Introduction to Data Science

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TU WIEN TECHNISCHE UNIVERSITÄT WIEN

CINECA

VSB TECHNICAL UNIVERSITY OF OSTRAVA | IT4INNOVATIONS NATIONAL SUPERCOMPUTING CENTER

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Data formats

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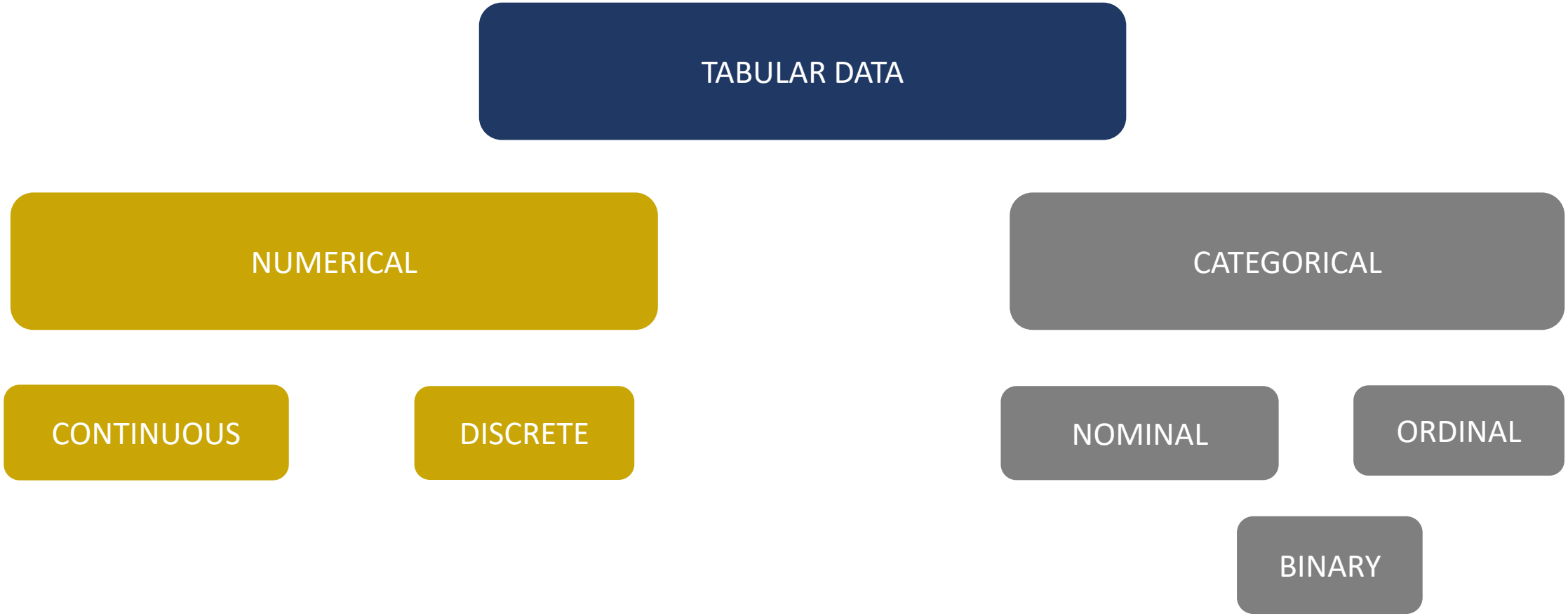

Numerical continuous data

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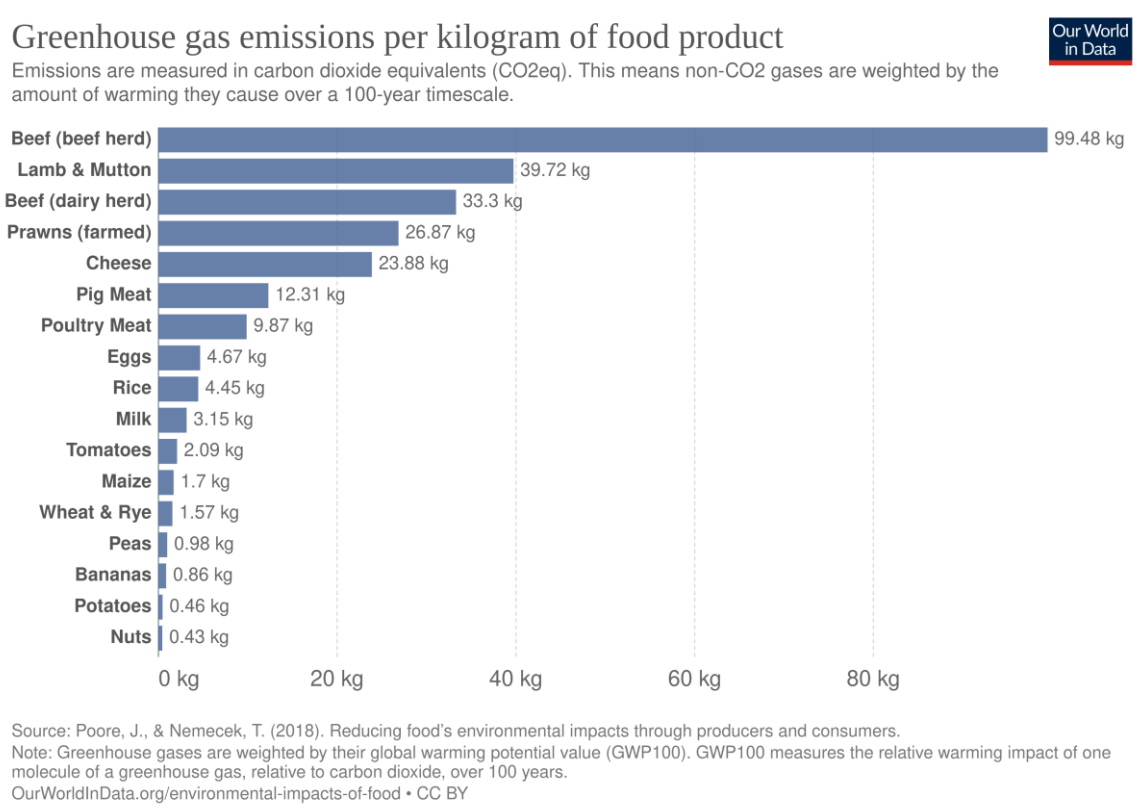
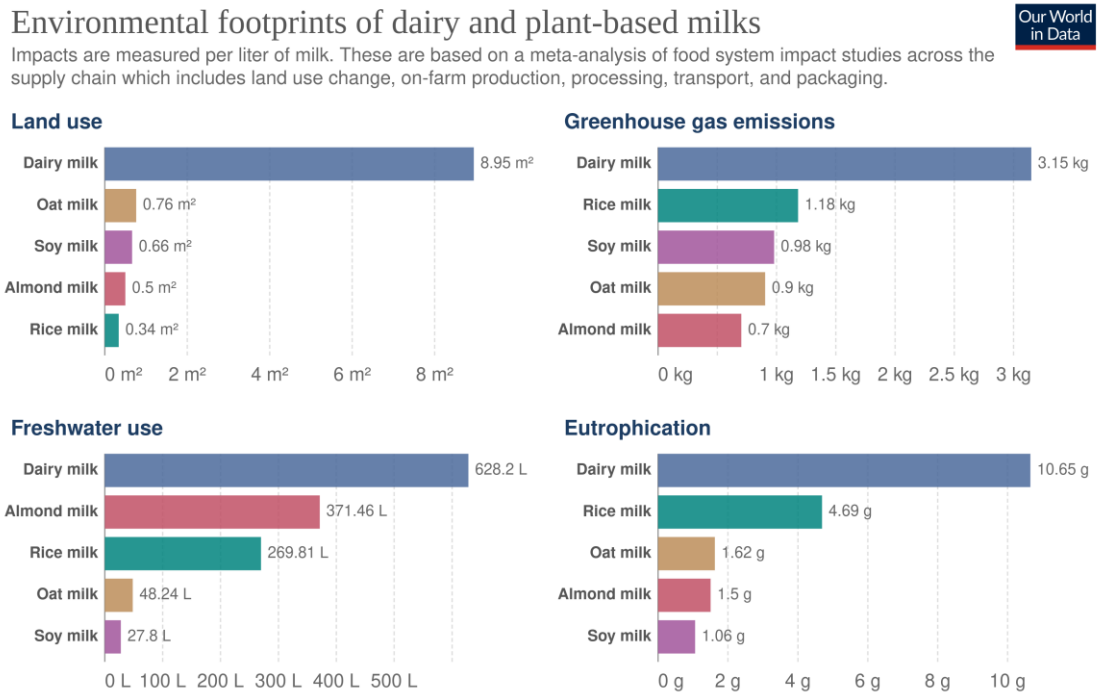


