Finding and Evaluating Data Sets

Data Bootcamp - January 2023
Library Guide about Finding/Evaluating Data Sets:
https://libguides.colorado.edu/findingdatasets/2023

What is data?

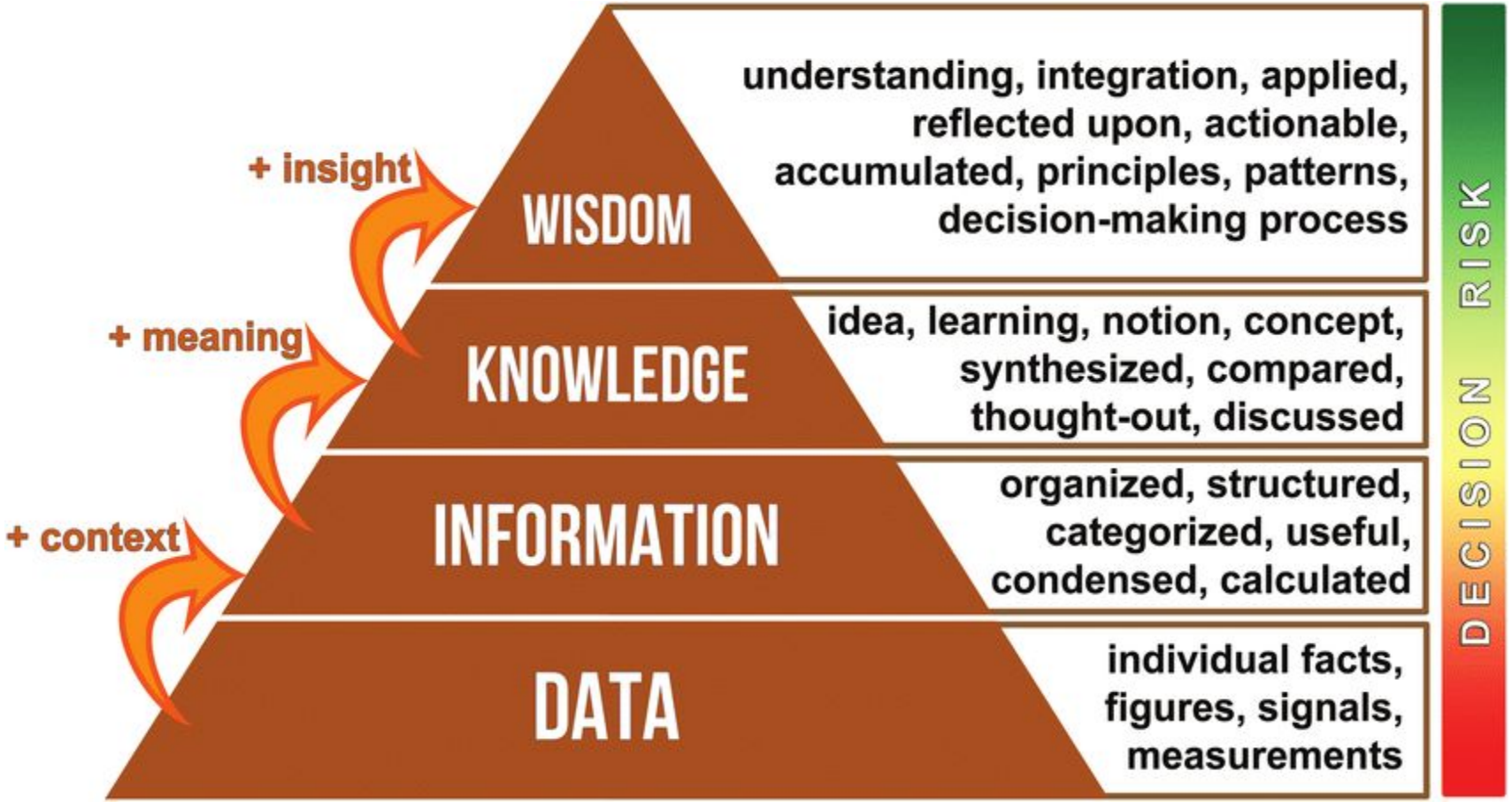
Data: discrete values or units of information that can take many forms: numbers, words, characters, images, sound recordings, videos. Data is anything that can be collected, stored, organized, and analyzed

Traditional Data:

- structured format
- stored in relational databases (uses tables, each row has a unique identity or ‘key’)

Big Data:

