Data Visualization

Introduction

M126 | Maria Roussou

We use the English language in all written material
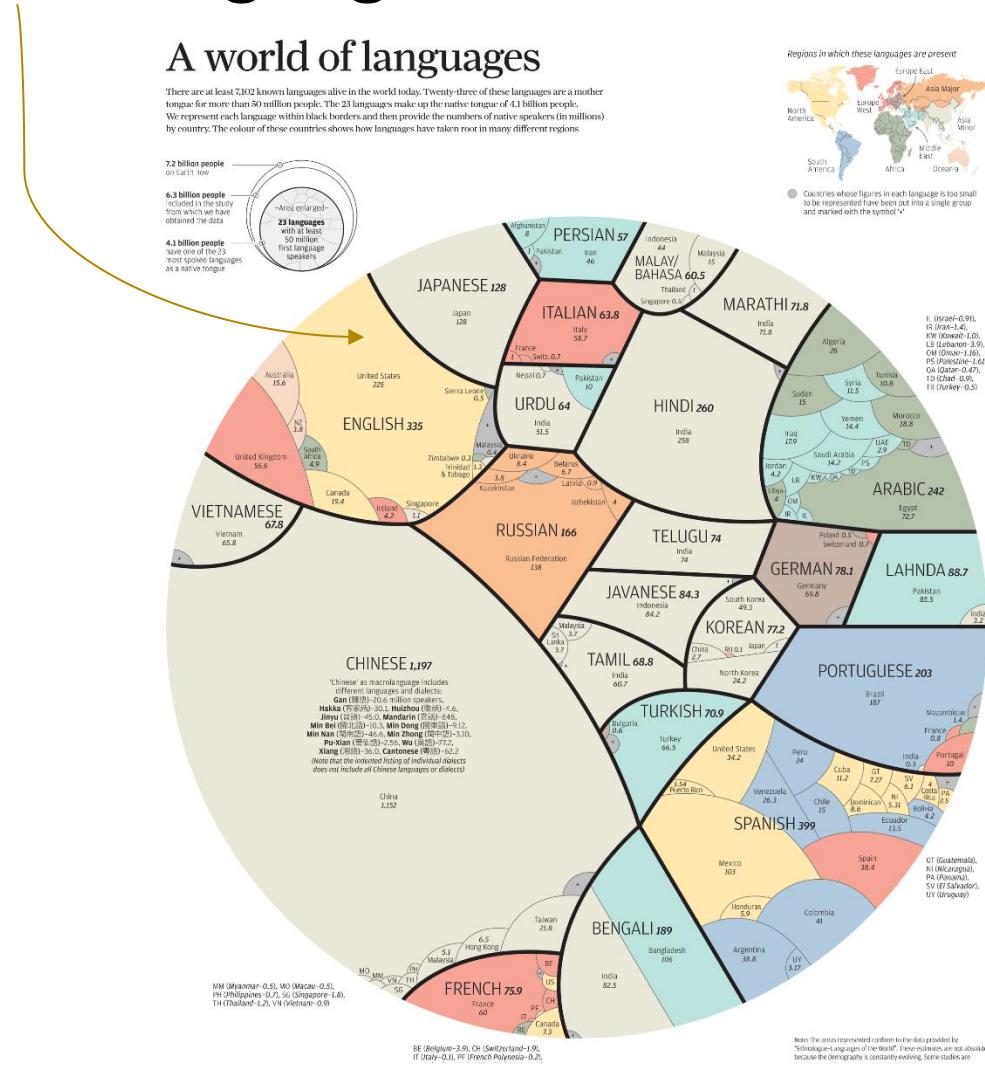
Some practicalities

