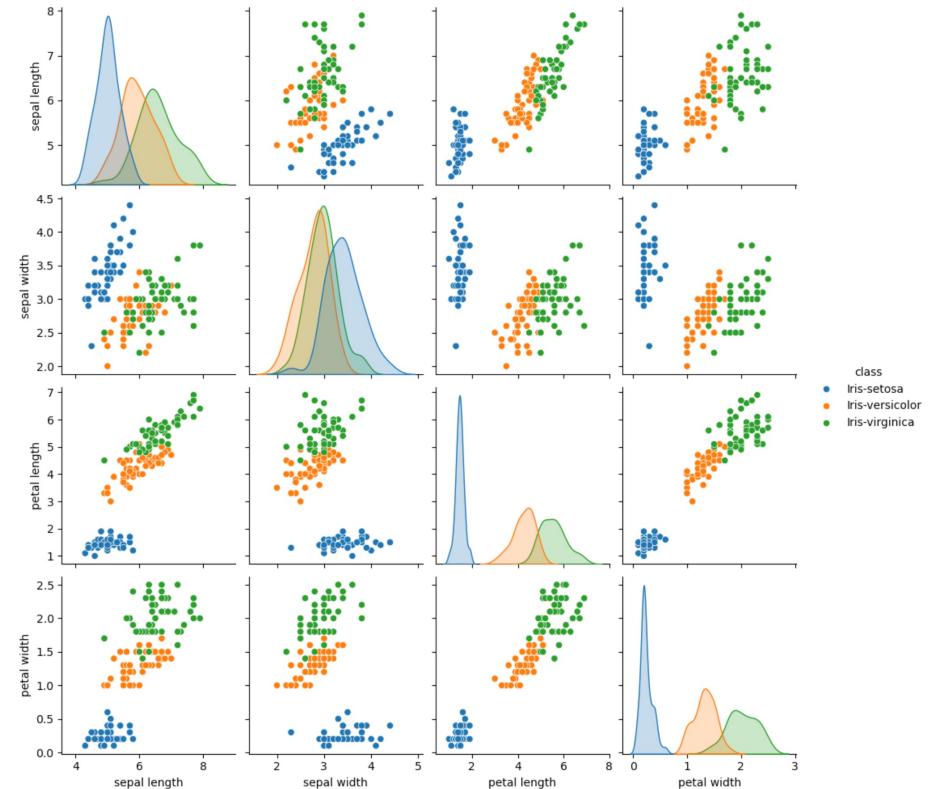


Sankey Diagram: Visualizes the breakdown of water usage
(source: <https://www.scientificamerican.com/article/water-in-water-out/>)



Function 2: Explore

- ◆ **Explore: Facilitates familiarization and exploration of data**
 - User-driven experiences, visual analysis
 - Lack of a specific, single narrative
 - More about users discovering insights themselves
- ◆ **Exploratory Tools / Key Differentiator**
 - Interactive interface for users to visually explore data
 - Encourages personal discoveries, patterns, and relationships
 - Designer creates an environment for analysis, not a predefined story
 - User do the hard work to discover insights