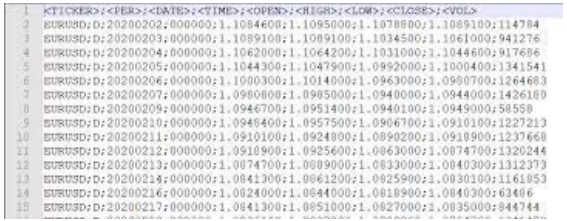
- Large volume of data (too big for relational databases)
- Variety of formats/types of data
- Receives data at high velocity (and often is constantly being created and stored)
- Stored in data warehouses (w/software framework such as Hadoop) or in the cloud

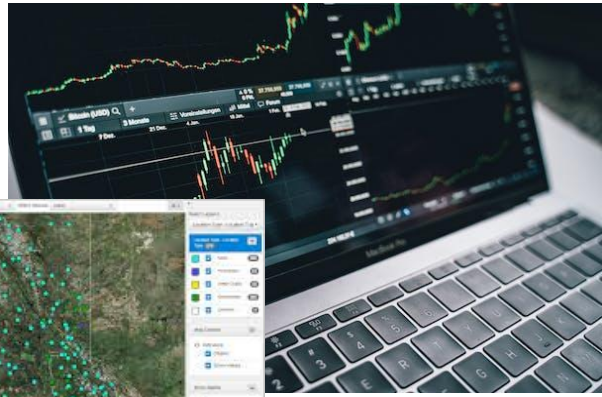


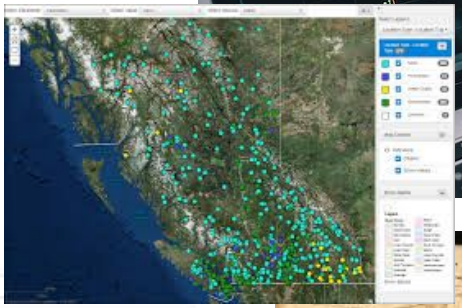
The data–information–knowledge–wisdom (DIKW) hierarchy © Luis Tedeschi,

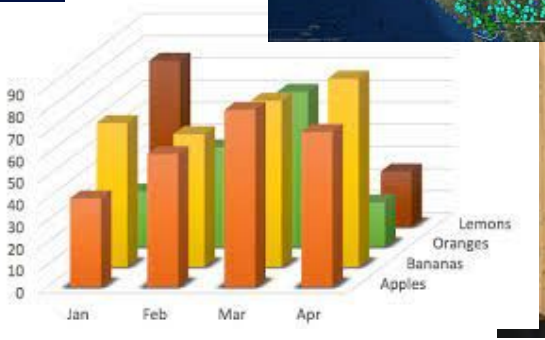
What is a data set?

- It is information that is collected, assembled, and organized–by someone–for analysis of an issue, phenomenon, or subject.
- May contain many kinds of information: textual, numeric, images, sound, video, code, geospatial
- May contain any number of formats (CSV, XML, TIFF, PDF, etc.)









Good Data vs. Bad Data

What is a “good” data set?

1. Usable: readable, well-documented, and available
2. Appropriate to your task/question
3. Functional format for your software/analysis
4. Complete, has good metadata
5. Minimal “cleaning” or “wrangling” needed

- **Provides information about your topic**
- **Helps prove/disprove theories**

Some Data Formats

From Axiom Data Science:

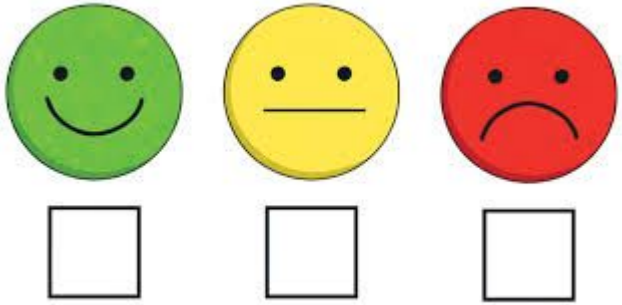
- Containers: TAR, GZIP, ZIP
- Databases: CSV, XML
- Tabular data: CSV
- Geospatial vector data: SHP, GeoJSON, KML, DBF, NetCDF
- Geospatial raster data: GeoTIFF/TIFF, NetCDF, HDF-EOS
- Moving images: MOV, MPEG, AVI, MXF
- Sounds: WAVE, AIFF, MP3, MXF
- Statistics: ASCII, DTA, POR, SAS, SAV
- Still images: TIFF, JPEG 2000, PDF, PNG, GIF, BMP
- Text: XML, PDF/A, HTML, ASCII, UTF-8
- Web archive: WARC

What is “bad” data set?