Our spoken language will be defined according to necessity and preference
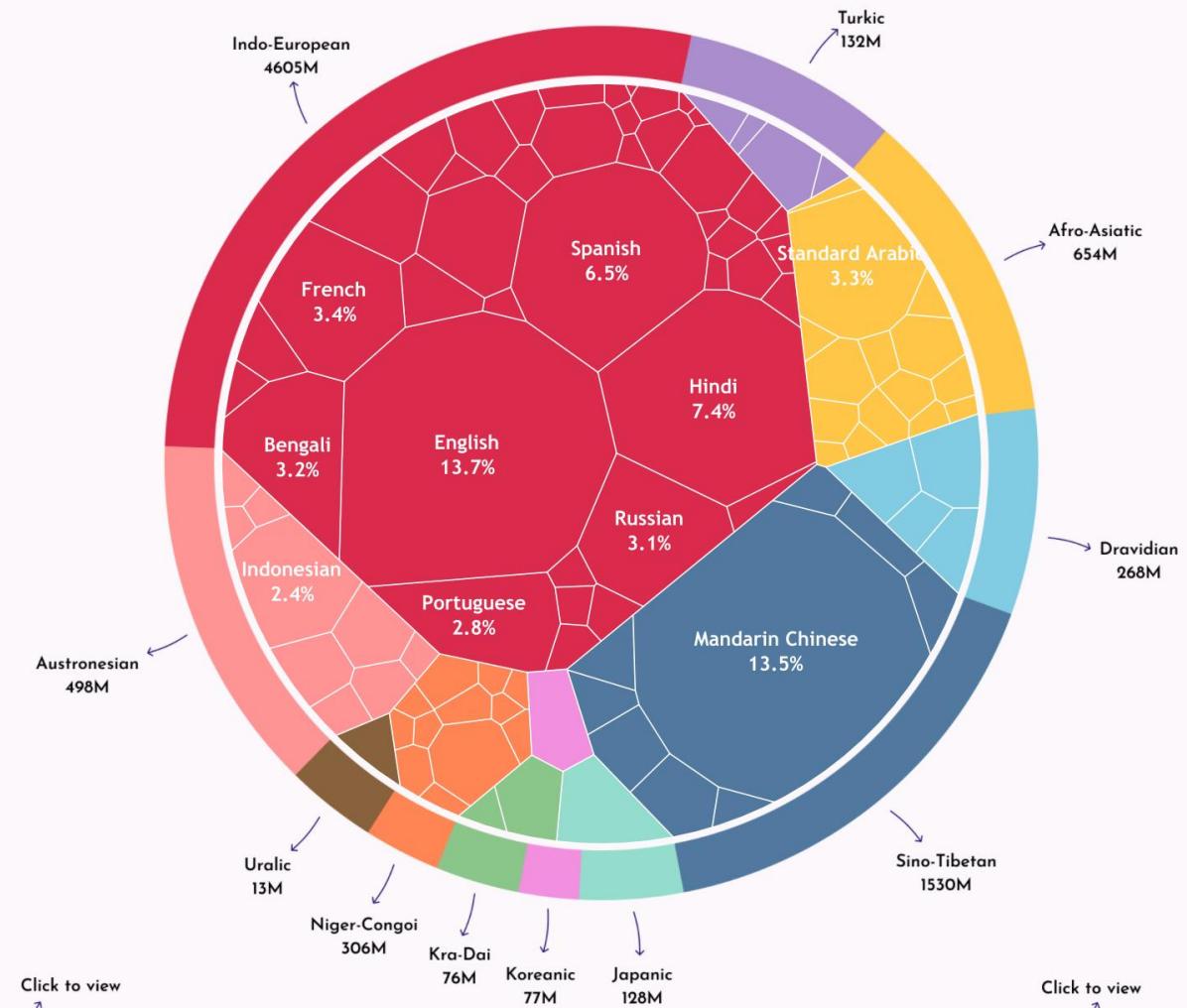
We use the English language
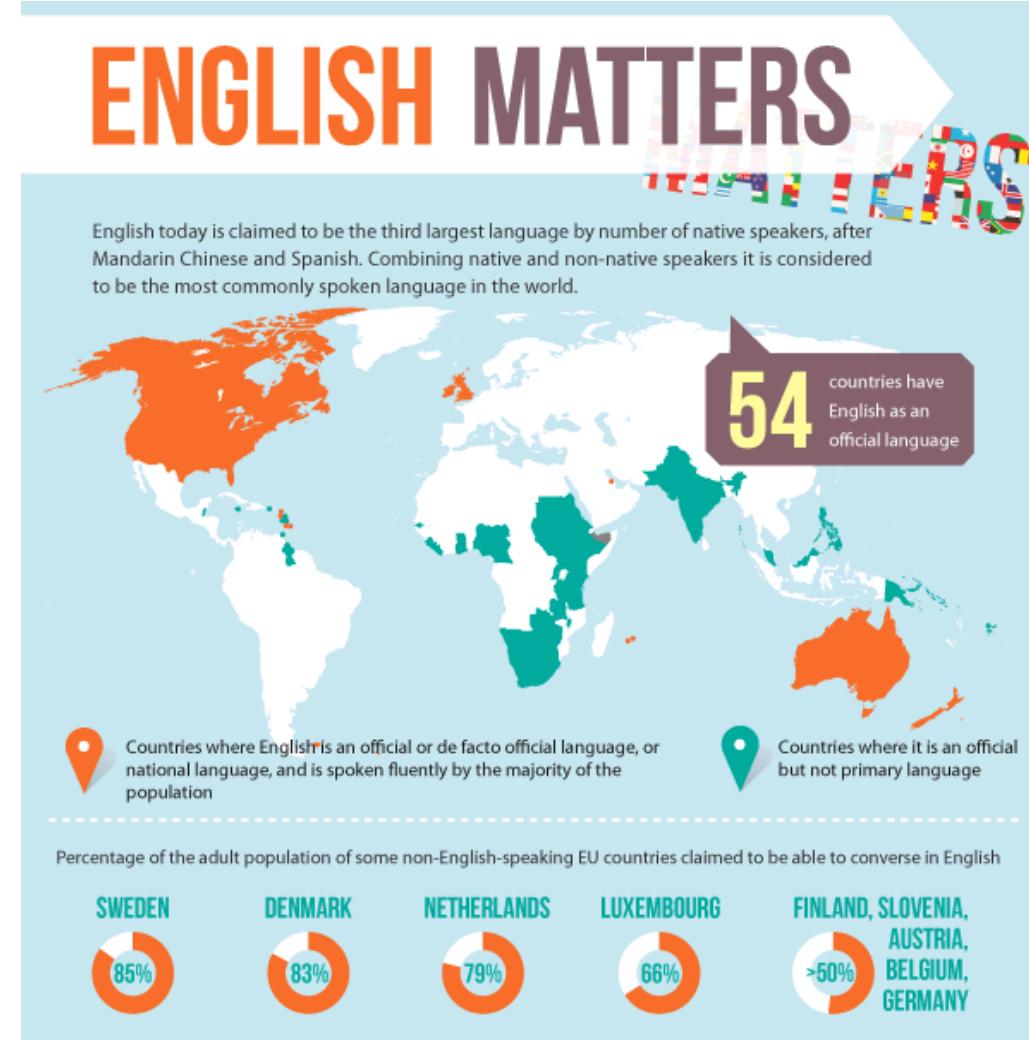
Some practicalities

- E-mail: mroussou@di.uoa.gr

- Class day, time
  - every Wednesday, 18:00 – 21:00

- Presence sheet*

(*) attendance is important, but not mandatory. Part of your grade will be based on your in-class / e-class participation

Round-the-room introductions

- 2-minute introduction about you:
  - studies/background
  - goals and expectations from this course

13 weeks of:

- Lectures

- Individual assignments

  ~3-4 on a variety of tools and methods

- Group project (in groups of 2-3)

  to create an interactive visualization of a dataset (of your choice), present it live, and document it on video

Course assessment

- ## Individual effort ~**40%**

  - ### In-class and e-class participation: ~**10%**
    Your contributions to in-class and online discussions will be a significant portion of your class participation grade.

  - ### Individual exercises & assignments: ~**30%**

- ## Group Project ~**60%**

  - ### Design & implementation: ~**50%**

  - ### Final Presentation & documentation: ~**10%**

Course style

- **Interactive & participatory**: active participation is a must!

- **By example**: real-world case studies

- **Up-to-date**: constantly abreast of new developments

- **Critique**: other work and our own

- **Research**: be prepared to spend significant amounts of time researching examples and reading papers