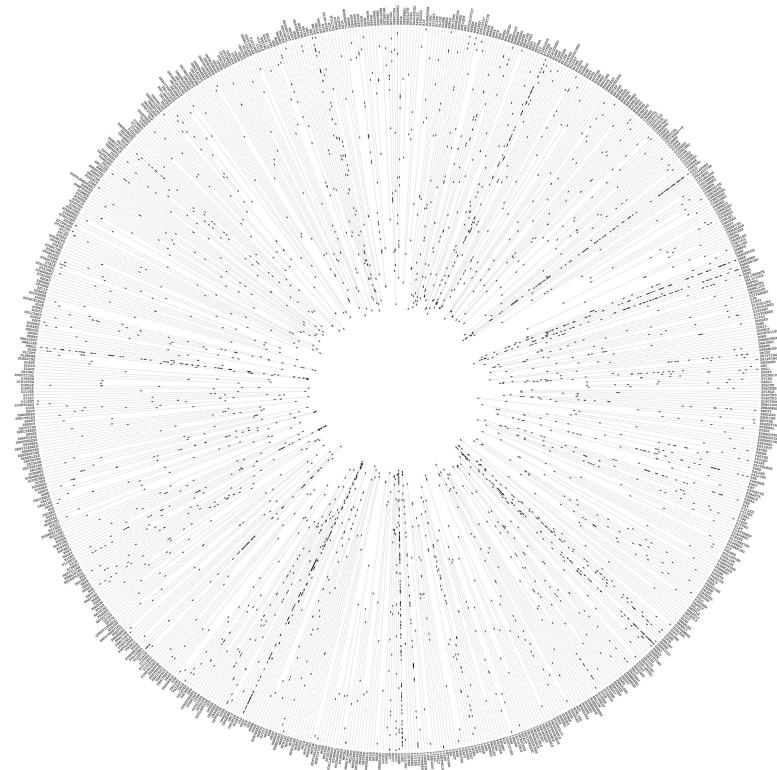


Scatterplot Matrix: Reveal correlations in a multivariate dataset



Function 3: Exhibit

- ◆ **Exhibit:** Use data as raw material for exhibition or self-expression (“data art”)
 - Create an artifact or aesthetic representation
- ◆ Characteristics:
 - Lack of structured narrative
 - No visual analysis capability
 - Challenges traditional definitions of data visualization
 - Blurs boundaries with graphic design and creative art
 - Focus on aesthetic reaction and emotional connection



Vis of all the adjectives used in C. McCarthy's book “The Road”.
Adjectives are arranged radially in alphabetical order and
each line represents a timeline of the book
(source: http://distantshape.com/the_road.html)

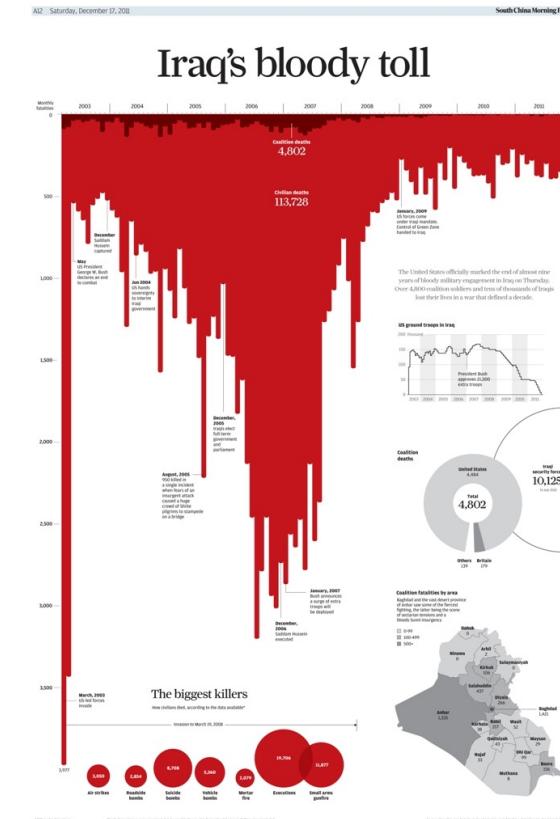
Tone

- ◆ **Tone:** Style of the design experience and desired emotional response
- ◆ Examples of Tone
 - Analytical and Pragmatic (“Reading Tone”): Dashboard with bar charts and line charts

“We need a chart to help monitor...”

- Persuasive and Emotional (“Feeling Tone”): Presentation depicting lives saved by fundraising

“We need to present this in a way that persuades people...”



Emotional Tone: Main chart shows the number of civilians who lost their lives as a result of the conflict on a monthly basis. These are compared to coalition fatalities (darker red, inset bars) (source: <http://graphics-info.blogspot.com/2012/09/malofiej-20-look-at-our-participation.html>)



Project Management Constraints

- ◆ **Time Pressure**
 - Common in commissioned design projects
 - Challenge: maintain creativity under time constraints
 - ➔ Effective time management and planning crucial
- ◆ **Cost**
- ◆ **Client Pressure**
 - Manage changes in requirements, new demands, and design interference
 - Adhere to organizational visual/brand identities and guidelines
 - ➔ Maintain open communication and involve clients in key decisions
- ◆ **Format and Technical Capabilities**
 - Consider platform compatibility (Web, tablet, smartphone)
 - Assess available technical resources and tools and technical infrastructure needs
 - Choose appropriate frameworks and database technologies

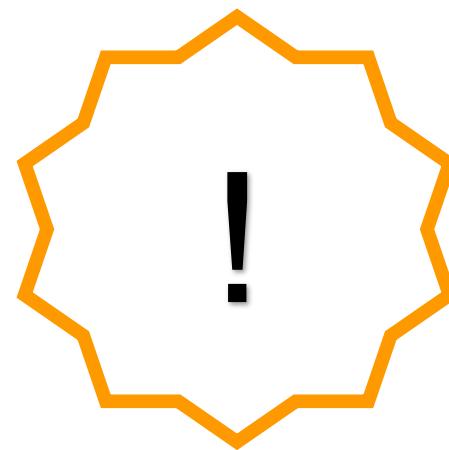


Your Turn !