Source: Poore, J., & Nemecek, T. (2018). Reducing food's environmental impacts through producers and consumers.
Note: Greenhouse gases are weighted by their global warming potential value (GWP100). GWP100 measures the relative warming impact of one molecule of a greenhouse gas, relative to carbon dioxide, over 100 years.
OurWorldInData.org/environmental-impacts-of-food • CC BY



Source: Poore, J., & Nemecek, T. (2018). Reducing food's environmental impacts through producers and consumers. Science.
OurWorldInData.org/environmental-impacts-of-food • CC BY

https://ourworldindata.org/environmental-impacts-of-food

Numerical discrete data

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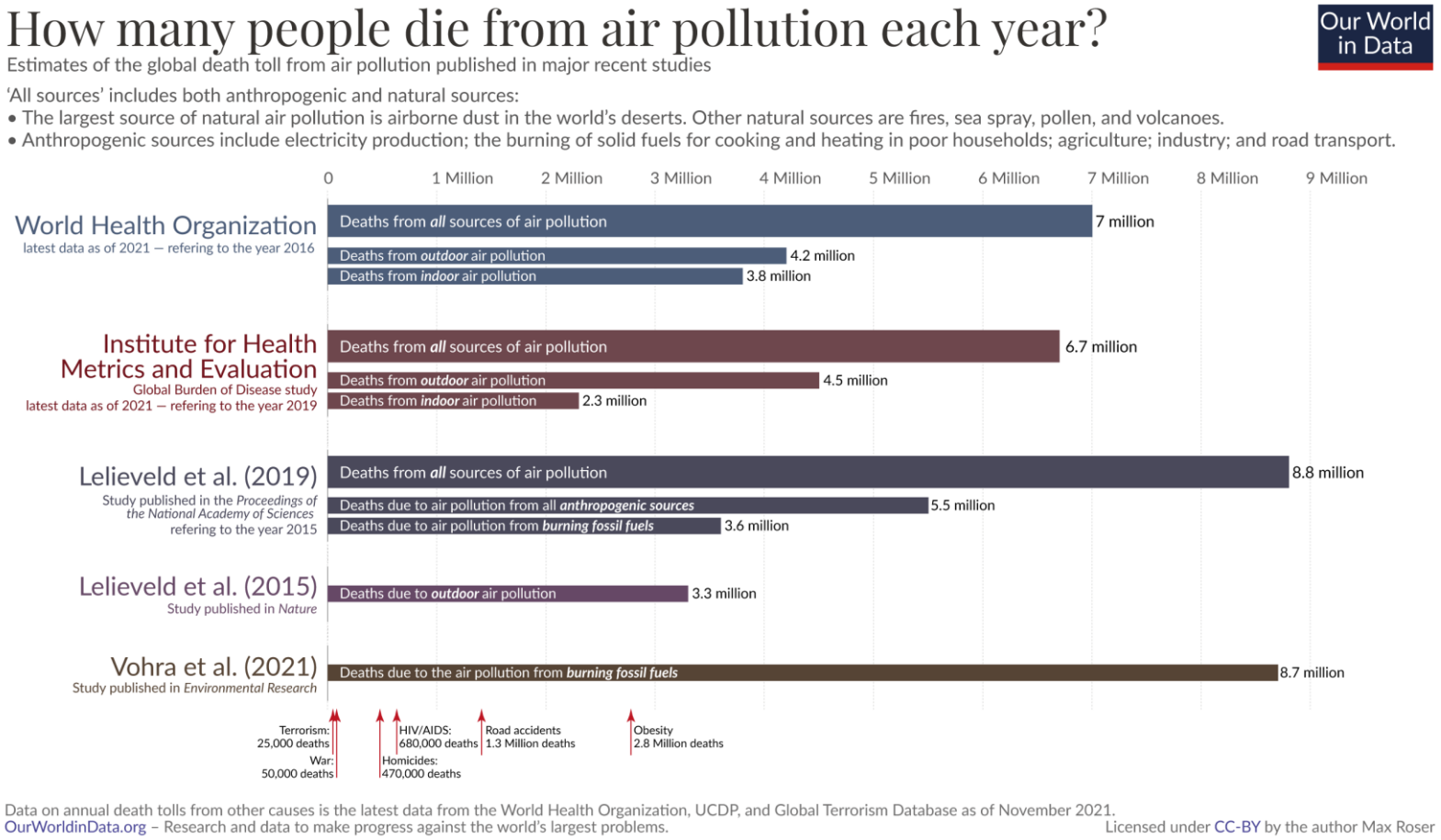