Course announcements, material, assignments

- e-class - https://eclass.uoa.gr/courses/DI453/

Course agenda

- e-class - https://eclass.uoa.gr/courses/DI453/ > **Agenda**

- No obligatory course book, but many to draw from
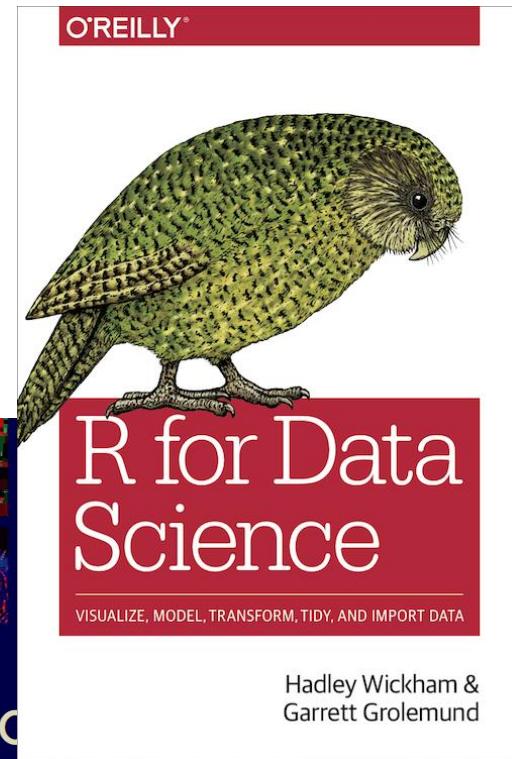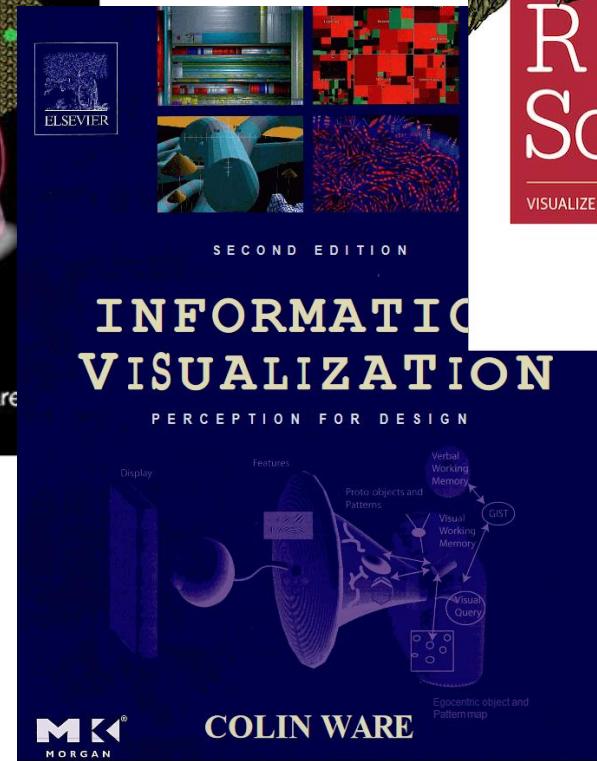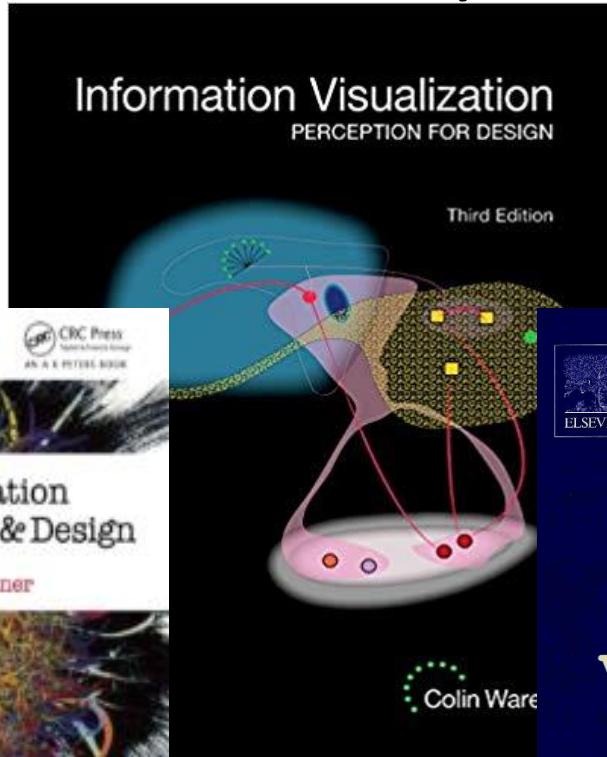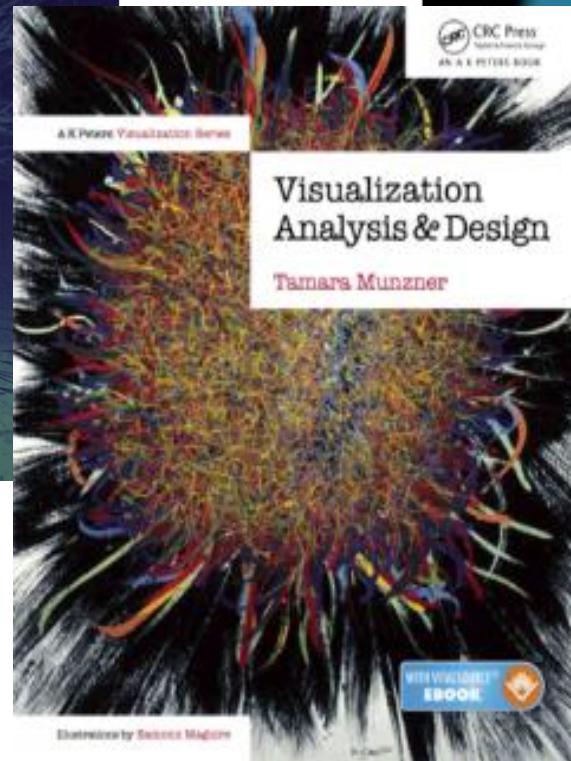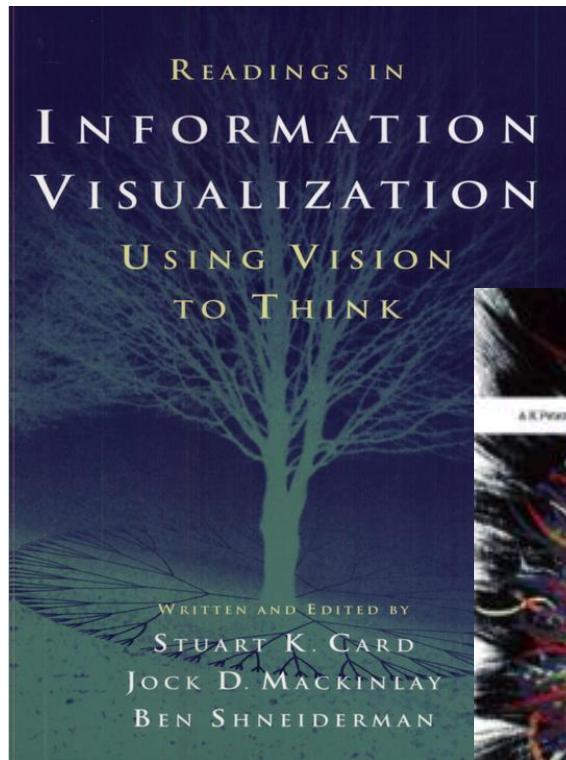
References (books)

- Bederson, B. B., & Shneiderman, B. (2003). *The Craft of Information Visualization: Readings and Reflections*. Morgan Kaufmann Publishers.

- Card, S. K., Mackinlay, J., & Shneiderman, B. (1999). *Readings in Information Visualization: Using Vision to Think*. (S. K. Card, J. Mackinlay, & B. Shneiderman, Eds.). Morgan Kaufmann.

- Munzner, T. (2014). *Visualization Analysis and Design*. CRC Press, A. K. Peters Visualization Series. Ch.1: What's Vis, and Why Do It?

- Murray, S. (2017). *Interactive Data Visualization for the Web* (2nd ed.). O'Reilly Media. https://alignedleft.com/tutorials/d3/

- Spence, R. (2014). *Information Visualization: An Introduction* (3rd Editio). Springer International Publishing Switzerland.

- Ware, C. (2013). Information Visualization: *Perception for Design* (3rd Edition). Morgan Kaufmann.