1. Incomplete
2. Unknown sources
3. Poorly documented methodology
4. Irregular entries
5. Contains errors
6. Poor metadata/labels
7. Old, expired, not relevant

- **Hinders/delays analysis**
- **Can lead to inaccurate/harmful conclusions**

How to evaluate data sets?



Consider:

- Currency (is it still relevant? Newer, better data?)
- Relevance (is this the right data for your question?)
- Authority (who put together the data? Are they qualified?)
- Accuracy (How detailed is the data? How precise? Are there inconsistencies?)
- Purpose (Why was it collected?)

Also consider:

- Funding source?
- Sample size?
- Bias? (look at methodology behind collection)
- Is it available? Accessible to you?

“The Reality of Data Sets”

According to Tableau’s help page entitled “Find Good Data Sets”:

There are two unavoidable facts about trying to find a data set that's not official, business-sanctioned data.

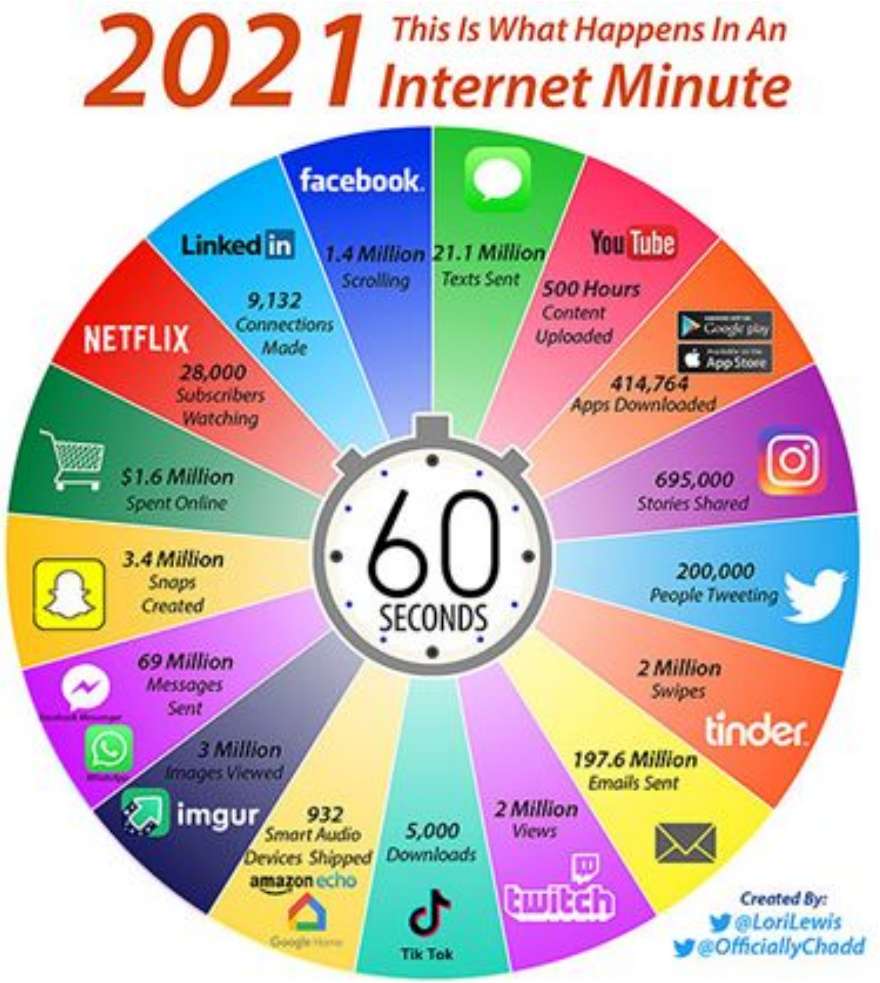
You won’t find what you're looking for.