https://ourworldindata.org/data-review-air-pollution-deaths

Nominal data

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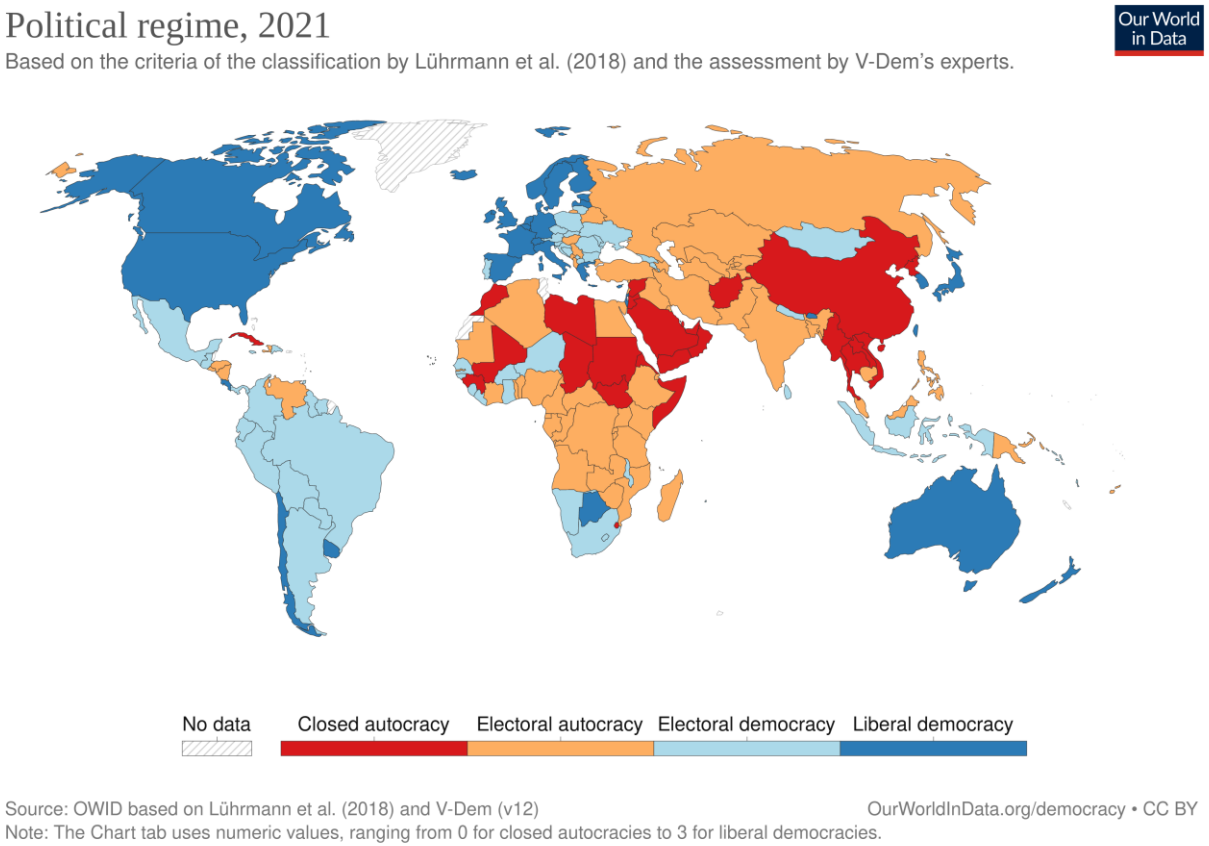

https://ourworldindata.org/democracy

Ordinal data

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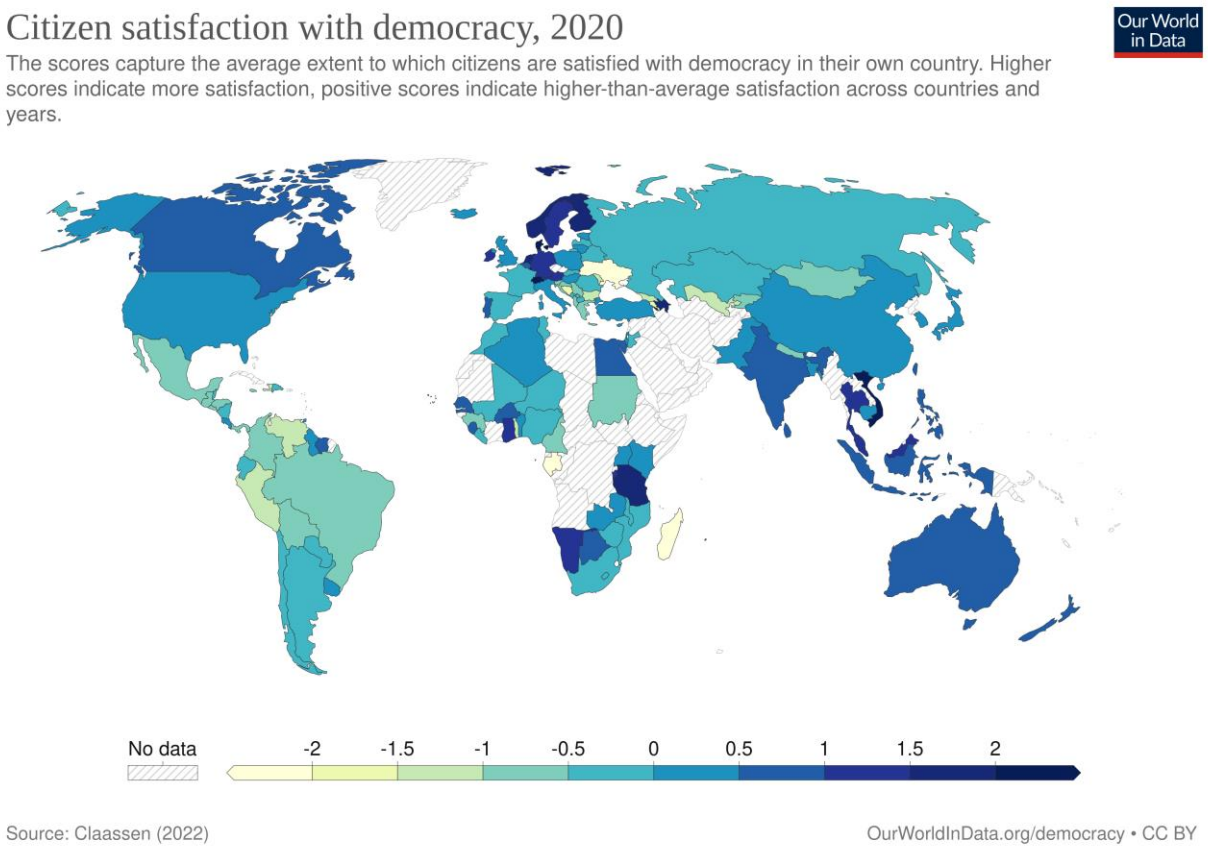

https://ourworldindata.org/influenza-deaths

Binary data

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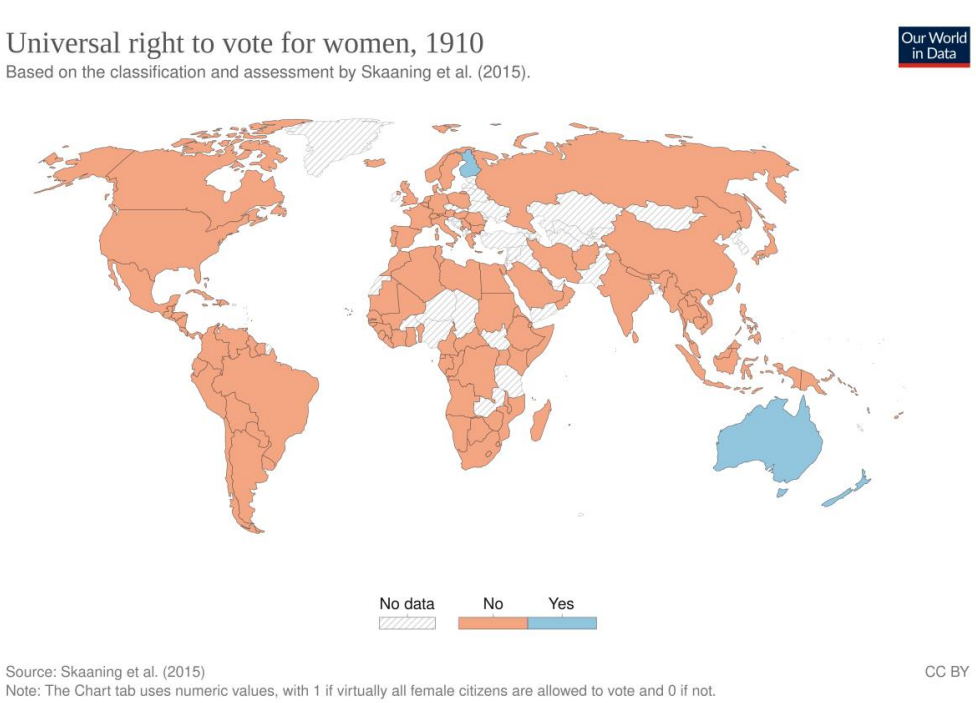

