

# Data Storytelling

Datenvisualisierungen  
und Dashboards

**Prof. Dr. Jan Kirenz**  
HdM Stuttgart

# Data Storytelling

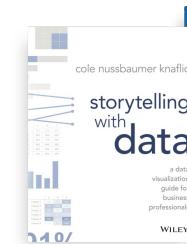
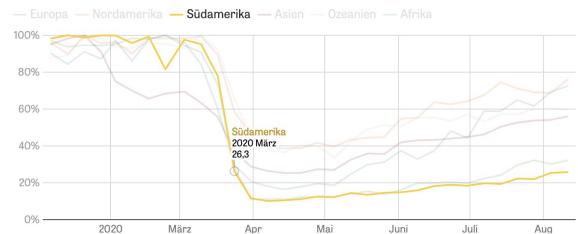
**Modul-Nr:** 338010-338014

**SWS/ECTS:** 3/5

**Prüfungsform:** PP

## Themenschwerpunkte

- Interaktive Dashboards & Reports
- Data Storytelling
- Programmierung in Python



In dem Projekt werden Daten aus unterschiedlichen Quellen in interaktiven Visualisierungen, Reports und Dashboards anschaulich dargestellt. Der Projekt-Themenschwerpunkt kann jeweils frei gewählt werden (bspw. Daten mit Bezug zu Gesellschaft, Wirtschaft, Machine Learning, Politik, Bildung, Wissenschaft ...).

Die Visualisierungen, Reports und Dashboards werden mit Hilfe der Programmiersprache Python und Open-Source Python-Bibliotheken (bspw. Dash, Bokeh, Seaborn, Matplotlib) erstellt. Die dafür notwendigen Programmierkenntnisse werden in dem Kurs vermittelt.

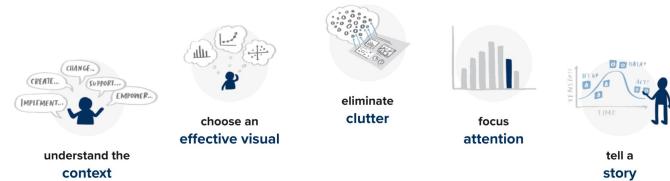
# Data Storytelling - Themenschwerpunkte

Der Kurs orientiert sich inhaltlich insbesondere an "Storytelling with Data" und "Storytelling with Data - let's Practice" von Cole Nussbaumer Knaflic:

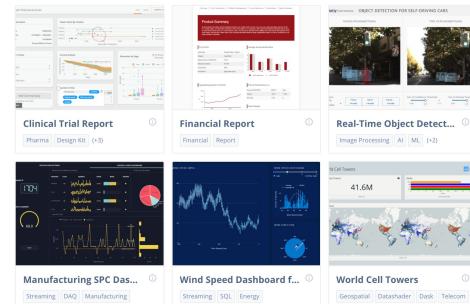
- Grundlagen erfolgreicher Datenkommunikation
- Auswahl effektiver Visualisierungen
- Data storytelling & data-driven decision making

Die Erstellung der Visualisierungen, Reports und Dashboards werden in Python umgesetzt:

- Erstellung von Visualisierungen
- Entwicklung von Dashboards
- Erstellung von Reports
- Programmierung mit Python



Quelle: Nussbaumer (2021) <https://www.storytellingwithdata.com/books>



# 6 Lessons in data storytelling

1. Understand the context
2. Choose an appropriate visual display
3. Eliminate clutter
4. Focus attention where you want it
5. Think like a designer
6. Tell a story

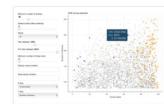


Dash Enterprise  
App Gallery



This public instance of the Dash Enterprise app manager runs >60 dash apps for 100s of concurrent users on Azure Kubernetes Services. Click on a Dash app's name to below for more information. For the open-source demos, the Python & R source code can be found on GitHub. For apps using Design Kit or Snapshot Engine, reach out to get a demo.

