

Data Science Bootcamp PGGM 2020

Bootcamp Lecturer

Pedro V Hernandez Serrano

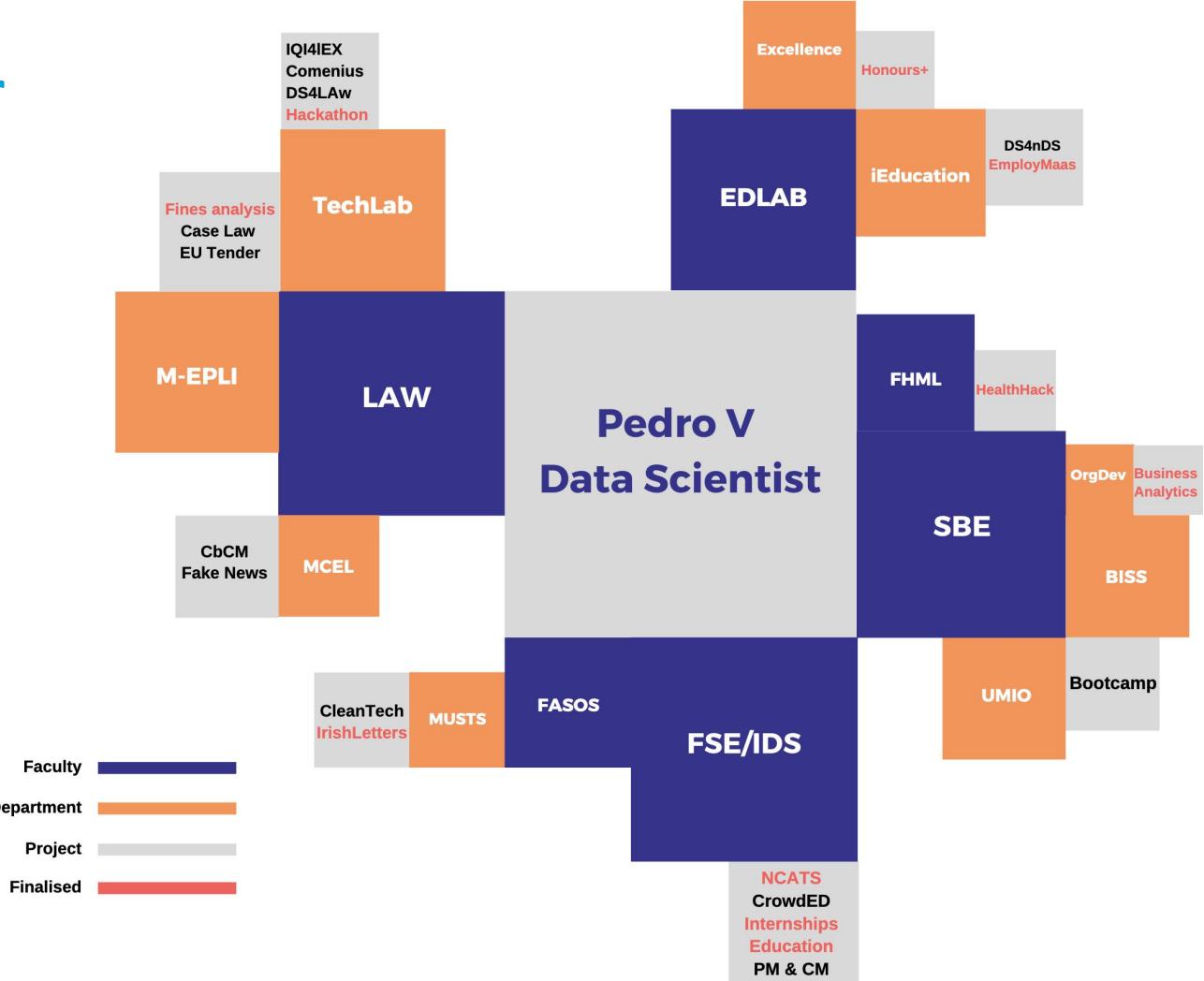
Data Scientist at Institute of Data Science, Maastricht University

As Data Scientist at UM:

- Teaching the fundamentals of Data Science
- Implementing Data Science for research
- Enabling cross-discipline collaborations

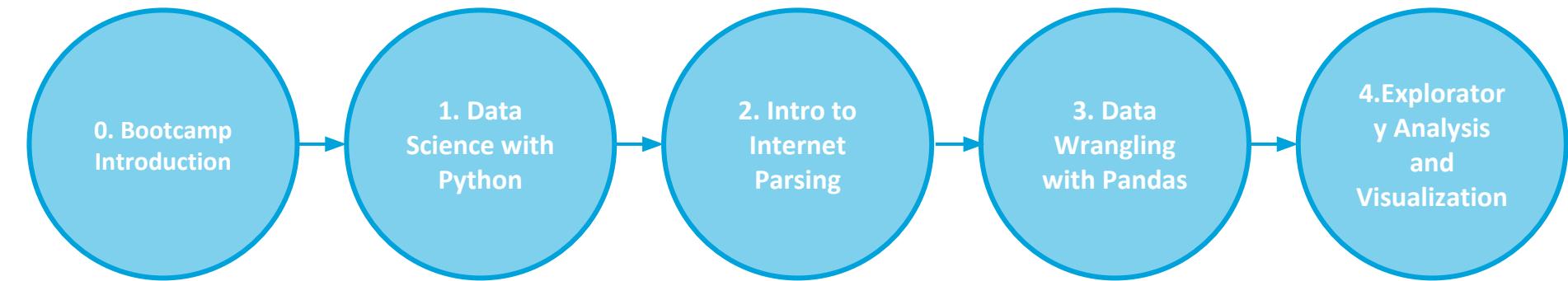
Research focus:

- Law & Policy Data Analytics
- Statistical Crowdsourcing
- Reproducible Data Science

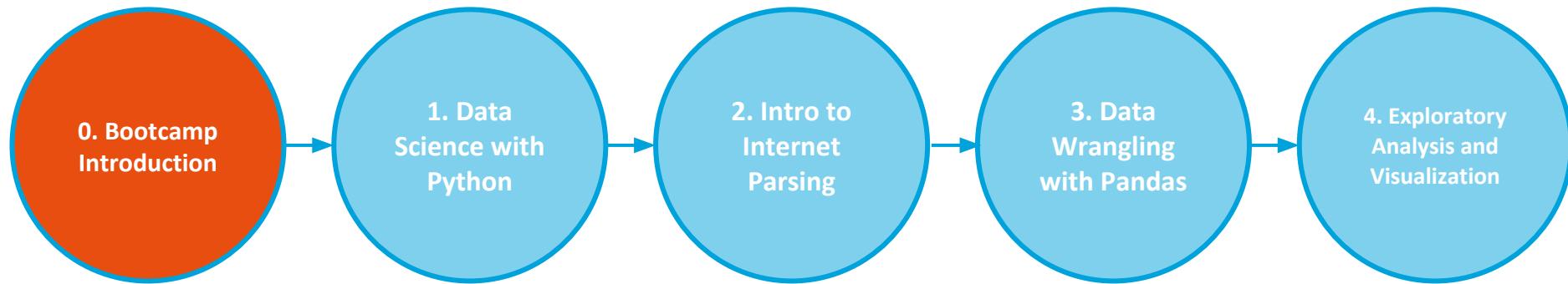


Outline

Data Science Bootcamp Outline

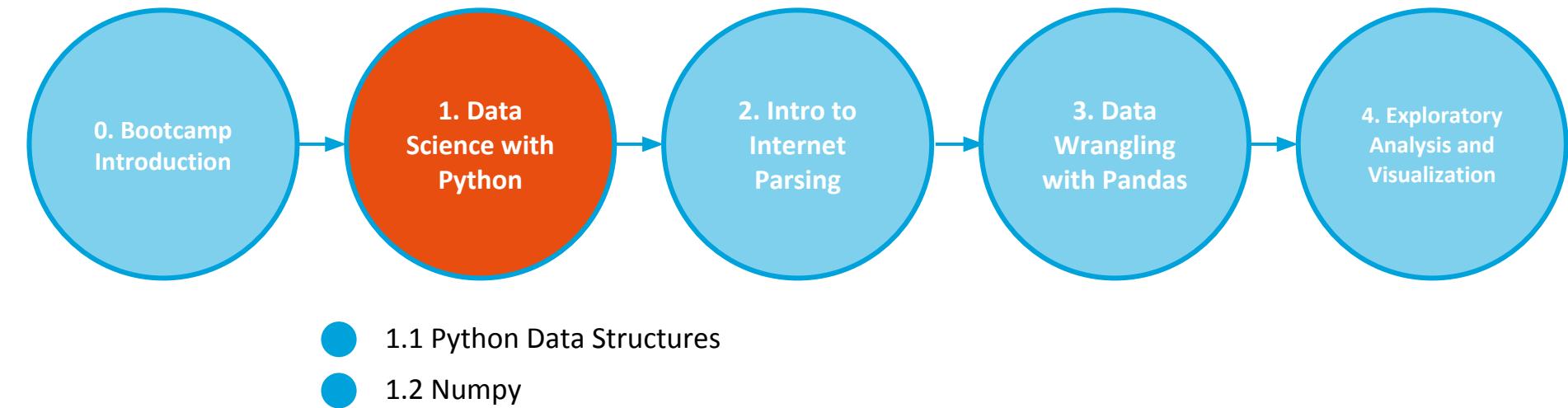


Data Science Bootcamp Outline

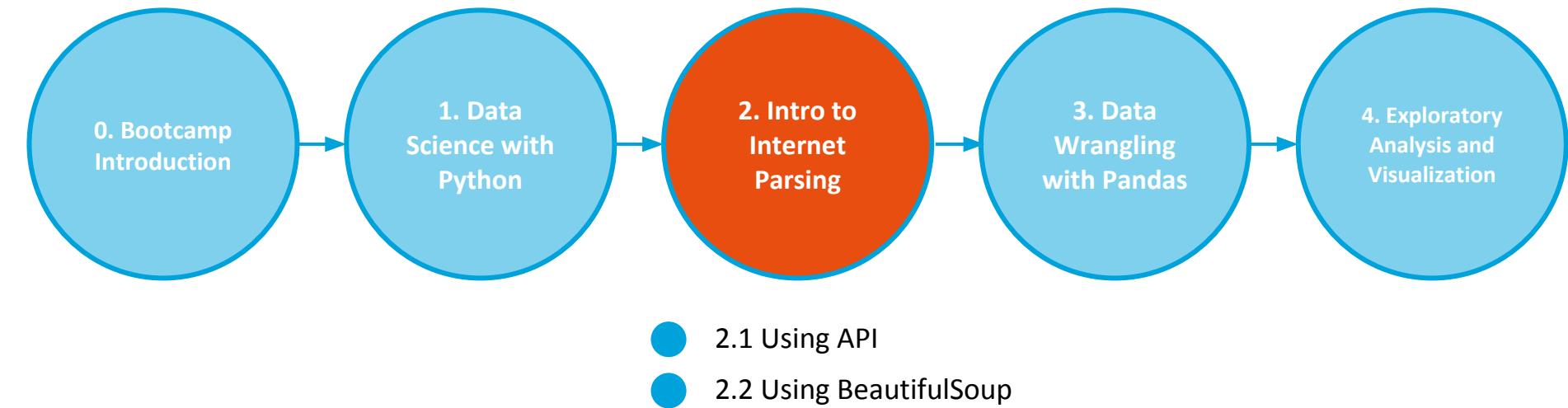


- Intro to Data Analysis
Presentation

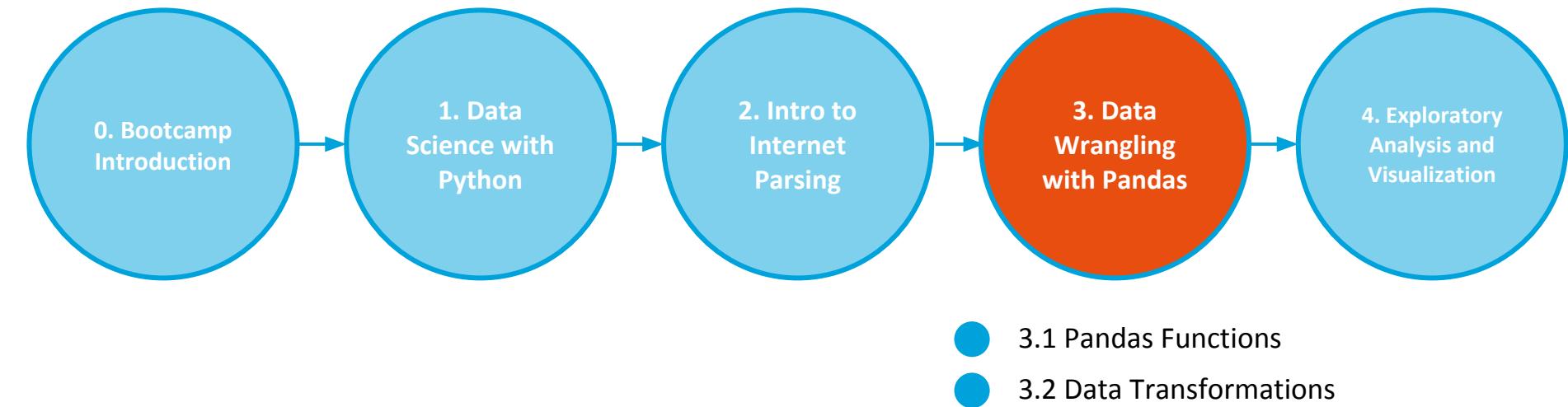
Data Science Bootcamp Outline



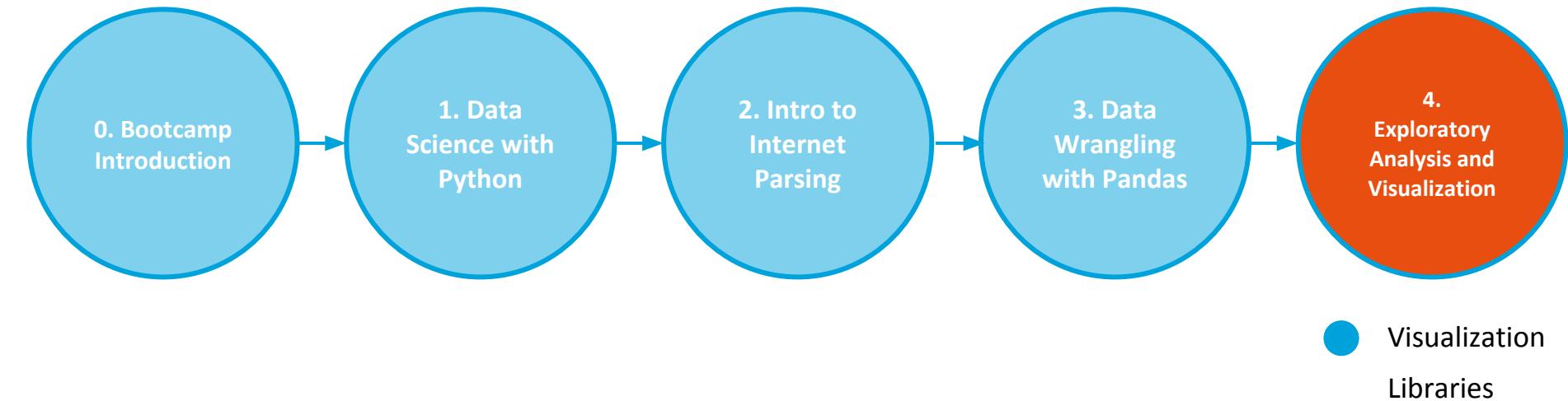
Data Science Bootcamp Outline



Data Science Bootcamp Outline



Data Science Bootcamp Outline



Data Science Bootcamp Outline

Day 1

Part 1

- Bootcamp introduction
- 1 - Intro Data Science with Python.ipynb*