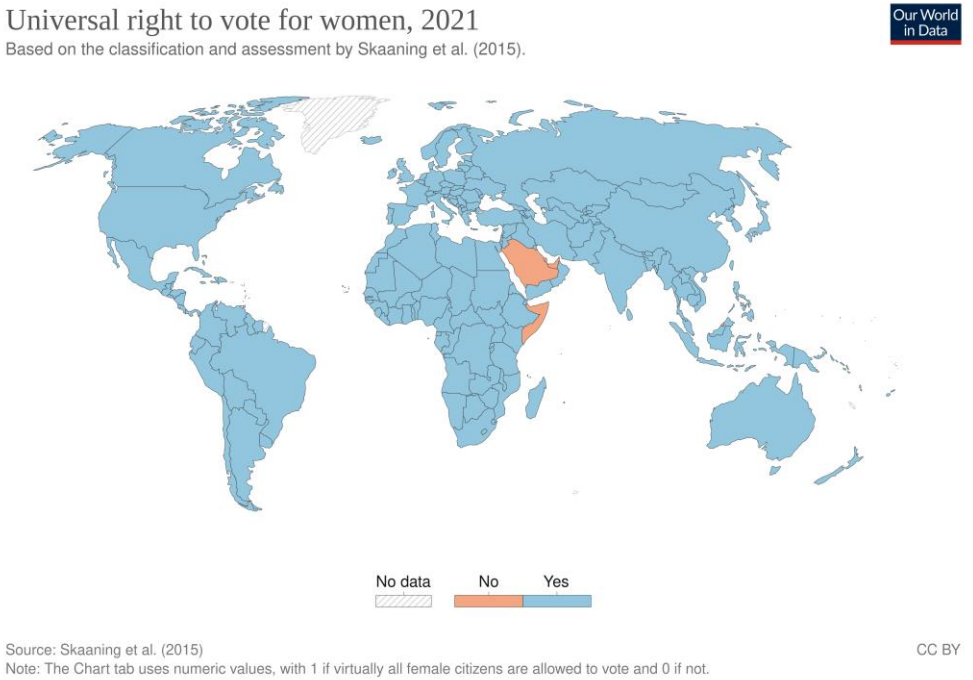

https://ourworldindata.org/democracy

Each format has its own visualization

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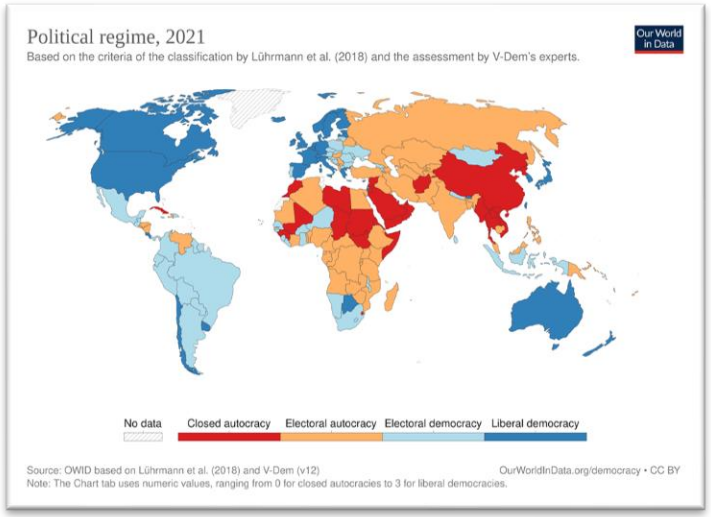