Aerospace | Automotive | Energy | Finance | Manufacturing | Medical Imaging | Pharma | Retail | Sports Analytics



An interactive query tool for a set of IMDB data

[Source code: movies](#)



Interactive weather statistics for three cities

[Source code: weather](#)



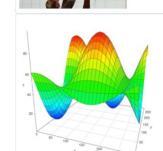
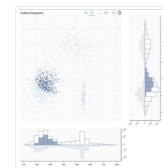
Explore the "autompg" data set by selecting and highlighting different dimensions

[Source code: crossfilter](#)

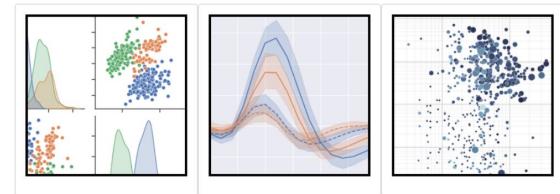
World Cell Towers

Linked plots, summary statistics, and correlations for market data

[Source code: stocks](#)



seaborn



Seaborn is a Python data visualization library based on matplotlib. It provides a high-level interface for drawing attractive and informative statistical graphics.

For a brief introduction to the ideas behind the library, you can read the introductory notes. Visit the [installation page](#) to see how you can download the package and get started with it. You can browse the [example gallery](#) to see what you can do with seaborn, and then check out the [tutorial](#) and [API reference](#) to find out how.

To see the code or report a bug, please visit the [GitHub repository](#). General support questions are most at home on [stackoverflow](#) or [discourse](#), which have dedicated channels for seaborn.

# Entwicklung mit Python-basierten Modulen

# Communicating with Interactive Articles

Examining the design of interactive articles by synthesizing theory from disciplines such as education, journalism, and visualization.

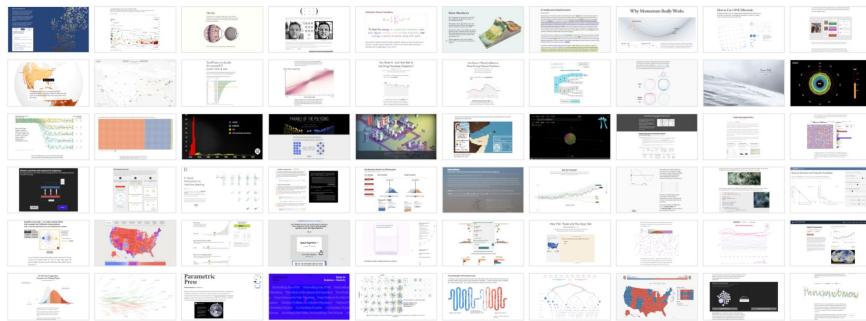


FIGURE 1: Exemplary Interactive Articles From Around The Web. Select an article for more information.

**AUTHORS**

Fred Hohman  
Matthew Conlen  
Jeffrey Heer  
Duen Horng (Polo) Chau

**AFFILIATIONS**

Georgia Tech  
University of Washington  
University of Washington  
Georgia Tech

**PUBLISHED**

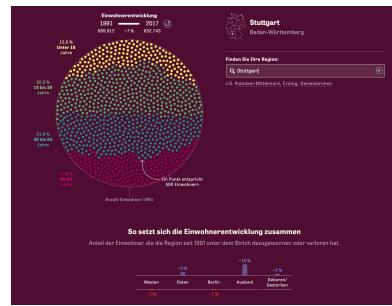
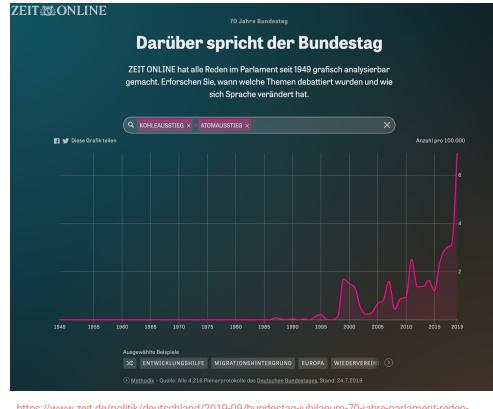
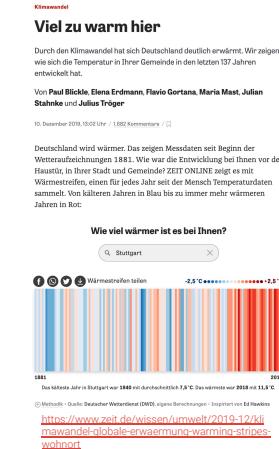
Sept. 11, 2020