Lunch Break

Part 2

- Assignment 1

Day 2

Part 1

- 2 - Intro to Internet Parsing.ipynb*
- 3 - Data Wrangling with Pandas.ipynb*

Lunch Break

Part 2

- Assignment 2

Day 3

Part 1

- 4 - Exploratory Analysis and Visualization.ipynb*

- Use case discussion

Lunch Break

Part 2

- Use case output: Data Product

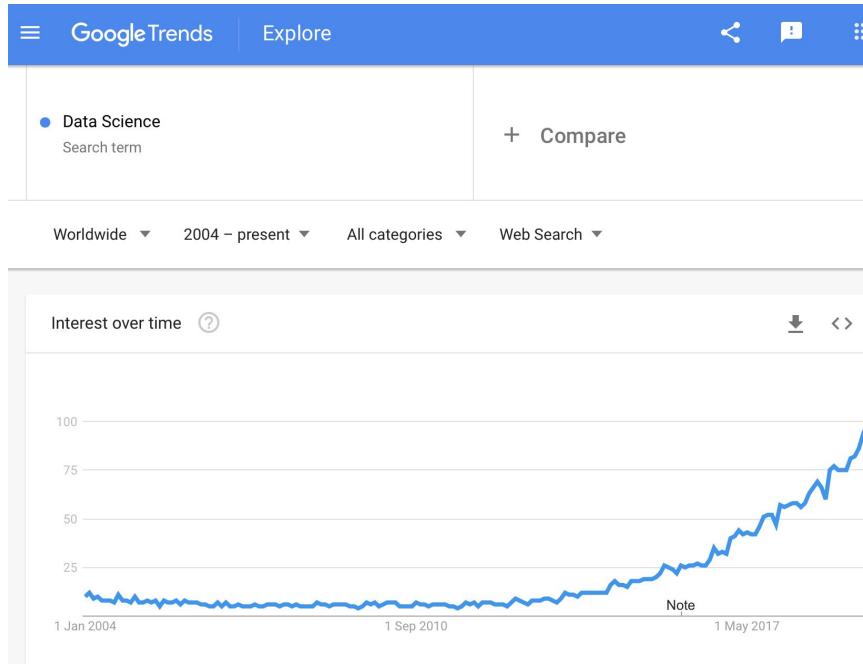


Goals

- Introduce the basics of the python programming environment such as functions, reading and manipulating csv files, and the numpy library.
- Introduce data manipulation techniques using pandas data science library.
- Introduce the abstraction of the Series and DataFrame as the central data structures for data analysis.