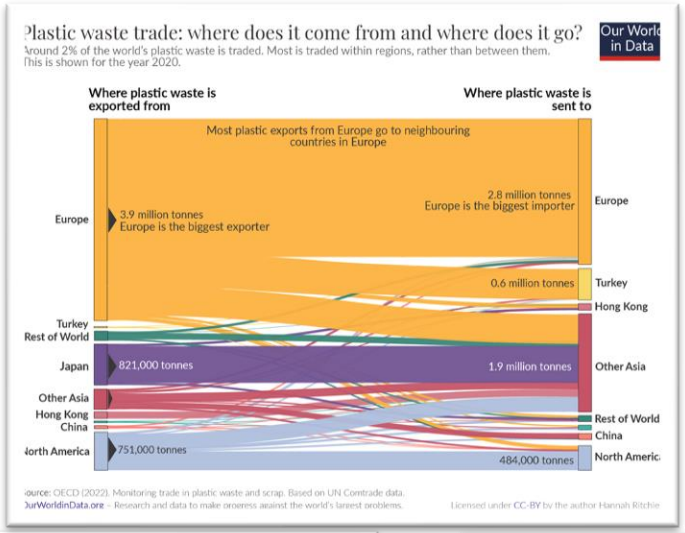

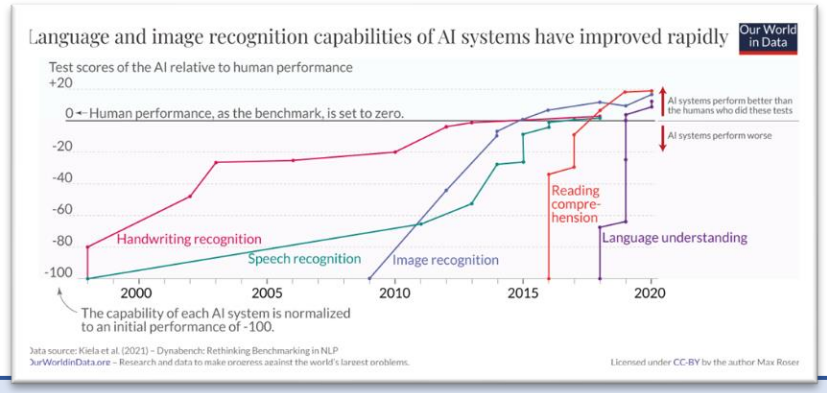

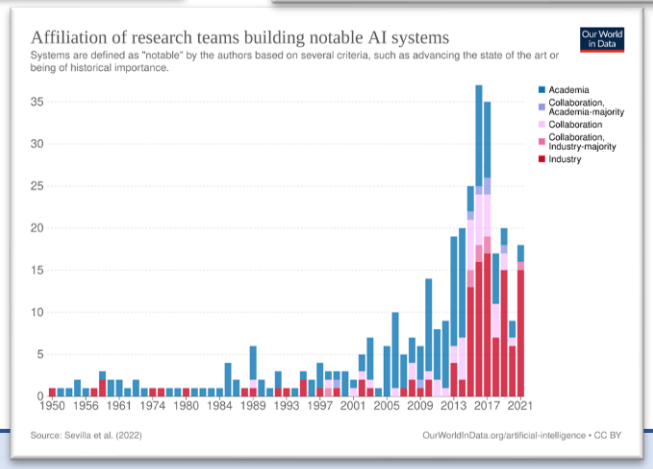

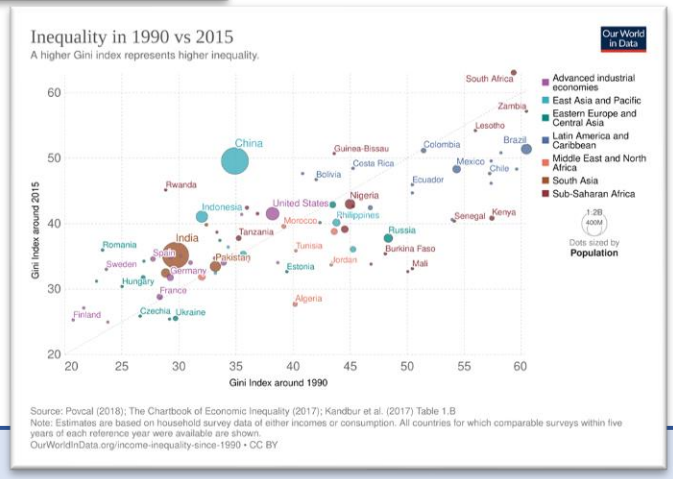

https://ourworldindata.org/

Non tabular data: images

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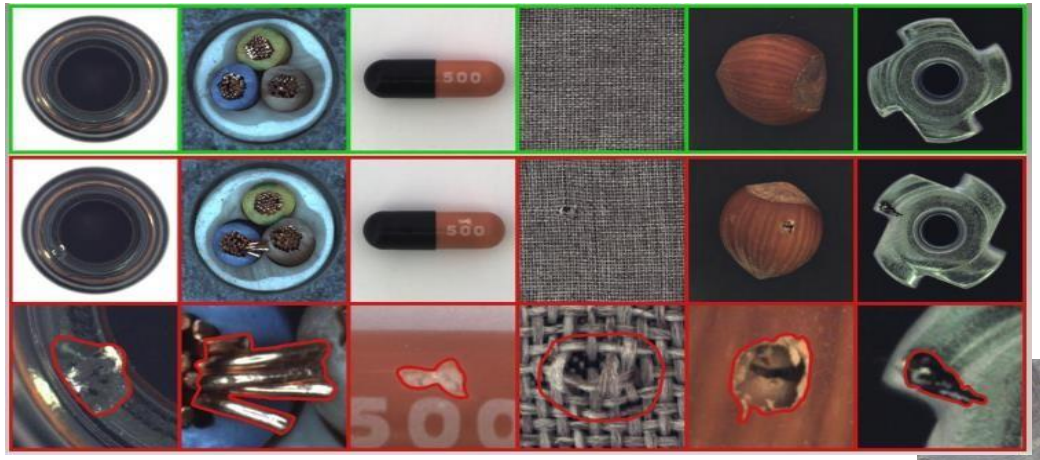

Non tabular data: videos

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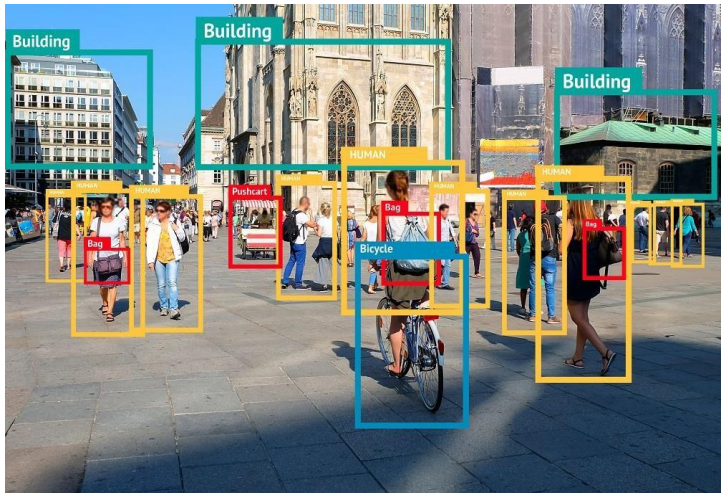