**DOI**

10.23915/distill.00028

<https://distill.pub/2020/communicating-with-interactive-articles/>

## Beispiele interaktiver Datenvisualisierungen



# Beispiele interaktiver Datenvisualisierungen

# Weitere Hinweise



3.4M views

## David McCandless: Die Schönheit der Visualisierung von Daten

David McCandless • TEDGlobal 2010 • July 2010

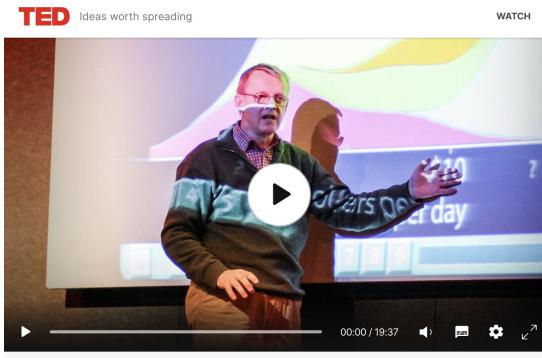
David McCandless verwandelt komplexes Datenmaterial wie die weltweiten Militärausgaben, Medien-Rummel, Facebook-Statusaktualisierungen und mehr in schöne, aber dennoch einfache Diagramme. Er schlägt vor, dass wir Informationsdesign als Werkzeug verwenden sollten, um uns in der heutigen Informationsflut zurechtzufinden und einzigartige Muster und Verbindungen zu entdecken, die vielleicht unsere Wahrnehmung der Welt ändern können.

This talk was presented at an official TED conference, and was featured by our editors on the home page.

[https://www.ted.com/talks/david\\_mccandless\\_die\\_schoenheit\\_der\\_visualisierung\\_von\\_daten?language=de](https://www.ted.com/talks/david_mccandless_die_schoenheit_der_visualisierung_von_daten?language=de)



<https://informationisbeautiful.net/>



15M views

## Hans Rosling präsentiert die besten Statistiken, die Sie jemals gesehen haben

Hans Rosling • TED2006 • February 2006

Niemals wurden Ihnen Daten auf diese Art und Weise präsentiert. Mit der Dramatik und der Dringlichkeit eines Sportreporters entlarvt Statistikguru Hans Rosling den Mythos der sogenannten „Entwicklungslander“.

This talk was presented at an official TED conference, and was featured by our editors on the home page.

[https://www.ted.com/talks/hans\\_rosling\\_die\\_besten\\_statistiken\\_die\\_sie\\_jemals\\_gesehen\\_haben?language=de](https://www.ted.com/talks/hans_rosling_die_besten_statistiken_die_sie_jemals_gesehen_haben?language=de)



<https://www.gapminder.org/>

# Inspirationen



## Data Visualization as Exploratory Medium | Fernanda Viégas | WiDS 2021

220 Aufrufe • 11.03.2021

12 0 TEILEN SPEICHERN ...