- Develop a general understanding of data formats and representations
- Get an overview of some python visualization packages.
- Learn how to perform a data science pipeline and their best use cases
- Know limitations and caveats of available interactive python libraries
- We will learn through doing.

Python for Data Science

Is Python for Data Science a Trend?

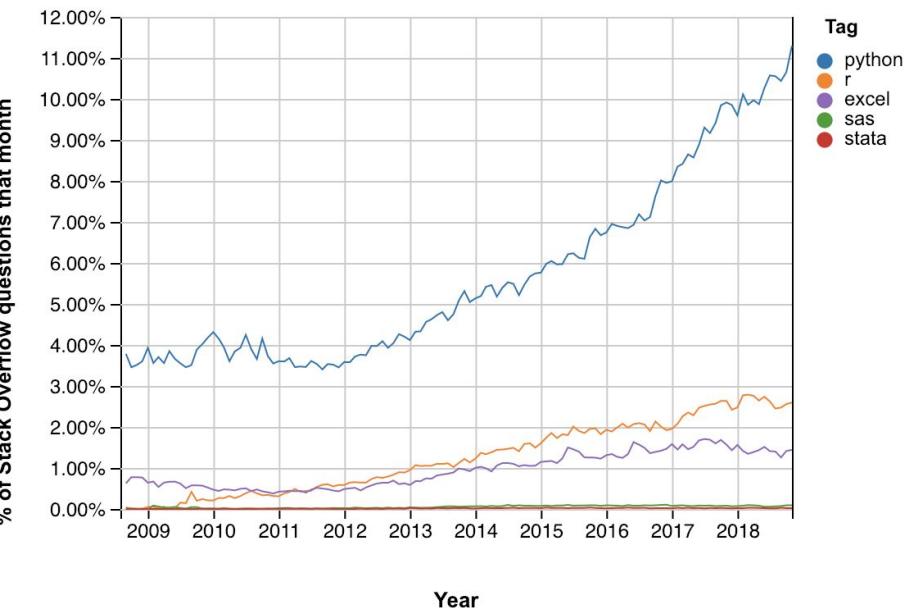


Related topics	Rising	Breakout
1 Python - Programming language		Breakout
2 Analytics - Topic		Breakout
3 Big data - Topic		Breakout
4 Business - Organization type		Breakout
5 Salary - Topic		Breakout