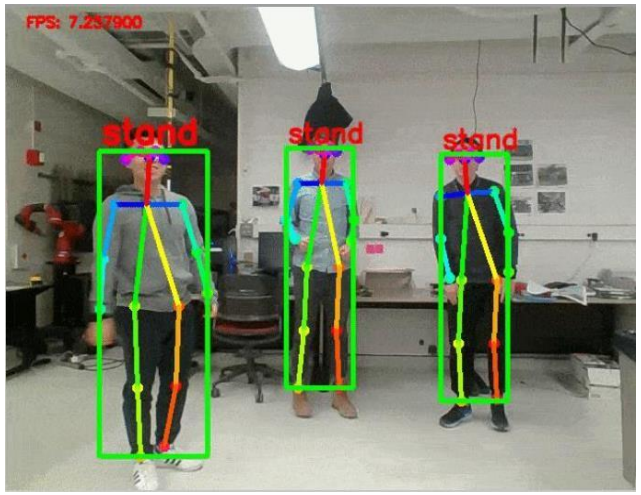

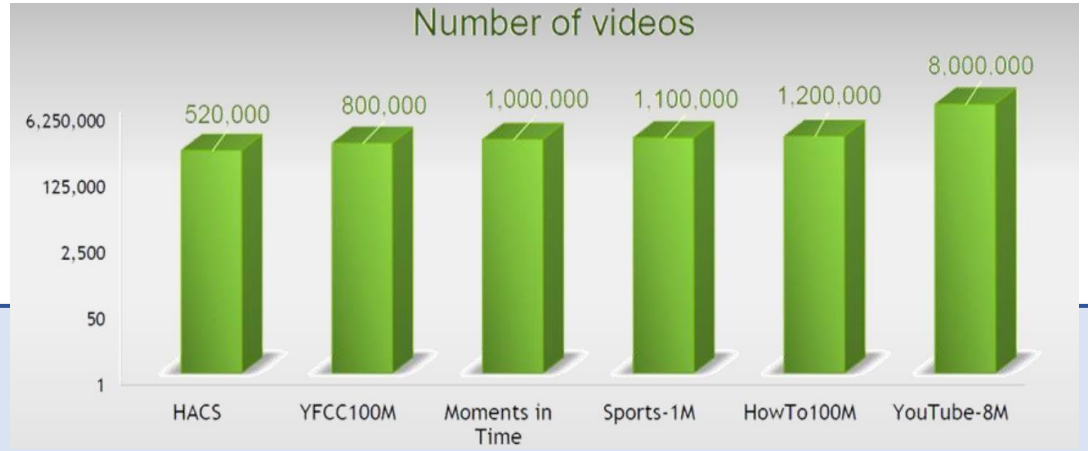

Non tabular data: text & audio

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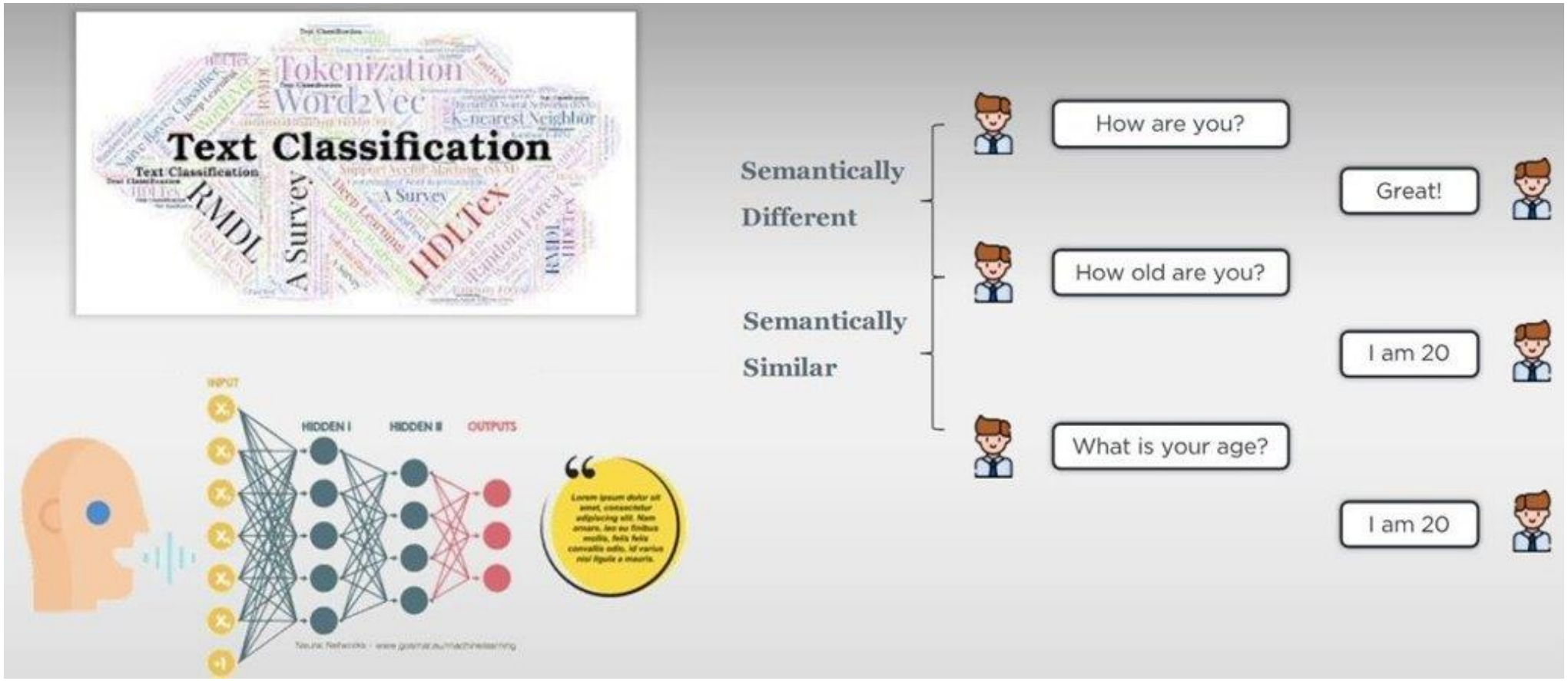

Where to find GOOD data

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https://ourworldindata.org/

https://www.kaggle.com/

https://paperswithcode.com/datasets

first_steps_with_data.ipynb

Garbage in, garbage out

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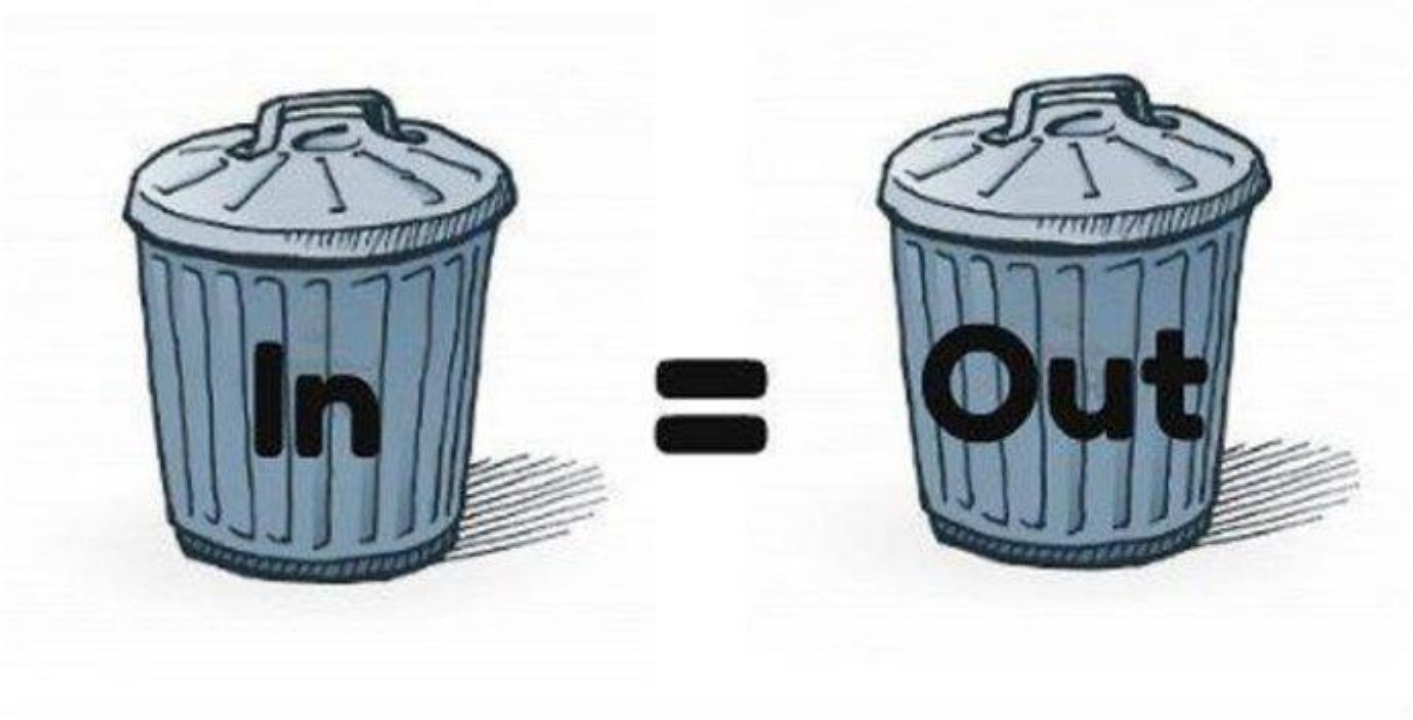