- Grolemund, G., & Wickham, H. (2017). *R for Data Science*. O'Reilly Media. Retrieved from https://r4ds.had.co.nz/

References (books)

- Tufte, E. R. (2001). *The Visual Display of Quantitative Information* (2nd ed.). Graphics Press.
- Tufte, E. R. (1990). *Envisioning Information* (4th ed.). Graphics Press.
- Tufte, E. R. (1997). *Visual Explanations: Images and Quantities, Evidence and Narrative*. Graphics Press.
- Tufte, E. R. (2006). *Beautiful Evidence* (1st ed.). Graphics Press.

http://www.edwardtufte.com/tufte/
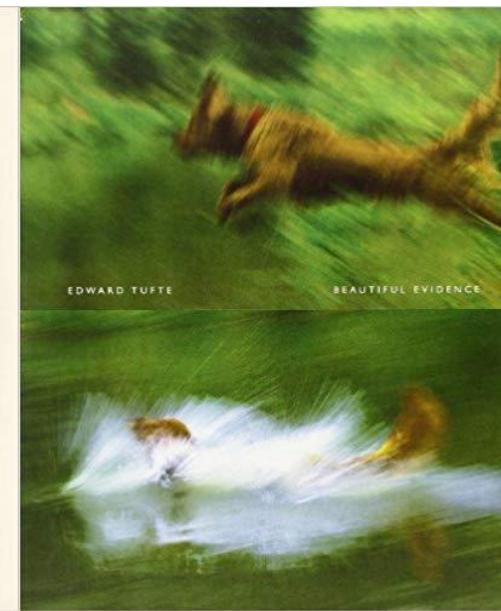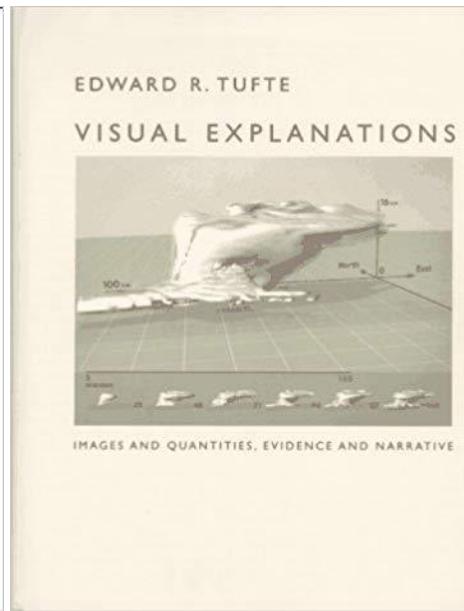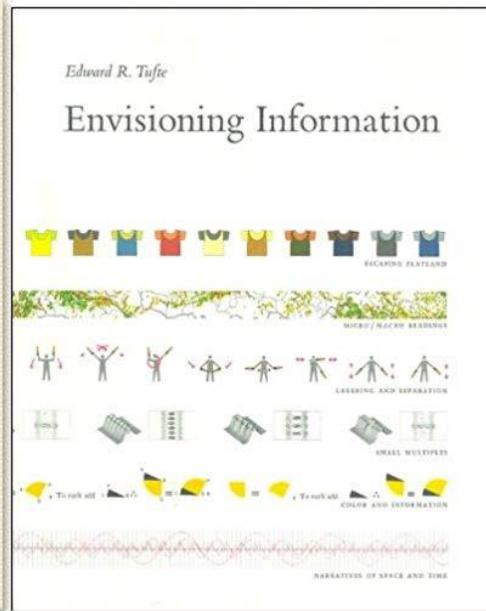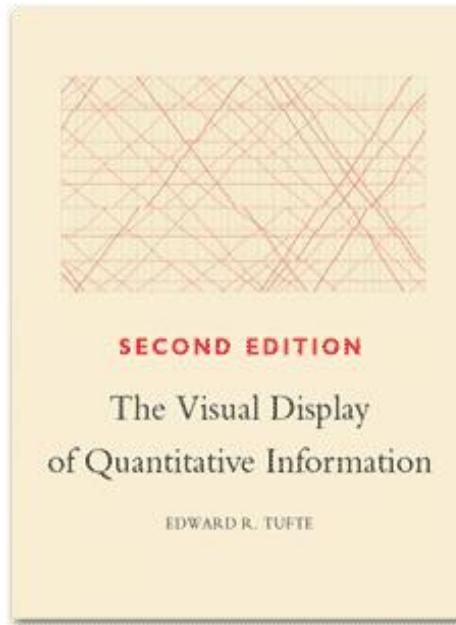
Other resources

- Websites with examples (e.g., [Flowing Data](#))

- Data / datasets (e.g., [Kaggle](#))

- Videos (e.g., Hans Rosling's talks)

- Conferences (e.g., [IEEE Vis](#))

- Tools (e.g., Tableau)

Course material - Get organized

- https://www.zotero.org/, https://www.mendeley.com/

Get organized: example Mendeley Desktop

Course content

- ## Introduction & definitions
  - Getting-to-know-us and practicalities
  - What is DataViz and why do it
  - Examples
- ## Perception
  - visual channel characteristics, color, size, shape, spatial layouts, etc., how human perception relates to creating effective data visualizations
- ## DataViz Principles – Representation
  - Raw data & data types, representation techniques (charts, lines, etc.)
- ## Presentation
  - Scrolling, flipping, context and detail, focus, zooming, etc.
- ## Interaction
  - Dynamic queries, Direct walk, Details-on-demand, Brushing, etc.

- **Visualization Tools**
  - (Excel)
  - Tableau
  - R (using tidyverse which incudes ggplot, Shiny…)
  - D3 (via <u>Observable</u>)
  - (Python)
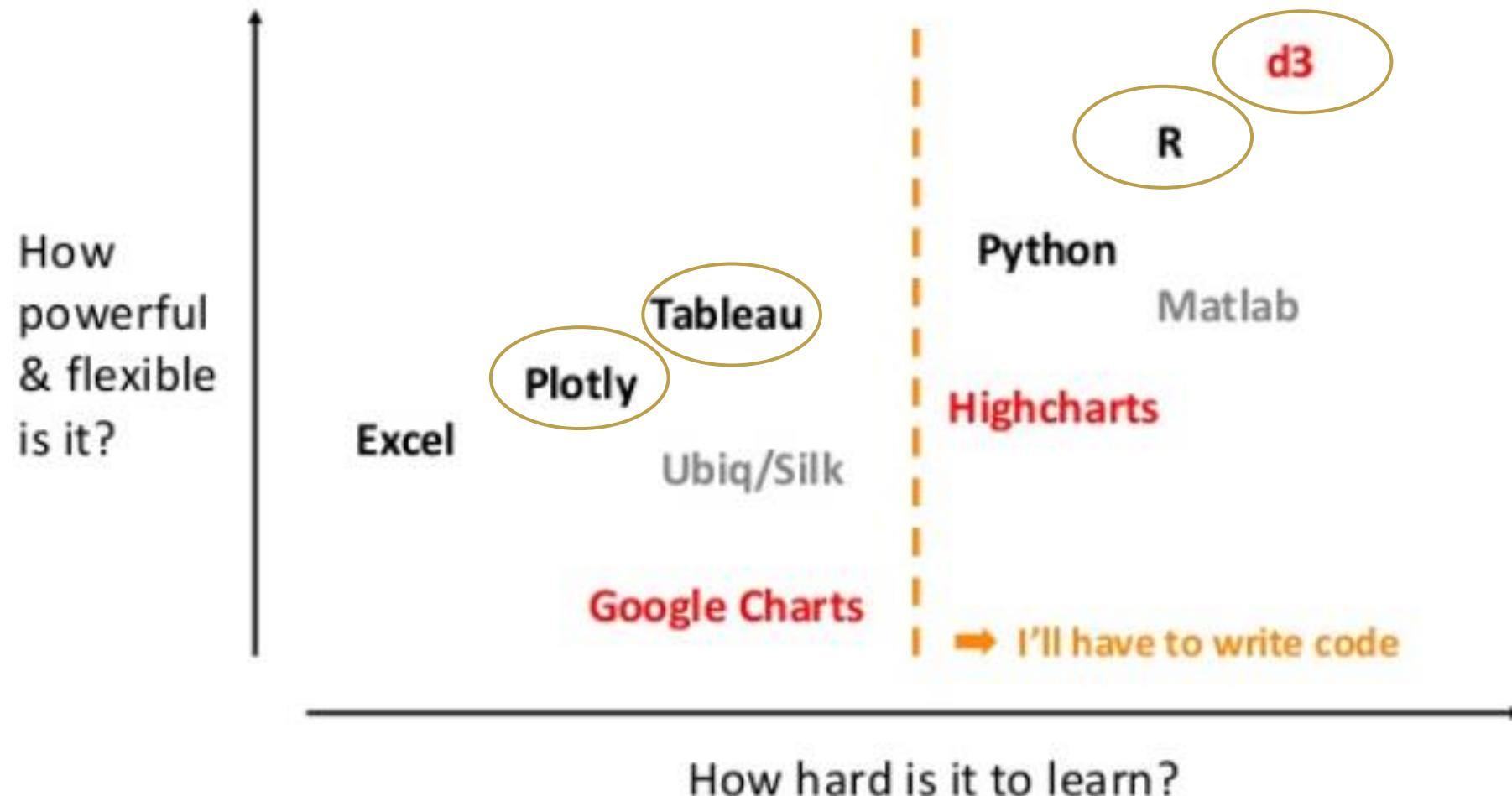
- Visualization Tools