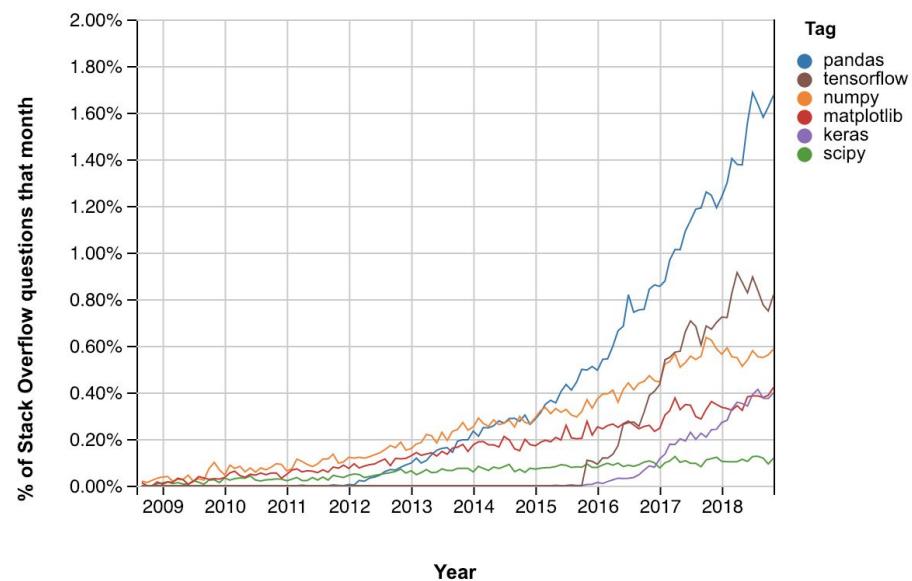
- Data is growing really fast. It grows exponentially and continues to grow so. And it's estimated to be about 2.5 Exabytes, that is 2.5 million TB, a day. [1]
- And over 1.5 trillion queries on Google in a year.[2]

Python for Data Science

Popularity of Data Tools



Popularity of Python Packages

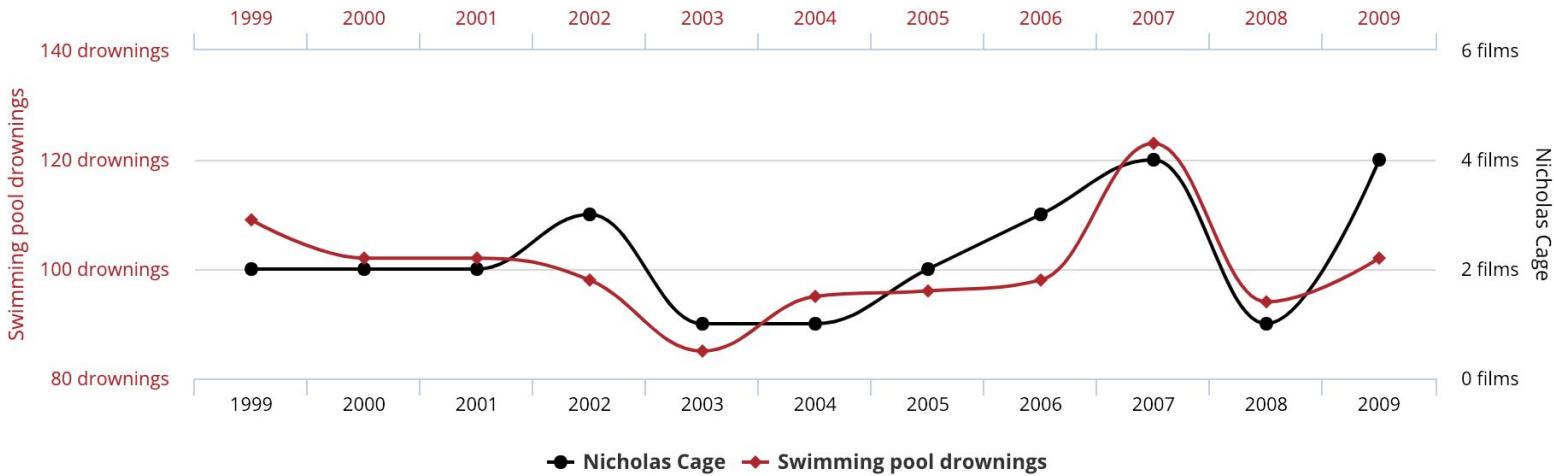


Correlation =! Causation

Number of people who drowned by falling into a pool
correlates with
Films Nicolas Cage appeared in



Correlation: 66.6% ($r=0.666004$)



Data sources: Centers for Disease Control & Prevention and Internet Movie Database

tylervigen.com

Why Python

As a general purpose language, Python supports a large range of tasks.

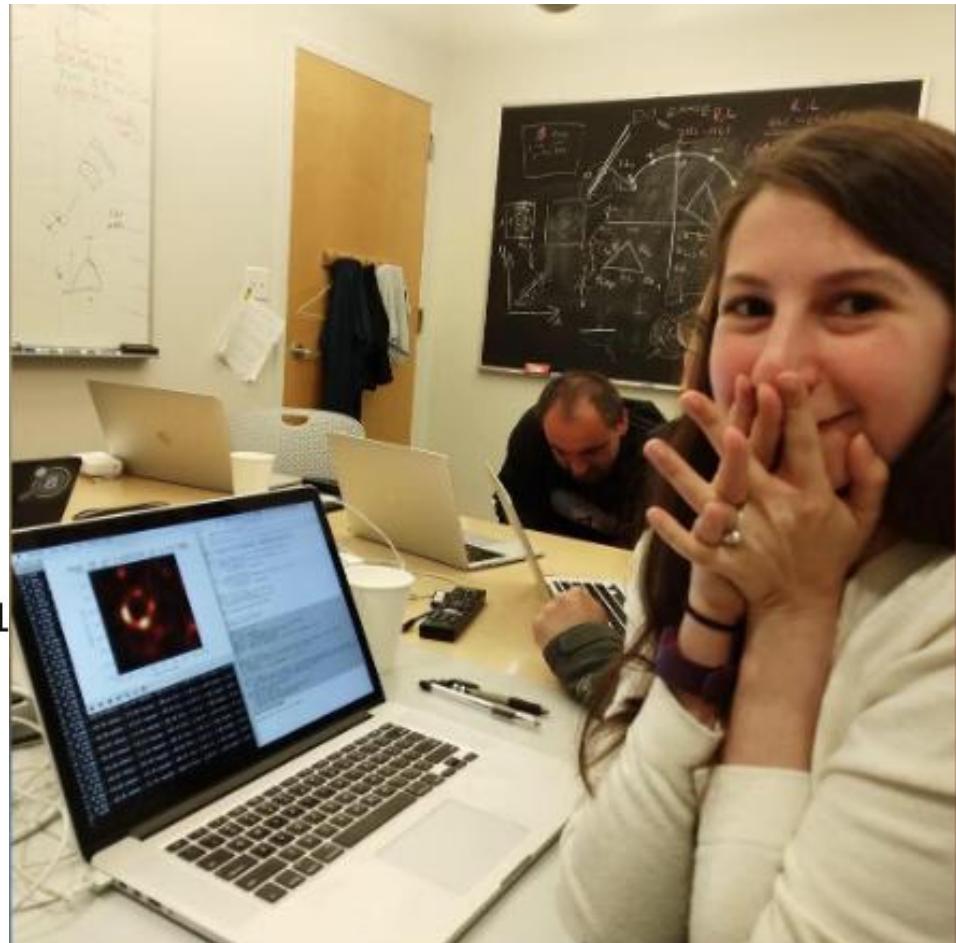
Or put another way: 'Python isn't the best at anything, but it's second best at everything'