ABONNIEREN



Women in Data Science  
1450 Abonnenten

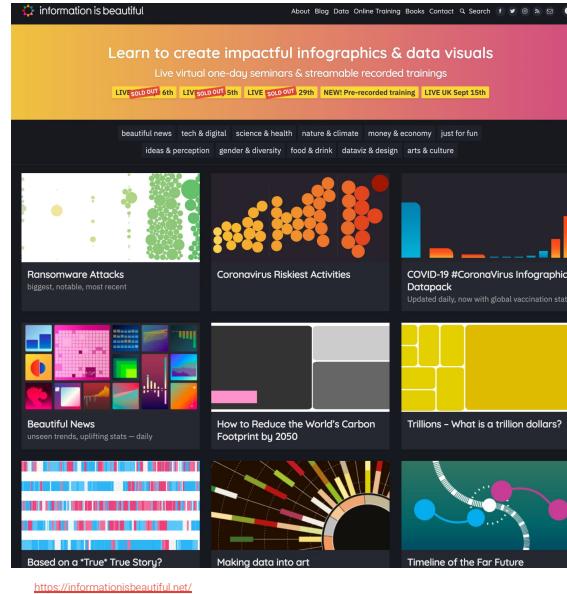
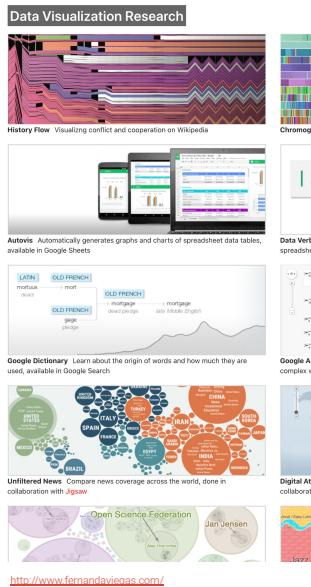
Fernanda Viégas, Principal Scientist at Google discusses a variety of ways in which data visualization can help people effectively engage with data: from generating scientific insight and enabling public debate to boosting artistic expression. Fernanda presents projects that illustrate

Mehr ansehen

<https://www.youtube.com/watch?v=yVtJGAtCdiU>

# Google Research

<https://pair.withgoogle.com/>



# Beispielhafte Datenvisualisierungen

**PLAYER VIDEO COMPUTER VISION ANALYSIS**

Step 1: Video selection

Choose a video  
Steve Nash free throw

OR

Enter an YouTube URL  
  
**FETCH**

**Source video**

Why Shooting 95% From the Free Throw Line - Steve Nash - Später anschauen Teilen Info

Length: 839s

URL:  
<https://www.youtube.com/watch?v=BKIQqb3sbU>

**Step 2: Start pose estimation (Click 'RUN MODEL')**

Start at (s): 3... Length (s) 10 min\_detection min\_tracking **RUN MODEL**

**Images with pose overlay**

**Pose analysis overview**

- 39 Frames per second
- 201 Total frames processed
- 5488 Visible landmarks (> 0.5)
- 27.3 Visible landmarks/frame

**Navigate to a frame**

Frame: 8152; Timestamp: 338.49s

<https://dash-gallery.plotly.host/bball-video-analysis/>

**Dash Financial**

Calibre Financial Index Fund Investor Shares **Full View**

Overview | Price Performance | Portfolio & Management | Fees & Minimums | Distributions | News & Reviews

**Product Summary**

As the industry's first index fund for individual investors, the Calibre Index Fund is a low-cost way to gain diversified exposure to the U.S. equity market. The fund offers exposure to over 500 of the largest U.S. companies, which span many different industries and account for more than three-fourths of the total stock market's value. The key risk for the fund is the volatility that comes with its full exposure to the stock market. While the Calibre Index Fund is broadly diversified within the large-capitalization market, it may be considered a core equity holding in a portfolio.