- What is data visualization?
- What are the main purposes of data visualization?
- What are the major advantages of data visualization?
- What are the criteria of good visualizations?
- What kind of strengths of human visual system we should exploit for data visualization?
- What kind of weaknesses of human visual system we should avoid for data visualization?

What this course is NOT about

- It is not a graphic design course
- It is not a course to learn tools

but

- Exposure to a number of visual design concepts & tools
- Support by experts

Assignments

- ~Week **3**: individual assignment (Html5, CSS,…)
- ~Week **7**: individual assignment (Tableau)
- ~Week **9**: individual assignment (*tbd,* R)
- ~Week **11**: individual assignment (*tbd,* D3)

- ~Week **13**: Final Project Presentation
- ~Week **16**: Project documentation

(see eClass agenda for due dates)

- To visualize effectively a dataset

- Main phases of work:
  - Conceptualization - design
  - Implementation
  - Presentation (& documentation)

https://tinyurl.com/m126-projects

- ## 2023-2024 Group projects
  ## https://t.ly/4b3G3

1. **Visualizing Spotify Music Streaming Trends**
   https://spotifyviz.vercel.app/

2. **MobiliCity**
   https://eirkyr.github.io/MobiliCity/

3. **«Are we done with Airbnb yet? Alternative: Rents VS Airbnb, FIGHT!»**
   https://m126-visualizations-project.000webhostapp.com/M126-Template/

4. **Visualizing the Environmental Impact of Electric Vehicles**
   https://wheelygoodair.ovh/

5. **Visualizing Economic Indicators for Global Education (Connecting Education & Finance)**
   https://evankos.netlify.app/

6. **Visualizing Athens Airbnb Trends Insights for Hosts and Travelers**
   https://sophiaross26.github.io/Airbnb-project/

7. **Visualising Greece's Demographic Downturn**
   https://kostantinostheo.github.io/vizginius/

8. **Αμβλώσεις: Οπτικοποίηση της έρευνας και των στατιστικών στοιχείων για τις αμβλώσεις**
   https://nikpnevmatikos.github.io/Data-Visualization-Abortion-Laws/

9. **Wanna EU Relocate?**
   https://nikoletos-k.github.io/Wanna-EU-Relocate-DataViz-2024/

10. **Visualizing the Humanitarian Crisis in Palestine**
    https://zazos.github.io/DataViz-website

11. **Talk is cheap; show me the code**
    https://jimtsiob.github.io/data-viz-comp-prog/

Final Group Projects 2022-2023

■ ## 2022-2023 Group projects

https://tinyurl.com/m126-2023

- ## 2021-2022 Group projects
  https://tinyurl.com/328sxwe7
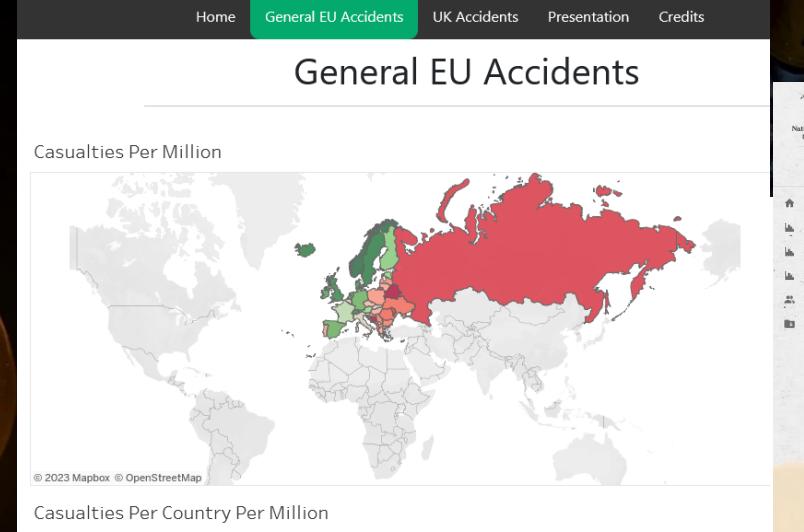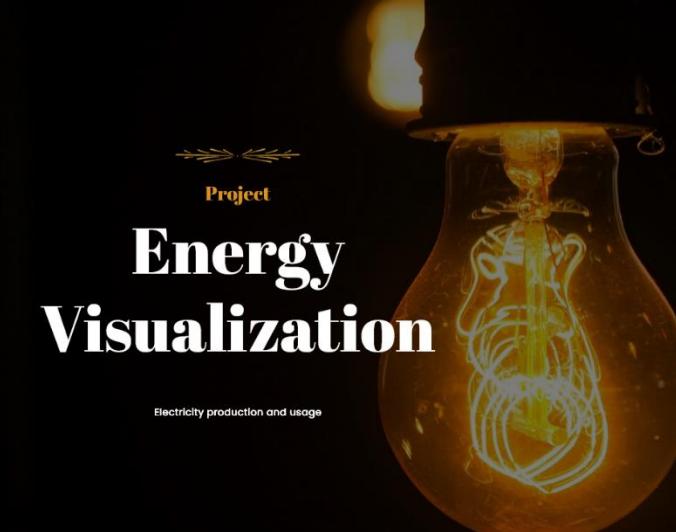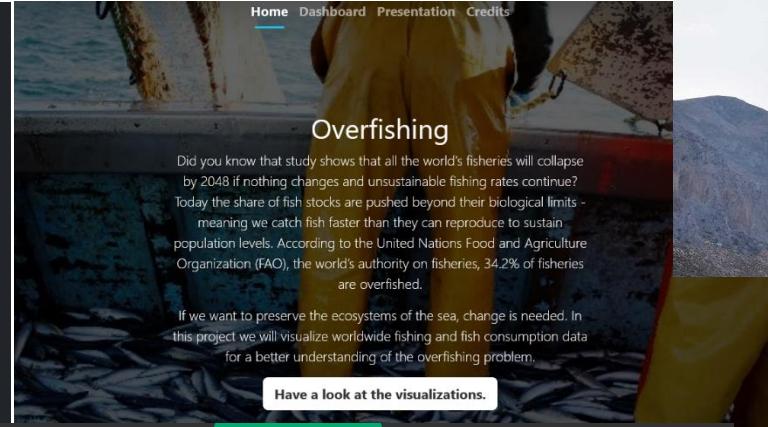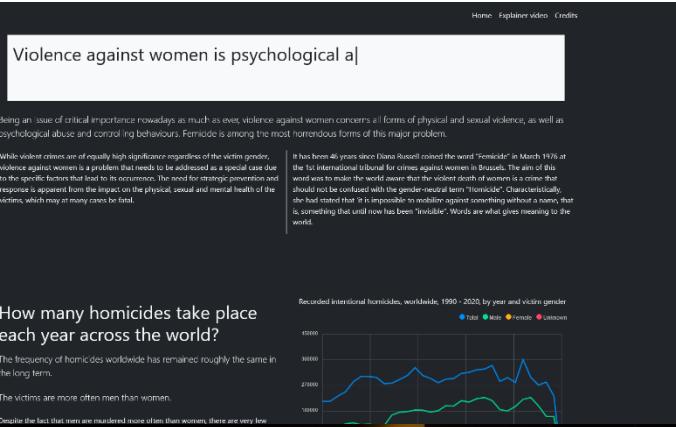
Final Group Projects 2020-2021