https://candysdirt.com/2016/05/27/property-taxes-garbage-garbage/

Missing data

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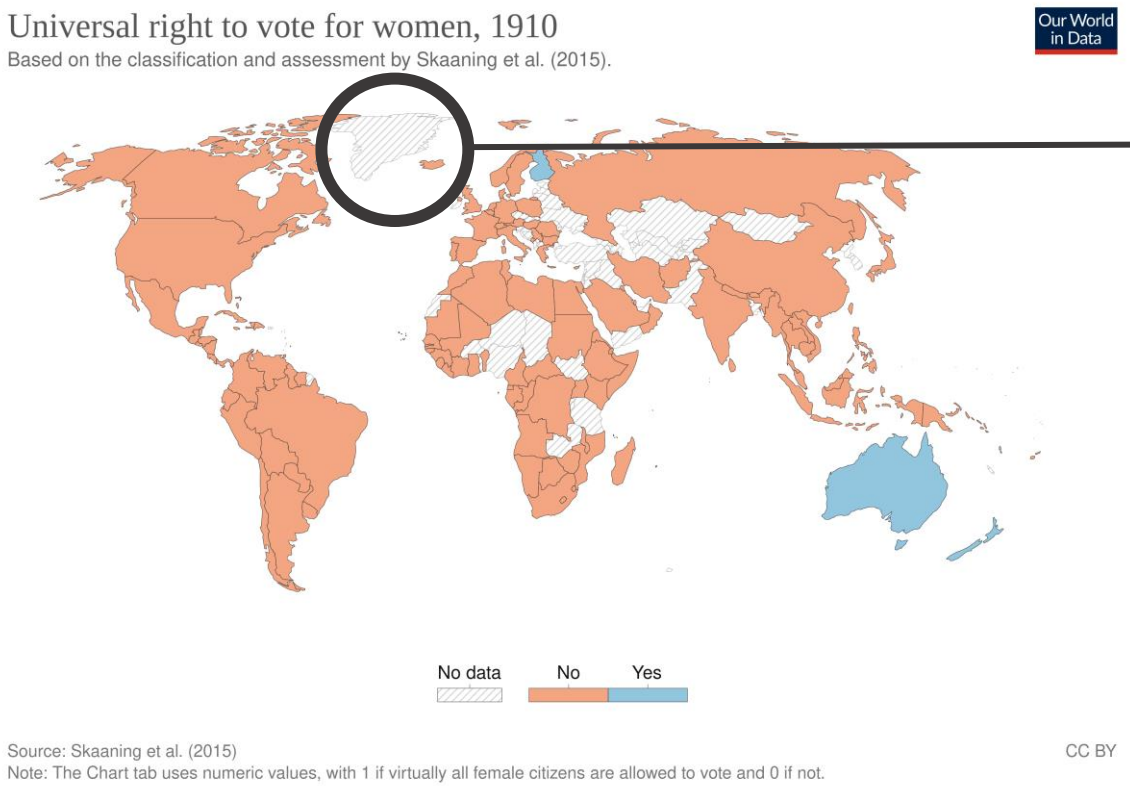

Missing data

https://ourworldindata.org/democracy

Outliers

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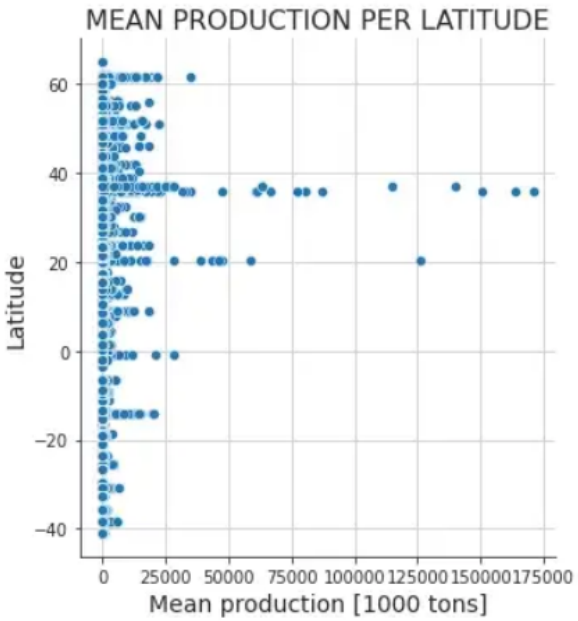
Outliers: data points **significantly** different from the others.

GRAPHICAL APPROACH



Z SCORE

$Z=(x-m)/s$

- m=mean
- s=standard deviation
- x=data point

https://towardsdatascience.com/how-to-detect-outliers-in-a-data-science-project-17f39653fb17

Unbalanced data

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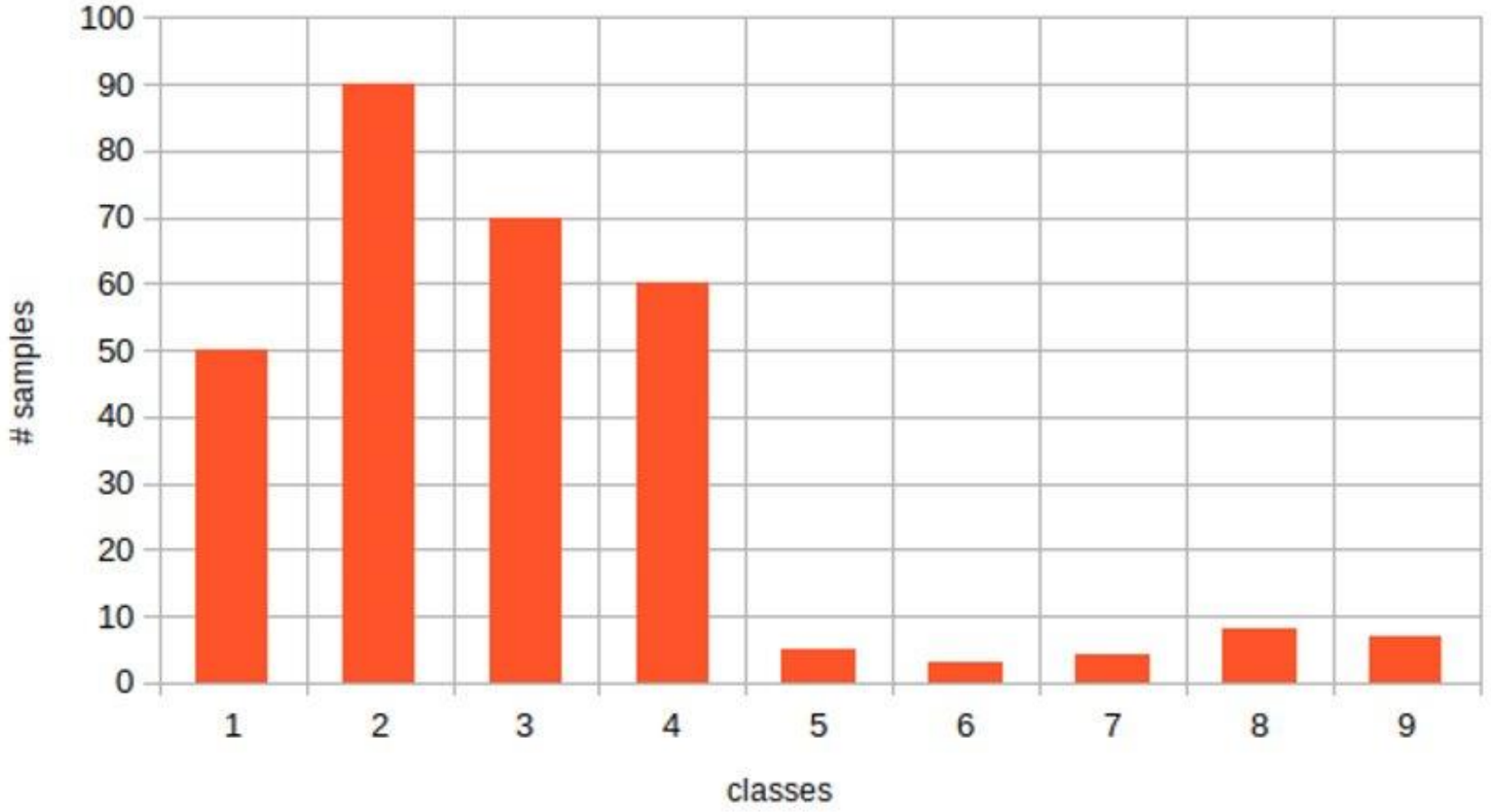