**Fund Facts**

Asset Class	Domestic Stock - General
Category	Large Blend
Expense ratio as of 04/27/2017	0.14%
Minimum investment	\$3,000*
Fund number	0040
Fund advisor	Equity Index Group

**Average annual performance**

Period	Calibre Index Fund	S&P 500 Index
1 Year	~10%	~10%
3 Year	~8%	~8%
5 Year	~10%	~10%
10 Year	~6%	~6%
40 Year	~6%	~6%

**Hypothetical growth of \$10,000**

**Price & Performance (%)**

Price as of 02/27/2018	\$254.07	None
Change	+\$323	+126%
SEC yield	1.67%	B

**Risk Potential**

Less Risk Less Reward More Risk More Reward

<https://dash-gallery.plotly.host/dash-financial-report/overview>

# Beispielhaftes Dashboards & Reports



# Introduction to Dash



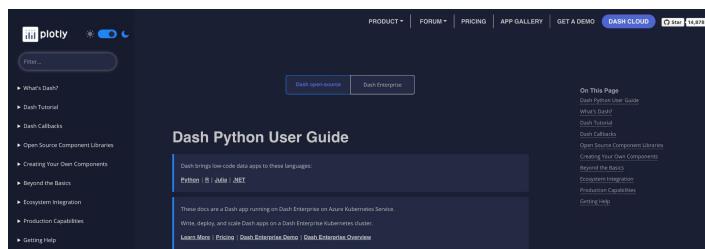
Dash is the most downloaded, trusted framework for building machine learning web apps in Python.

Build a machine learning web app in less than 300 lines of Python, R, or Julia code.

From GPT-3 to Hugging Face Transformers, UNet to YOLOv3, artificial intelligence is an ever-growing field that has made its way into numerous industries. Researchers, ML engineers, data scientists, business analysts, and execs alike, are trying to find the best way to understand and operationalize these models into their business.

With Dash, our goal is to enable AI and ML stakeholders at every level. Our demos and templates address the most common AI-business use cases, and Dash Enterprise takes those AI initiatives to the next level.

Scroll below to see the latest Dash-AI projects that we've worked on, broken down by AI concept, technique, library, and model. We're constantly adding to this list. But, if you have another AI model that you would like to see or you would like to chat, contact us! We also recently added some AI and ML documentation to our graphing libraries documentation. [Check it out!](#)



<https://dash.plotly.com/>

jupyter 00 - Introduction and Setup (unsaved changes)

Visit repo Copy Binder link

File Edit View Insert Cell Kernel Widgets Help

Not Trusted Python 3

Memory: 116 / 2048 MB

 Bokeh Tutorial

## 00. Introduction and Setup

### Tutorial Overview

The tutorial is broken into several sections, which are each presented in their own notebook:

1. Basic Plotting
2. Styling and Theming
3. Data Sources and Transformations
4. Adding Animations
5. Presentations and Layouts
6. Linking and Interactions
7. Bar and Categorical Data Plots
8. Graph and Network Plots
9. Geographic Plots
10. Exporting and Embedding
11. Running Bokeh Applications

As well as some extra topic appendices:

- A1. Models and Primitives
- A2. Visualizing Big Data with Datasader
- A3. High-Level Charting with Holoviews
- A4. Additional Resources

### What is Bokeh

Bokeh is an interactive visualization library that targets modern web browsers for presentation. It is good for:

- Interactive visualization in modern browsers
- Standalone HTML documents, or server-backed apps
- Expressive and versatile graphics
- Large, dynamic or streaming data
- Easy usage from python (or Scala, or R, or...)

And most importantly:

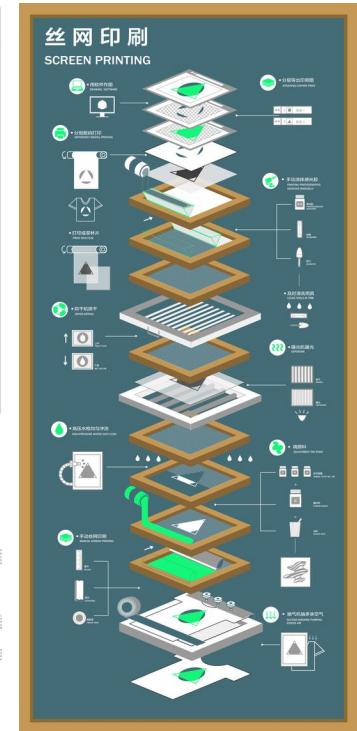
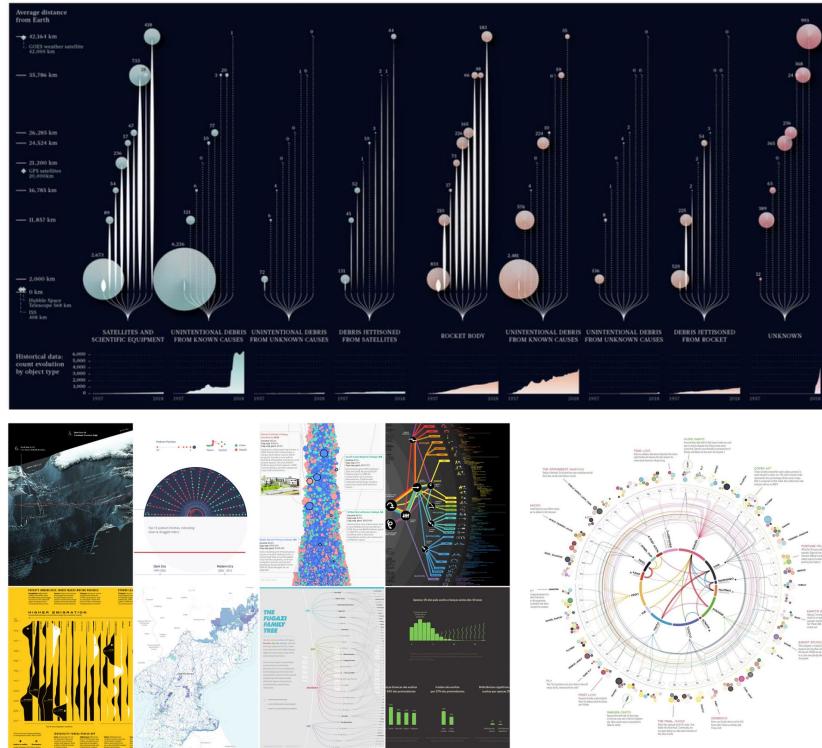
<https://mybinder.org/v2/gh/bokeh/bokeh-notebooks/master?filepath=tutorial%2F00%20-%20Introduction%20and%20Setup.ipynb>

# Erstellung interaktiver Inhalte mit Bokeh



## Information is Beautiful Awards

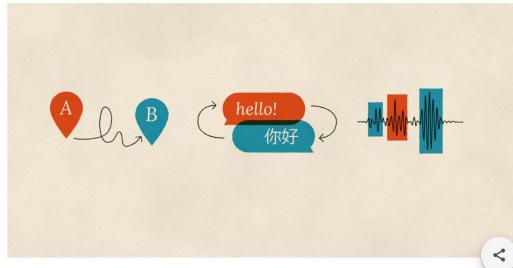
[https://www.informationisbeautifulawards.com/show\\_case?page=1&type=awards](https://www.informationisbeautifulawards.com/show_case?page=1&type=awards)



# Information is Beautiful Awards

## People + AI Research

Get practical insights from Google's People + AI Research (PAIR) team on how to take a multidisciplinary and human-centered approach to designing with machine learning and AI. Inside, find articles and video on how ML is changing the way we build experiences and interact with the world.



### Simulating Intelligence

Techniques for prototyping machine learning systems across products and features

Guide



### Participatory Machine Learning

A conversation about bringing more people and perspectives into the machine learning design process

[goo.gle](https://design.google/library/ai/participatory-machine-learning/)



### AI and Design: Putting People First

A discussion on how designers can harness and humanize AI's vast potential

Editorial

## People + AI Research

## We are Designers

People + AI Research (PAIR) is a multidisciplinary team at Google that explores the human side of AI by doing fundamental research, building tools, creating design frameworks, and working with diverse communities.