- ## 2020-2021 Group projects
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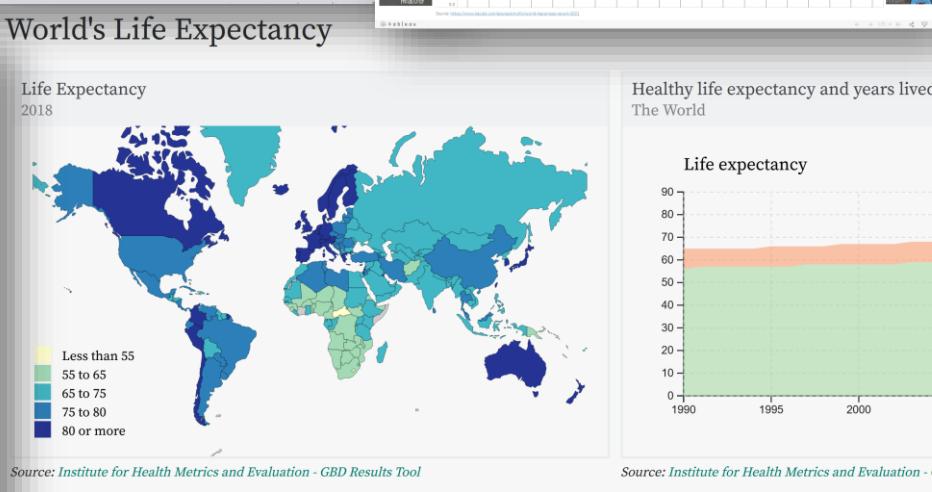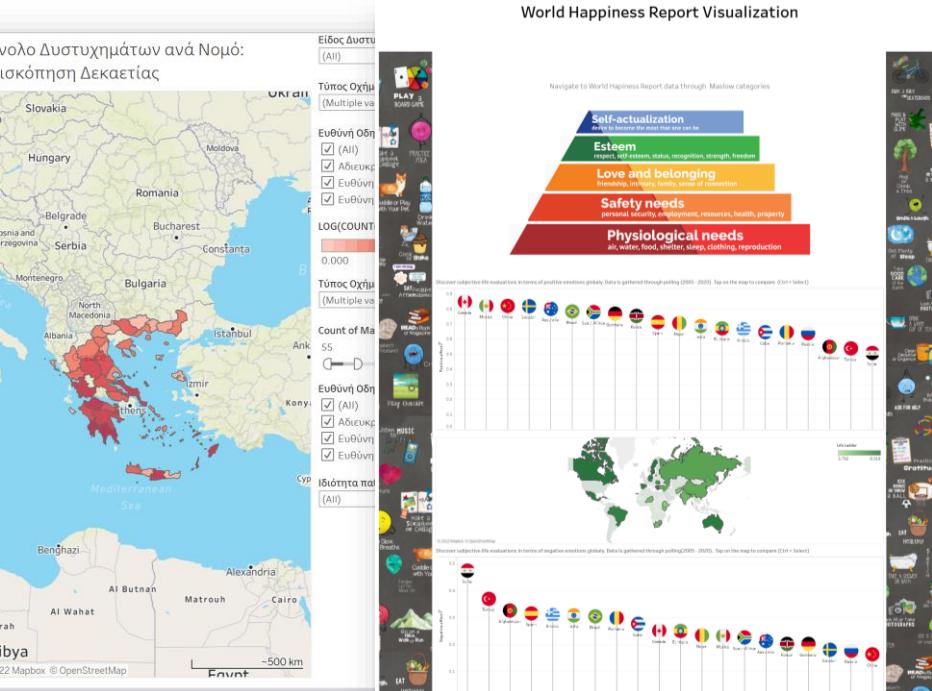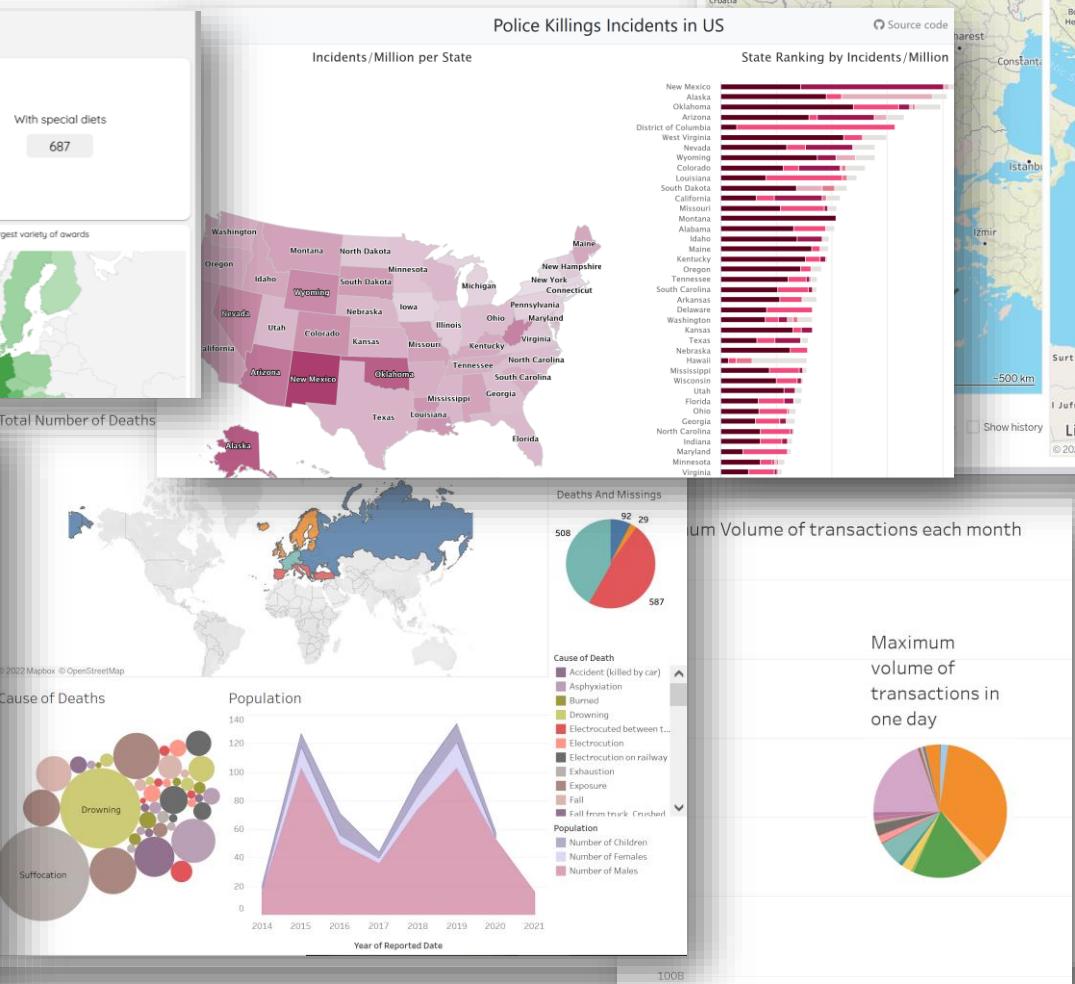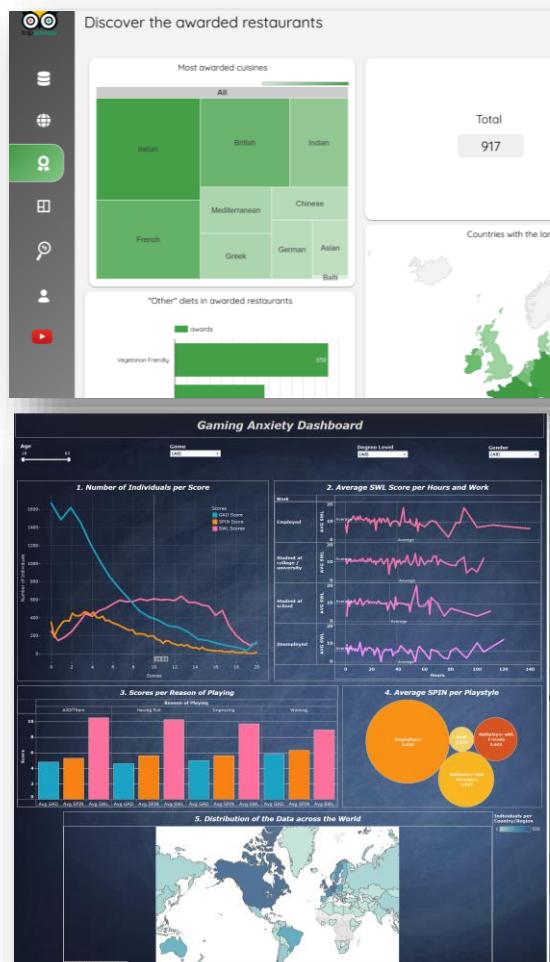
Final Group Projects 2020-2021