Exercise 1

Vision and Mission

for the FAO project
“Climate Change Impact on Global Agriculture”





Visualization

Vision & Context

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Audience Analysis: Understanding your Audience

- ◆ Importance of Audience Analysis
 - Tailor the visualization to meet audience needs
 - Ensure the visualization is relevant and engaging
 - Help in selecting appropriate visualizations
- ◆ Steps for Conducting Audience Analysis
 1. **Identify the Audience**
Determine who will be viewing your visualization
 2. **Gather Information**
Use surveys, interviews, and research to understand audience preferences and expectations
 3. **Segment the Audience**
Group audience members into segments with similar goals and pains
 4. **Develop Audience Personas**
Create detailed profiles for each segment to guide your design decisions





Identifying Your Audience

Techniques for Identifying the Audience

- ◆ **Surveys and Questionnaires**

Distribute surveys to gather data on audience demographics, preferences, and needs

- ◆ **Interviews and Focus Groups**

Conduct interviews or focus groups to obtain deeper insights into audience expectations

- ◆ **Market Research**

Utilize existing market research reports to understand broader audience trends





Creating Audience Personas

- ◆ **Define Characteristics**

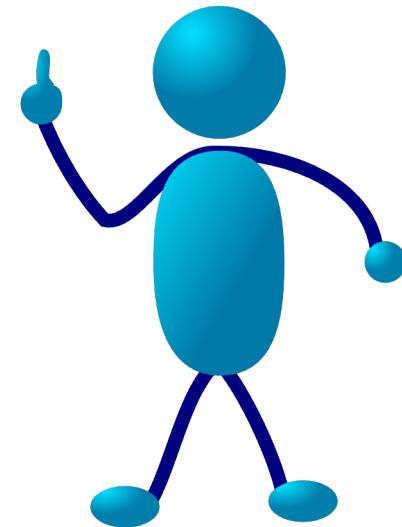
Identify key characteristics such as job roles, technical expertise, and data familiarity

- ◆ **Outline Goals and Pain Points**

Understand what each persona aims to achieve with the visualization and their potential challenges

- ◆ **Develop Detailed Profiles**

Create profiles that include names, job titles, goals, and frustrations to make personas relatable.



source: Clker-Free-Vector-Images on Pixabay



Visualization Target Persona Template

<p>Photo</p>	<p>Brief Biographie</p>
<p>Name</p>	<p>Goals and Needs</p>
<p>Demografic Data</p>	<p>Challenges and Pain Points</p>



Visualization Target Persona Template



Robert ("Bob")

Marketing Manager
with a team of four at
a fortune-500 company
located in New York

45 years old

single

Biographie

- Education: MBA in marketing
- 10+ years in marketing, 5 years in managerial role

Goals and Needs

- Obtain quick insights to make strategic decisions
- Monitor key performance indicators (KPIs) and marketing metrics
- Communicate insights to stakeholders and team members
- Identify trends and opportunities in the market
- Allocate resources effectively based on data-driven decisions

Challenges and Pain Points

- Limited time to analyse detailed data
- Difficulty in interpreting complex data visualizations
- Overwhelmed by too much data and information
- Frustrated by visualizations that are not intuitive or easy to understand



Your Turn !

Exercise 2

Audience Analysis

for the FAO project
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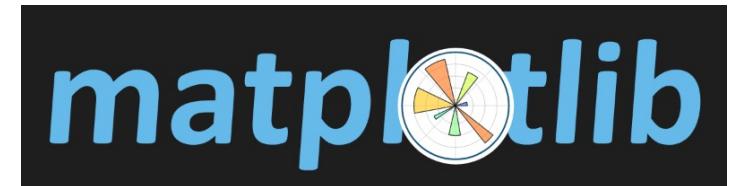
Python Visualization Libraries: Overview

- ◆ Python offers a variety of powerful libraries for data visualization
- ◆ Each with unique features and capabilities
- ◆ Popular libraries
 1. Matplotlib
 2. Seaborn
 3. Bokeh
 4. Vega-Altair
 5. Plotly