Unbalanced data

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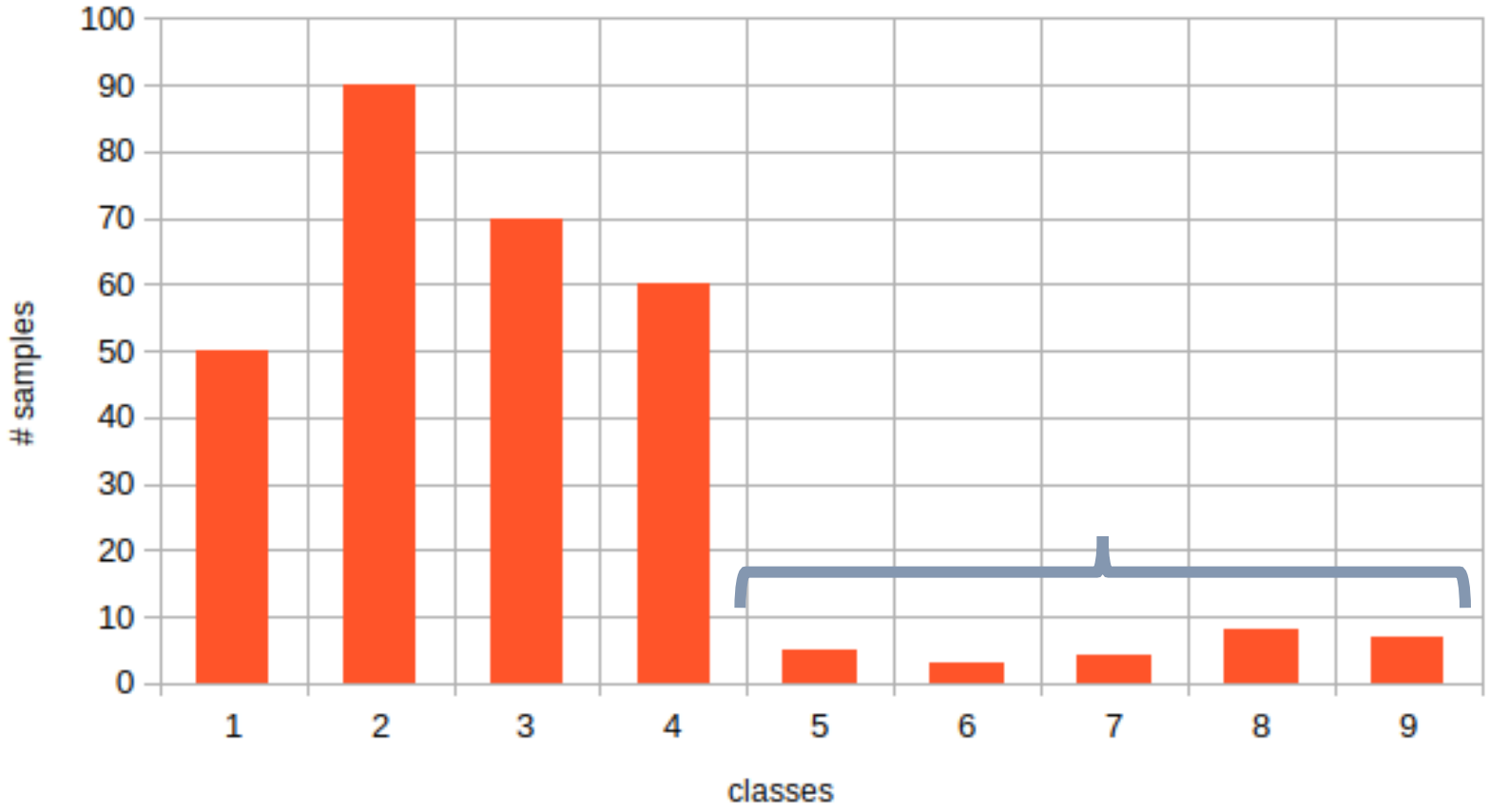

Rare events

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(A) **Cow: 0.99**, Pasture: 0.99, Grass: 0.99, No Person: 0.98, Mammal: 0.98

(B) No Person: 0.99, Water: 0.98, Beach: 0.97, Outdoors: 0.97, Seashore: 0.97

(C) No Person: 0.97, **Mammal: 0.96**, Water: 0.94, Beach: 0.94, Two: 0.94

Fig. 1. Recognition algorithms generalize poorly to new environments. Cows in 'common' contexts (e.g. Alpine pastures) are detected and classified correctly (A), while cows in uncommon contexts (beach, waves and boat) are not detected (B) or classified poorly (C). Top five labels and confidence produced by ClarifAI.com shown.

Wrong labels

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	snake	cat	dog	spider
snake	50	0	0	0
cat	0	40	20	0
dog	0	10	30	0
spider	0	0	0	50

Wrong labels

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	snake	mammal	spider
snake	50	0	0
mammal	0	50	0
spider	0	0	50

Numerical continuois data

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Wikipedia

Any problems?

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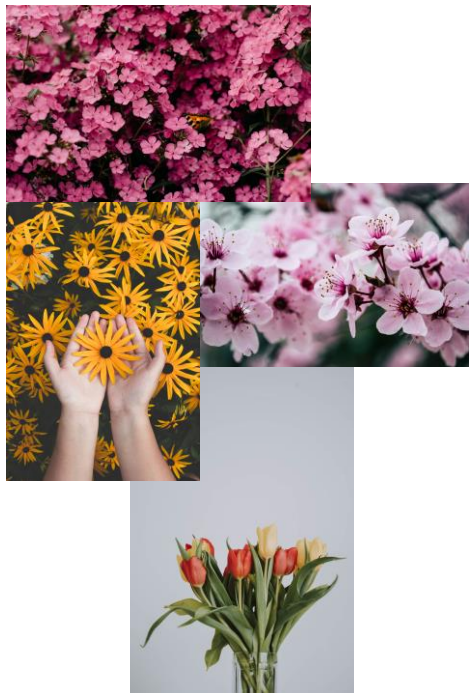

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Study finds gender and skin-type bias in commercial artificial-intelligence systems

Examination of facial-analysis software shows error rate of 0.8 percent for light-skinned men, 34.7 percent for dark-skinned women.

Watch Video

Larry Hardesty | MIT News Office
February 11, 2018

PRESS INQUIRIES

Joy Buolamwini, a researcher in the MIT Media Lab's Civic Media group

Photo: Bryce Vickmark

https://news.mit.edu/2018/study-finds-gender-skin-type-bias-artificial-intelligence-systems-0212

Exercise

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Same procedure of the hands-on session but with another dataset

- Download the dataset
- Look at the variables
- Plot some values
- Explore the data

Thank you for your attention!

http://sctrain.eu/

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