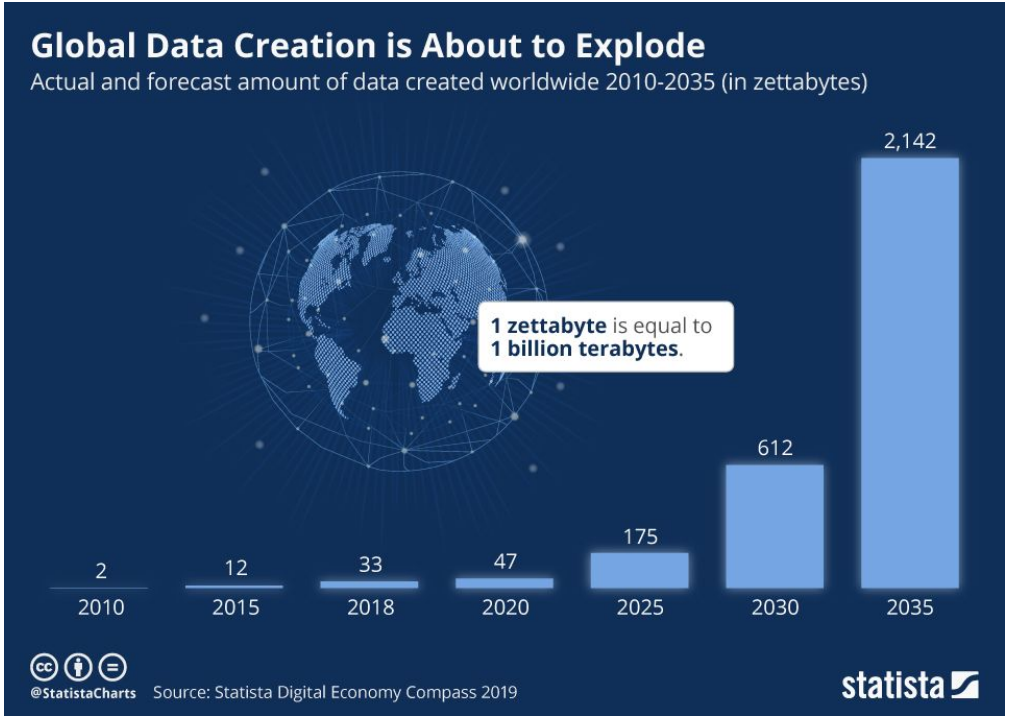
- Try to avoid strict expectations of what you need.
- Stay flexible and open minded about what you can use for a given project.
- Sometimes the data you want is behind a paywall—decide if it's worth it or not.

You’ll have to clean up the data.

- Be prepared for basic cleaning and shaping to make sure the data is well structured for analysis.
- You may need to bring in other data sets.
- Having a data dictionary or metadata can be vital.
- Calculations may be necessary.

Finding Data


2021 This Is What Happens In An Internet Minute
facebook
1.4 Million Scrolling
21.1 Million Texts Sent
YouTube
500 Hours Content Uploaded
414,764 Apps Downloaded
695,000 Stories Shared
200,000 People Tweeting
2 Million Swipes
tinder
197.6 Million Emails Sent
2 Million Views
twitch
5,000 Downloads
Tik Tok
932 Smart Audio Devices Shipped
amazon echo
3 Million Images Viewed
imgur
69 Million Messages Sent
3.4 Million Snaps Created
$1.6 Million Spent Online
NETFLIX
28,000 Subscribers Watching
LinkedIn
9,132 Connections Made
60 SECONDS
Created By:
@LoriLewis
@OfficiallyChadd


Global Data Creation is About to Explode
Actual and forecast amount of data created worldwide 2010-2035 (in zettabytes)
1 zettabyte is equal to 1 billion terabytes.
2 2010
12 2015
33 2018
47 2020
175 2025
612 2030
2,142 2035
@StatistaCharts
Source: Statista Digital Economy Compass 2019
statista

Open vs. Proprietary Data

- Open data: available to all
    a. Data sets are often required by grant issuing agencies
        i. Publicly-funded research is already required to be available in an open-access repository (see OSTP memo)
        ii. New changes will eliminate the embargo period (during which it is not available so only those with paid access can read at first)
- Proprietary data: privately owned and funded; protected by copyright, patents, contracts, privacy protected
        i. May be related to computer software, business/financial information, or unpublished research (insurance data, health data, financial data, data protected by court order, recipes, designs, patterns)
        ii. The University Libraries gives you access to some proprietary data
- **If you can't get a specific data set, what else is available?** You may need to be creative!

If you can't find the data for something:

- **Get help**: your advisor, research team, and subject librarian can give you advice and assistance
  - Ask the researchers of a project for their data
  - However: they might not be willing to share
    - In a recent article, researchers gave reasons for not sharing data:
      - lack of time to search for data (29.2%)
      - loss of data (27.7%)
      - privacy or legal concerns (23.1%)

- **You may have to look in a variety of places to find relevant data**
  - (we will discuss some)
- You may also have to change your topic 😟

Steps for Finding Data

1. Define your question or the problem you are investigating
2. Search background information
3. Identify possible sources/repositories
4. Search for data set
5. Evaluate data set

Photo by Suket Dedhia on Pexels

1. Define your question

1. What is your topic?
2. How can you think about this topic empirically?
3. What kind of data do you want to find?
    a. You can always search around to see what data is available…

Keep in mind:

- Your research question or focus may change as you investigate, be flexible
- Not all data is available, you might have to come up with alternative kinds of data to complete your research

2. Find Background Information

1. General background information provides you with:
    a. Context
    b. Knowledge of **terms used by experts** in the field you are investigating
    c. Can help you **identify places to search**
2. You can see what research has already been done on your topic
    a. See the methods used to collect and analyze data
    b. See what issues investigated (so you don't repeat what has been done)
3. Sometimes you can find data sets in articles or in databases
        i. Web of Science allows you to search for articles with data included
        ii. ACM (calls data "artifacts")

***To search background information, use **popular sources** (internet/social media search) and **scholarly sources** (check out library guides about where to look in various subject areas)

3. **Identify Possible Sources**

- Data sets must be created: collected, organized, stored, made accessible
- This takes time, money and effort
  - Who has the resources, responsibility/mandate, interest, in collecting this data?
    - Person? (Researcher? Scientist?)
    - Research organizations/labs?
    - Government departments and agencies? (EPA, Census Bureau?)
    - International organizations? (World Bank, World Health Organization)
    - Companies? (Facebook, Amazon, Pfizer)
    - **Other???**

4. Searching for Data: Internet Search

1. **Internet search**
    1. Find and search the sources you identified as places to start
    2. Do a general search; try lots of different search terms (synonyms, terms you collected during background research)
        i. Try specific words such as "data set," "survey," "statistics," "poll"
        ii. Use quotation marks to keep words together: "environmental impact," "college student"
        iii. Use boolean operators to search your terms "environmental impact" AND "cryptocurrency mining"
        iv. Use a site search: "environmental impact" site:reddit.com
        v. Search for a data repository for your topic: "open data repository for ornithology"

4. Library Resources

1. **Use Library Guides by discipline to find data**:
    1. Government Information (has TONS of links to local and federal government websites)
        i. https://libguides.colorado.edu/strategies/government
    2. Business Information (has TONS of guides about how to find various kinds of data at the bottom of the page)
        i. https://libguides.colorado.edu/portal/business
    3. Geospatial Data: https://libguides.colorado.edu/geospatialdata
2. **Use Specific Library Databases to Find Data**:
    1. Statista: Statista aggregates statistics and studies from market researchers, organizations, specialist publications, and government sources.
    2. Statistical Insight
    3. Proquest Statistical Abstracts of the World
    4. Statistical Abstract of the United States
    5. Data Planet Statistical Datasets
    6. Passport
    7. Web of Science
        i. After you search your topic, you can use a filter on the left side of the screen to limit to "associated data" which will return articles that include data

4. Searching for Data: Use a Data Search Engine

- Use a data repository database to search for data sets
  a. Google Data Search: Dataset Search is a search engine for datasets. Using a simple keyword search, users can discover datasets hosted in thousands of repositories across the Web.
  b. Re3data.org: global registry of research data repositories that covers research data repositories from different academic disciplines.
  c. Open Access Directory's List of Open Repositories
  d. Open Access Directory's List of Repositorties by Discipline
  e. Nature's List of Scientific Data Repositories

4. Some Databases to Check Out…

- Data.gov
- Kaggle
- Microsoft Research Open Data
- Reddit Datasets
- ICPSR (Inter-university Consortium for Political and Social Research)
- World Bank Open Data World Health Organization Data
- Amazon Web Services (AWS) Data Exchange
- Data.europa.eu
- Figshare
- Zenodo

5. Evaluate Your Data Set

1. Return to the questions, is the data:
    a. Usable: readable, well-documented, and available
    b. Appropriate to your task/question
    c. Functional format for your software/analysis
    d. Complete, has good metadata
    e. Minimal “cleaning” or “wrangling” needed
2. Consider who (people and organizations) that have made the data
    a. Currency
    b. Relevance
    c. Authority
    d. Accuracy
    e. Purpose
3. How was the data set created? What kinds of flaws (sample size, bias) might it have?

Activity: https://bit.ly/finddataactivity

1) **Think about a topic you would like to find a data set for.**
2) **Conduct a search for a data set**
3) **In the google sheet, list:**
   a) **Your topic**
   b) **Type of data you want to find**
   c) **How you searched**
   d) **Repositories/sources used**
   e) **Data sets found**
   f) **Your evaluation of the data set**
   g) **Challenges/comments/questions**
   h) **Topics you'd like to explore more**

4) **Discuss/share your experience with a neighbor or in the chat**

Need Help Using Data?

- CRDDS Learning Materials and Classes/Consultations
- Coursera
- LinkedIn Learning
- YouTube
- ICPSR training guide on Youtube
- SAGE Research Methods Online