- Python is an, open-source high-level, interpreted, programming language.
- A data science/text analytics project may include everything from scraping data from the web, analyzing a mixture or text and numerical data, computing features, training a model, creating high-quality graphs, and then hosting a webapp with results.
- 70,000 libraries in the Python Package Index
- It has a massive user community, who contribute to a large number of high-quality, well maintained open-source tools.
- Widely used in industry.



Python users

- **Numpy** (van der Walt et al. 2011)
- **Scipy** (Jones et al. 2001)
- **Pandas** (McKinney 2010)
- **Jupyter** (Kluyver et al. 2016)
- **Matplotlib** (Hunter 2007).
- **Astropy** (The Astropy Collaboration et al. 201



Python users

- Google Translate
- Spotify recommender
- Dropbox
- Netflix
- All NLP
- Video games (Sims)
- Visualization software (Dash)

THE ASTROPHYSICAL JOURNAL LETTERS

OPEN ACCESS

First M87 Event Horizon Telescope Results. III. Data Processing and Calibration

The Event Horizon Telescope Collaboration, Kazunori Akiyama^{1,2,3,4} , Antxon Alberdi⁵ , Walter Alef⁶, Keiichi Asada⁷, Rebecca Azulay^{8,9,6} , Anne-Kathrin Bacsko⁶ , David Ball¹⁰, Mislav Baloković^{4,11} , John Barrett²  +Show full author list

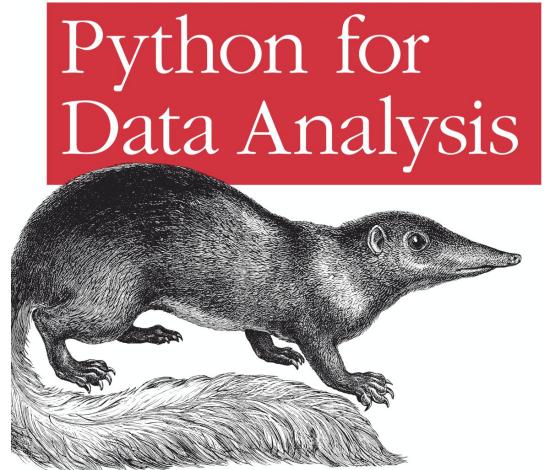
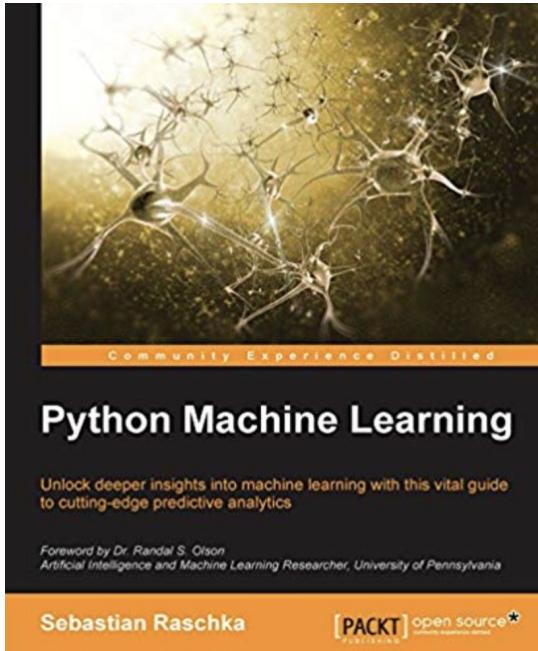
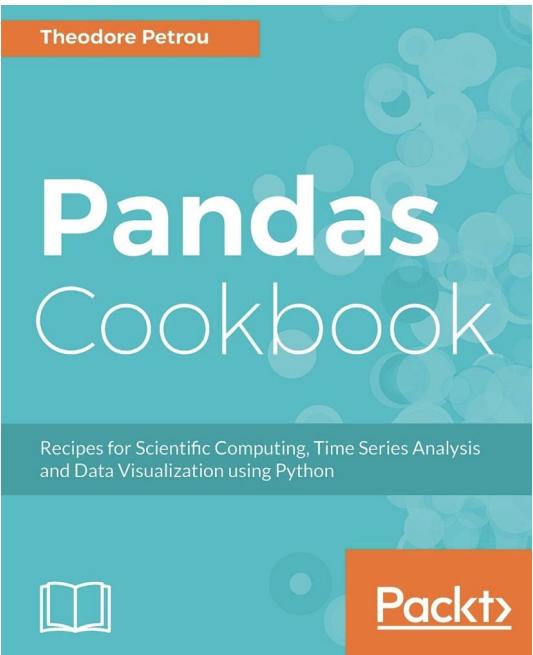
Published 2019 April 10 • © 2019. The American Astronomical Society.