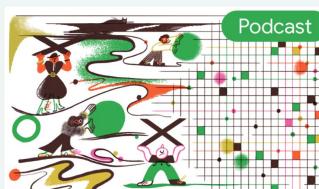
We believe that for machine learning to achieve its positive potential, it needs to be participatory, involving the communities it affects and guided by a diverse set of citizens, policy-makers, activists, artists and more.



## Check out our work



<https://pair.withgoogle.com/>



# Datenvisualisierung mit Bezug zu KI

<https://design.google/library/ai/>



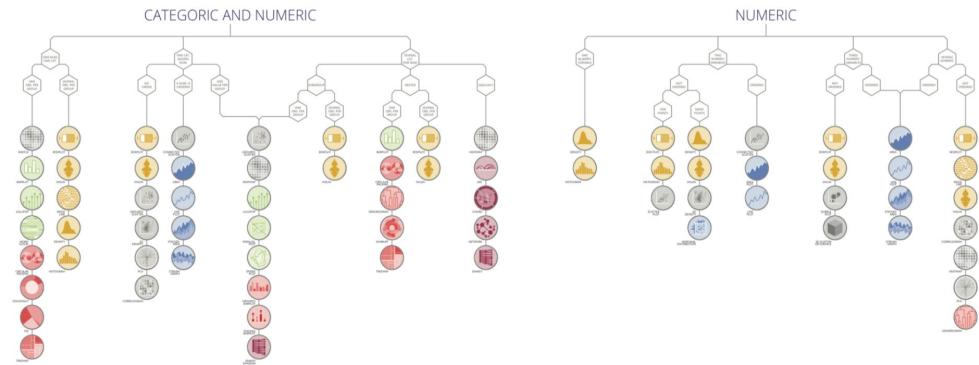
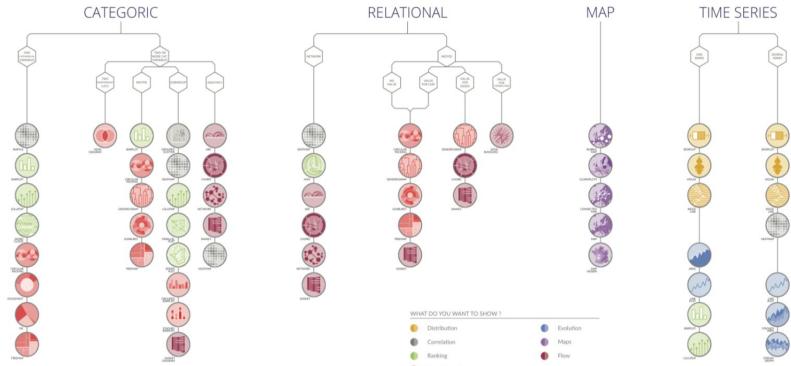
from  
Data  
to Viz

"From Data to Viz" is a classification of chart types based on input data format. It will help you find the perfect chart in three simple steps:

- ① Identify what type of data you have.
- ② Go to the corresponding decision tree and follow it down to a set of possible charts.
- ③ Choose the chart from the set that will suit your data and your needs best.

Data is a world with endless possibilities and this project does not claim to be exhaustive. However, it should give you a good starting point. For an interactive version and much more, visit:

[data-to-viz.com](http://data-to-viz.com)



## The Python Graph Gallery

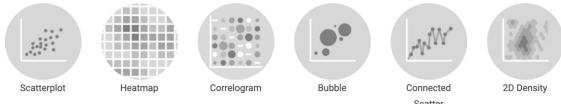


Welcome to the Python Graph Gallery, a collection of hundreds of charts made with [Python](#). Charts are organized in about 40 sections and always come with their associated reproducible code. They are mostly made with [Matplotlib](#) and [Seaborn](#) but other library like [Plotly](#) are sometimes used.

### Distribution



### Correlation



### Ranking



Source: From Data to Viz <https://www.python-graph-gallery.com/>

# From Data to Visualization with Python

The European Union Open Data Portal (EU ODP) gives you access to open data published by EU institutions and bodies. All the data you can find via this catalogue is free to use and reuse for commercial or non-commercial purposes.