1. Restaurants in Europe: A Visualization Analysis
Site: https://datastudio.google.com/u/0/reporting/d9941ae3-5460-43d1-ae10-4db6416db2a3/page/3nn6B
Video: https://youtu.be/PtcYpt6As1Y

2. **Cryptocurrencies**
Site: https://datavisualisation2021.github.io/Cryptocurrency/
Video: https://datavisualisation2021.github.io/Cryptocurrency/credits.html

3. **Εξαφάνιση Προσφυγικών Ροών 2014-2021**
Site: https://elenapashali.github.io/DataProjectGroup3/
Video: https://youtu.be/uJANgP5s41o

4. **Οδική Ασφάλεια**
Site: http://users.uoa.gr/~ic1200016/m126/index.html

Final Group Projects 2020-2021

5. **World Happiness Report Visualization**
Site: https://ippokratoys.github.io/world-life-happiness-visualization/
Video: https://youtu.be/Mizq_obRqvY

6. **GamingAnxiety**
Site: https://mikemitsios.github.io/Gaming_Anxiety/index.html
Video: https://www.youtube.com/watch?v=taYprdbYI0E

7. **World's Life Expectancy**
Site: https://lefkothea-bianca.github.io/Data-Visualization-Project.github.io/
Video: https://youtu.be/QKzmGfvBxus

8. **Police Killings Incidents in US**
Site: https://jbalasis.github.io/dataVisualization/dashboard
Video: https://jbalasis.github.io/dataVisualization/video

9. **Students' Performance**
Site: https://app.powerbi.com/groups/me/apps/cc52c2b9-b854-42b1-99cf-f873e3d6c20c/reports/34c779d7-9c5b-42a2-b0b8-847e33c6fc03/ReportSection
Video: https://drive.google.com/file/d/13RX7_iuDjaj9Ek0DpQ2CzOJb_PytmSTP/view