[The Astrophysical Journal Letters, Volume 875, Number 1](#)

[Focus on the First Event Horizon Telescope Results](#)

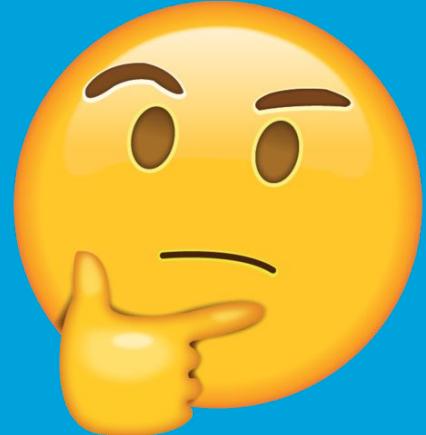
It all got started, I believe, because the very earliest Googlers (Sergey, Larry, Craig, ...) made a good engineering decision: “Python where we can, C++ where we must.”

Data Science Books

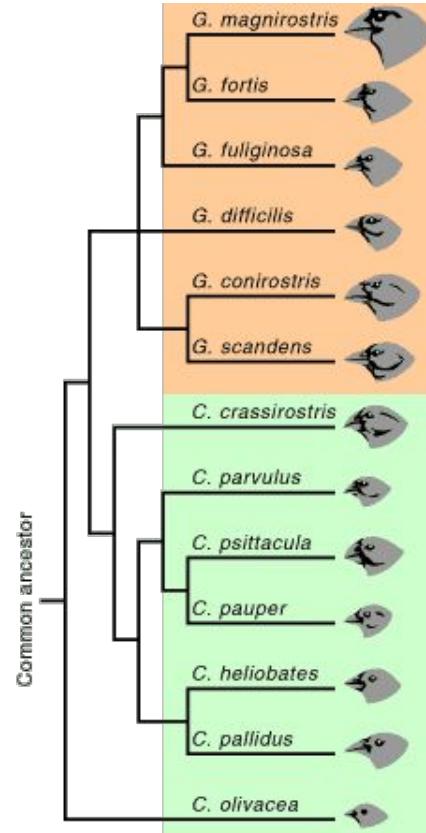
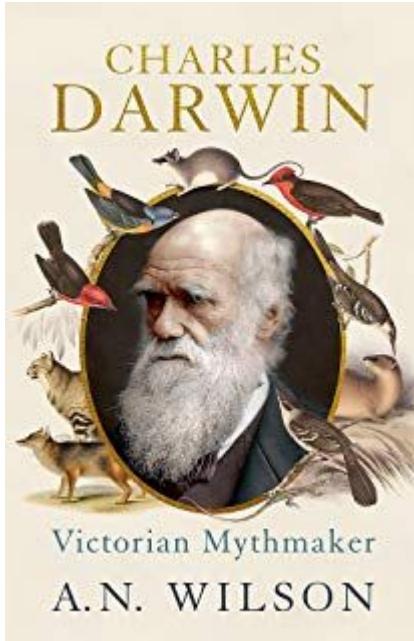


Data Analysis

Is data analysis a new thing?



Observation and categorization



Statistics early stage

The Table of CASUALTIES.