Show results with:

- all of these words
- any of these words
- the exact phrase

Search for metadata using our [SPARQL endpoint query editor](#) or [access the API](#).

Discover our datasets [View datasets by subject](#) [View all datasets](#) [View all publishers](#)

**Focus on**

**Antibiotic resistance in Europe**

> European Centre for Disease Prevention and Control



# OECD Data

Find, compare and share the latest OECD data: charts, maps, tables and related publications ...

Search

OECD Data

---

## Featured Charts

The global outlook is unstable, see the latest [OECD Economic Outlook](#).

**Real GDP forecast** Total, Annual growth rate (%) 2012 - 2021



Year	World (%)	US (%)
2012	3.3	1.5
2013	3.5	2.2
2014	3.0	2.5
2015	3.5	2.0
2016	3.2	1.5
2017	2.8	1.5
2018	2.5	1.5
2019	2.2	1.5
2020	2.0	1.5
2021	2.2	1.5

---

## Browse by

[topic](#) or [country](#)

[Search tips](#)  
[Catalogue of OECD databases](#)

---

## Latest news

### Statistical news releases

See recent statistical news releases.

### Compare your income

Try OECD's Compare your income to check your perception of income inequality against reality!

---

## Statistical resources

### Database access



Make your own queries on large databases in our data warehouse, [OECD.Stat](#).

---

The screenshot shows the World Bank Open Data homepage. At the top, there's a navigation bar with links for 'THE WORLD BANK' and 'Data'. Below it, a banner says 'Now to this site? Start here'. The main title 'World Bank Open Data' is prominently displayed, followed by the subtitle 'Free and open access to global development data'. A search bar contains the placeholder 'Search data e.g. GDR, population, interests...'. Below the search bar are two buttons: 'Browse by Country or Indicator'. On the left, there's a sidebar with sections for 'MONEY MARKET', 'COMMODITY PRICES', and 'SUBSIDIES'. The 'COMMODITY PRICES' section highlights 'Commodity prices made further gains in December—Pink Sheet' with a link to 'jew Baffin, Mata Host Masculine, Jan 05, 2020'. The 'SUBSIDIES' section shows a chart titled 'Poverty headcount ratio at \$1.90 a day (PPP) (% of population)' with a value of 11.5%. To the right, a large red box features the text 'INTERNATIONAL DEBT STATISTICS' and '2020' in large white letters, along with the 'WORLD BANK GROUP' logo and the text 'International Debt Statistics 2020'.

The screenshot shows the Data.gov homepage. At the top, there's a navigation bar with links for DATA, TOPICS, IMPACT, APPLICATIONS, DEVELOPERS, and CONTACT. Below the navigation is a large banner with the text "The home of the U.S. Government's open data". Underneath the banner, it says "Here you will find data, tools, and resources to conduct research, develop web and mobile applications, design data visualizations, and more." A search bar at the top right contains the query "Health Care Provider Charge Data". Below the search bar, there's a "GET STARTED" button and a link to "SEARCH OVER 245,222 DATASETS". The main content area displays a grid of 12 data sets, each with a thumbnail icon and a title. The titles are: Agriculture, Climate, Consumer, Ecosystems, Education, Energy, Finance, Health, Local, Manufacturing, Maritime, Ocean, Public Safety, and Science & Tech.

**DISTAT**  
Statistisches Bundesamt

**GENESIS-ONLINE**

**☰ Menü**

# Die Datenbank des Statistischen Bundesamtes

**Datenbank durchsuchen**

TOP 5 Tabellen

S1000-0007 Aus- und Einfuhr 61111-0002 Verbraucherpreisindexen 61111-0001 Verbraucherpreisindex Jahre S1000-0018 Aus- und Einfuhr M12621-0002 Durchschnittliche Lebenserwartung

# Beispielhafte Datenquellen (Open Data)