- ## 2019-2020 Group projects
  ### https://tinyurl.com/y76394h2
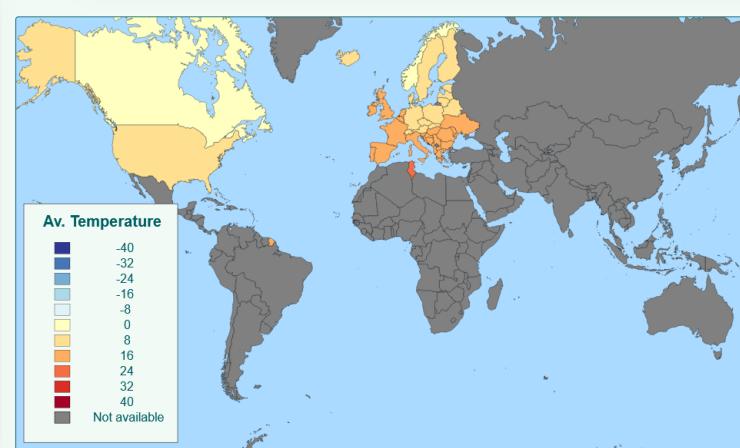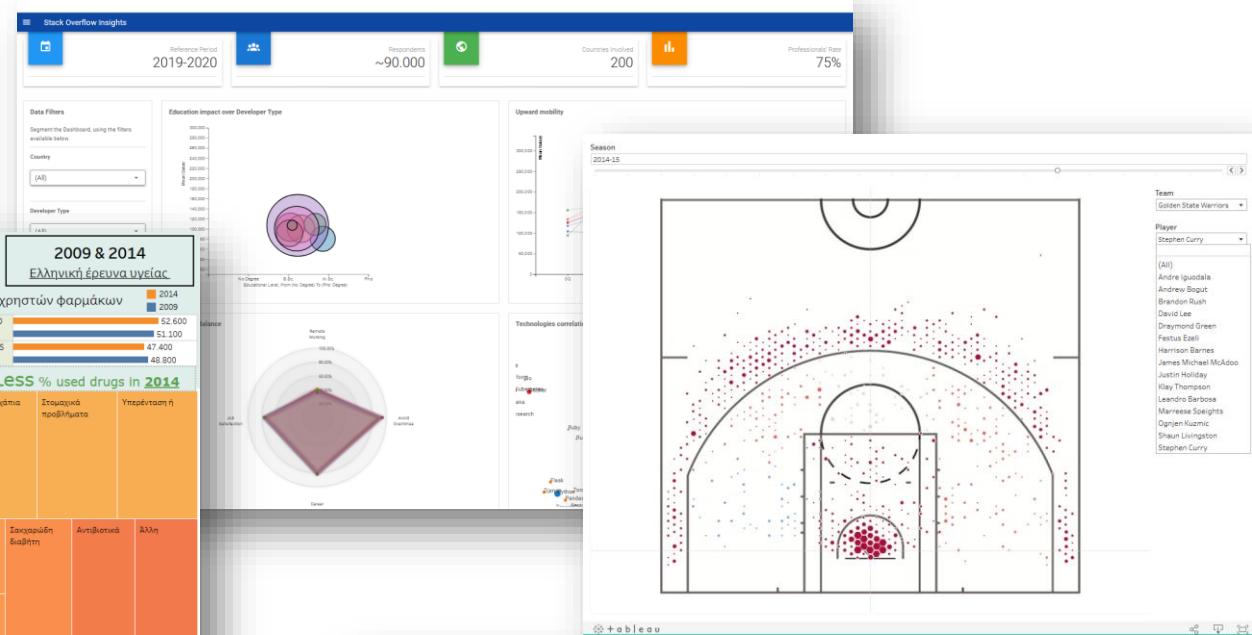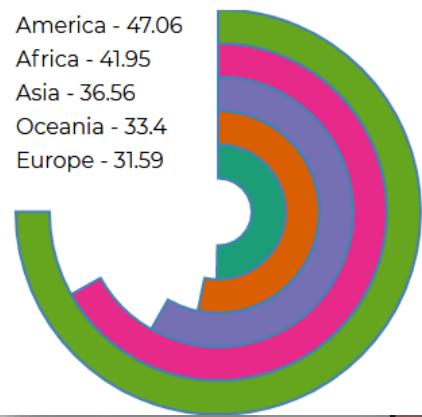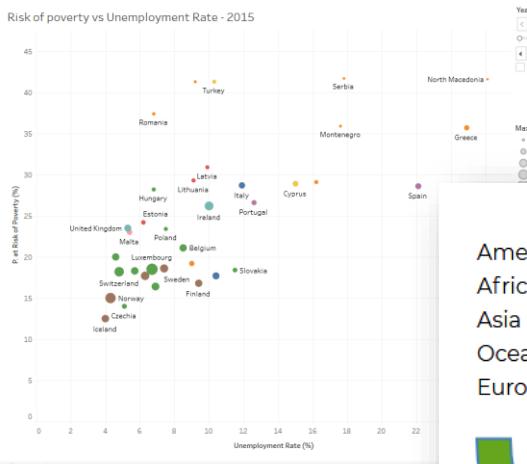
1. Health data visualizations in Greece

Site: https://vnansi.github.io/dashboardabouthealth

Video: https://youtu.be/_qVkE7krq5I

2. Netflix Data Visualisation

Site: https://kleanthi7.shinyapps.io/NetflixDataVisualisation

Video: https://www.kapwing.com/videos/5f0b66a3dce446001502e5c8

3. The Big Screen Visualization

Site: https://xkitsios.github.io/DataVizProject/

Video: https://youtu.be/7j08kc5-c6E

4. NBA Shot Evolution

Site: https://in7ictus.github.io/m126/

Video:
https://github.com/in7ictus/m126/blob/master/assets/presentation.mp4

5. Stack Overflow Insights

Site: https://stackoverflow-viz-app.github.io/stackoverflow-developers-insights/

Video: https://youtu.be/wSOmzuOE2eA

6. World Income inequality

Site: https://income-inequality-dv.herokuapp.com/dashboard

Video: https://income-inequality-dv.herokuapp.com/video

7. Social Inequalities between EU students

Site: https://jvardas.github.io/group-7-dataviz/

Video: https://vimeo.com/437672319

8. Movie Data Visualization

Site: http://83.212.107.231/#main_dashboard_graphs

Video: https://www.dropbox.com/s/kp6ia864v0yydbp/2020-07-12%2018-49-15.mkv?dl=0

9. Global Warming

Site: https://kostis30fyllou.github.io/climate-change/

Video: https://www.youtube.com/watch?v=OwR-5u2MhfI&feature=youtu.be

- See
  "The Role of Big Data Visualization in an Era of Pandemics"
  Open Conference, November 2020
  https://youtu.be/xP257qHKcME

Data Visualization: What and why?

Homework assignment

"Build a basic website about yourself using HTML5, CSS, SVG, Javascript, jQuery"

The website must include at least 3 interlinked webpages containing:

- 1-2 paragraphs about yourself and a picture of yourself
- CSS to style the pages, with specific styles for at least 5 elements
- On one page, a **data-driven visualization image** that you found on the web, with a one paragraph explanation of why you chose it
- On one page give credit to all the sources you have used to build the website (e.g. jQuery License: MIT and jQuery License)

- One of the pages must include an <u>SVG</u> showing at the same time three animated (moving in time) and colored geometric shapes

- Must allow the user to click on the animated shapes and in response perform some action on the shapes (disappear them, freeze/unpause them, etc).

Homework assignment

Start by completing:
- codecademy.com HTML and CSS tutorials
- codecademy.com JavaScript and jQuery tutorials
- W3schools SVG tutorial

Alternatively,
- W3schools HTML
- Dive Into HTML5 – Homepage
- Dive Into HTML5 - Canvas

- Links for visualization examples, feel free to browse through bloomberg.com, nytimes.com, nasa.gov, … (see eClass **Resources**)

Thank you!

mroussou@di.uoa.gr

https://eclass.uoa.gr/courses/DI453/

Discord: https://tinyurl.com/m126-discord-25