Matplotlib

- ◆ <https://matplotlib.org/>
- ◆ Basic plotting capabilities
- ◆ Highly customizable
- ◆ Wide range of plot types (line, bar, scatter, etc.)
- ◆ Use Cases
 - Creating simple, static plots
 - Customizing plots for publication
 - Building foundational visualizations for more complex projects





Seaborn

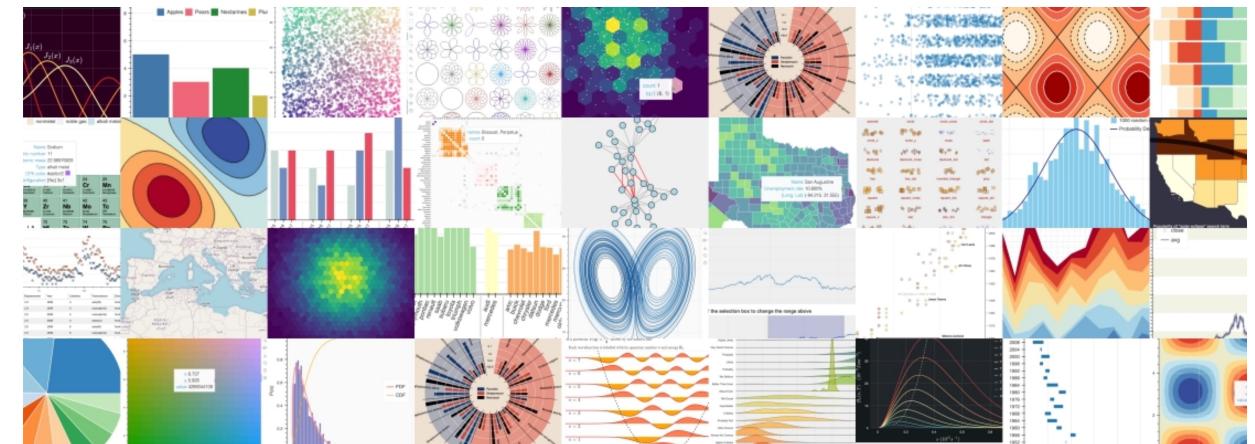
- ◆ <https://seaborn.pydata.org/>
- ◆ Built on top of matplotlib
- ◆ Statistical data visualization
- ◆ Attractive default styles
- ◆ Simple API for complex visualizations
- ◆ Use Cases:
 - Exploratory data analysis
 - Statistical visualizations (e.g., distribution plots, heatmaps)
 - Creating visually appealing plots quickly





Bokeh

- ◆ <https://bokeh.org/>
- ◆ Interactive visualizations
- ◆ Supports streaming and real-time data
- ◆ Web-based visualizations
- ◆ Use Cases:
 - Building interactive dashboards
 - Real-time data monitoring
 - Creating web applications with integrated visualizations



Bokeh Sample Plots

source: <https://bokeh.org/>



Vega-Altair

- ◆ <https://altair-viz.github.io/>
- ◆ Declarative visualization grammar
- ◆ High-level API for complex visualizations
- ◆ Easily composable and reusable visual components
- ◆ Use Cases:
 - Rapidly prototyping visualizations
 - Creating complex, layered plots
 - Data exploration and analysis



Vega-Altair



Vega-Altair Sample Plots

source: <https://altair-viz.github.io/>

- ◆ <https://plotly.com/>
- ◆ High-quality interactive visualizations
- ◆ Extensive chart types (3D, geo, etc.)
- ◆ Integration with web applications
- ◆ Use Cases:
 - Building interactive dashboards and reports
 - Creating visually rich, interactive plots
 - Integrating visualizations into web applications





Streamlit

- ◆ Streamlit – “A faster way to build and share data apps”
 - <https://streamlit.io/>
 - Turns data scripts into shareable web apps
 - Pure Python
 - “No” front-end experience required
 - Compatible with all previously mentioned Vis Libs:
matplotlib, seaborn, bokeh, vega-altair, plotly
 - Deployable via docker-image (or WASM)





Key Takeaways

- ◆ Flow of Information
- ◆ Purpose and Vision
 - Commissioned or Self-Initiated Project
 - Motivating Curiosity
 - Intended Effect: Explain, Explore, Exhibit
 - Tone: Reading or Feeling
 - Project Management Constraint
- ◆ Audience Analysis
 - Identify the Audience
 - Gather Information
 - Segment the Audience
 - Develop Audience Personas
- ◆ Python Vis Libs and Deployment
 - Matplotlib, Seaborn, Bokeh, Vega-Altair, Plotly
 - Streamlit



Photo by Dragonfly Ave on Unsplash