The Years of our Lord	1647	1648	1649	1650	1651	1652	1653	1654	1655	1656	1657	1658	1659	1660	1661	1662	1663	1664	1665	1666	1667	1668	1669	1670	1671	1672	1673	1674	1675	1676	1677	1678	1679	1680	1681	1682	1683	1684	1685	1686	1687	1688	1689	1690	1691	1692	1693	1694	1695	1696	1697	1698	1699	1700	1701	1702	1703	1704	1705	1706	1707	1708	1709	1710	1711	1712	1713	1714	1715	1716	1717	1718	1719	1720	1721	1722	1723	1724	1725	1726	1727	1728	1729	1730	1731	1732	1733	1734	1735	1736	1737	1738	1739	1740	1741	1742	1743	1744	1745	1746	1747	1748	1749	1750	1751	1752	1753	1754	1755	1756	1757	1758	1759	1760	1761	1762	1763	1764	1765	1766	1767	1768	1769	1770	1771	1772	1773	1774	1775	1776	1777	1778	1779	1780	1781	1782	1783	1784	1785	1786	1787	1788	1789	1790	1791	1792	1793	1794	1795	1796	1797	1798	1799	1800	1801	1802	1803	1804	1805	1806	1807	1808	1809	1810	1811	1812	1813	1814	1815	1816	1817	1818	1819	1820	1821	1822	1823	1824	1825	1826	1827	1828	1829	1830	1831	1832	1833	1834	1835	1836	1837	1838	1839	1840	1841	1842	1843	1844	1845	1846	1847	1848	1849	1850	1851	1852	1853	1854	1855	1856	1857	1858	1859	1860	1861	1862	1863	1864	1865	1866	1867	1868	1869	1870	1871	1872	1873	1874	1875	1876	1877	1878	1879	1880	1881	1882	1883	1884	1885	1886	1887	1888	1889	1890	1891	1892	1893	1894	1895	1896	1897	1898	1899	1900	1901	1902	1903	1904	1905	1906	1907	1908	1909	1910	1911	1912	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933	1934	1935	1936	1937	1938	1939	1940	1941	1942	1943	1944	1945	1946	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070	2071	2072	2073	2074	2075	2076	2077	2078	2079	2080	2081	2082	2083	2084	2085	2086	2087	2088	2089	2090	2091	2092	2093	2094	2095	2096	2097	2098	2099	20100	20101	20102	20103	20104	20105	20106	20107	20108	20109	20110	20111	20112	20113	20114	20115	20116	20117	20118	20119	20120	20121	20122	20123	20124	20125	20126	20127	20128	20129	20130	20131	20132	20133	20134	20135	20136	20137	20138	20139	20140	20141	20142	20143	20144	20145	20146	20147	20148	20149	20150	20151	20152	20153	20154	20155	20156	20157	20158	20159	20160	20161	20162	20163	20164	20165	20166	20167	20168	20169	20170	20171	20172	20173	20174	20175	20176	20177	20178	20179	20180	20181	20182	20183	20184	20185	20186	20187	20188	20189	20190	20191	20192	20193	20194	20195	20196	20197	20198	20199	20200	20201	20202	20203	20204	20205	20206	20207	20208	20209	20210	20211	20212	20213	20214	20215	20216	20217	20218	20219	20220	20221	20222	20223	20224	20225	20226	20227	20228	20229	20230	20231	20232	20233	20234	20235	20236	20237	20238	20239	20240	20241	20242	20243	20244	20245	20246	20247	20248	20249	20250	20251	20252	20253	20254	20255	20256	20257	20258	20259	20260	20261	20262	20263	20264	20265	20266	20267	20268	20269	20270	20271	20272	20273	20274	20275	20276	20277	20278	20279	20280	20281	20282	20283	20284	20285	20286	20287	20288	20289	20290	20291	20292	20293	20294	20295	20296	20297	20298	20299	20300	20301	20302	20303	20304	20305	20306	20307	20308	20309	20310	20311	20312	20313	20314	20315	20316	20317	20318	20319	20320	20321	20322	20323	20324	20325	20326	20327	20328	20329	20330	20331	20332	20333	20334	20335	20336	20337	20338	20339	20340	20341	20342	20343	20344	20345	20346	20347	20348	20349	20350	20351	20352	20353	20354	20355	20356	20357	20358	20359	20360	20361	20362	20363	20364	20365	20366	20367	20368	20369	20370	20371	20372	20373	20374	20375	20376	20377	20378	20379	20380	20381	20382	20383	20384	20385	20386	20387	20388	20389	20390	20391	20392	20393	20394	20395	20396	20397	20398	20399	20400	20401	20402	20403	20404	20405	20406	20407	20408	20409	20410	20411	20412	20413	20414	20415	20416	20417	20418	20419	20420	20421	20422	20423	20424	20425	20426	20427	20428	20429	20430	20431	20432	20433	20434	20435	20436	20437	20438	20439	20440	20441	20442	20443	20444	20445	20446	20447	20448	20449	20450	20451	20452	20453	20454	20455	20456	20457	20458	20459	20460	20461	20462	20463	20464	20465	20466	20467	20468	20469	20470	20471	20472	20473	20474	20475	20476	20477	20478	20479	20480	20481	20482	20483	20484	20485	20486	20487	20488	20489	20490	20491	20492	20493	20494	20495	20496	20497	20498	20499	20500	20501	20502	20503	20504	20505	20506	20507	20508	20509	20510	20511	20512	20513	20514	20515	20516	20517	20518	20519	20520	20521	20522	20523	20524	20525	20526	20527	20528	20529	20530	20531	20532	20533	20534	20535	20536	20537	20538	20539	20540	20541	20542	20543	20544	20545	20546	20547	20548	20549	20550	20551	20552	20553	20554	20555	20556	20557	20558	20559	20560	20561	20562	20563	20564	20565	20566	20567	20568	20569	20570	20571	20572	20573	20574	20575	20576	20577	20578	20579	20580	20581	20582	20583	20584	20585	20586	20587	20588	20589	20590	20591	20592	20593	20594	20595	20596	20597	20598	20599	20600	20601	20602	20603	20604	20605	20606	20607	20608	20609	20610	20611	20612	20613	20614	20615	20616	20617	20618	20619	20620	20621	20622	20623	20624	20625	20626	20627	20628	20629	20630	20631	20632	20633	20634	20635	20636	20637	20638	20639	20640	20641	20642	20643	20644	20645	20646	20647	20648	20649	20650	20651	20652	20653	20654	20655	20656	20657	20658	20659	20660	20661	20662	20663	20664	20665	20666	20667	20668	20669	20670	20671	20672	20673	20674	20675	20676	20677	20678	20679	20680	20681	20682	20683	20684	20685	20686	20687	20688	20689	20690	20691	20692	20693	20694	20695	20696	20697	20698	20699	20700	20701	20702	20703	20704	20705	20706	20707	20708	20709	20710	20711	20712	20713	20714	20715	20716	20717	20718	20719	20720	20721	20722	20723	20724	20725	20726	20727	20728	20729	20730	20731	20732	20733	20734	20735	20736	20737	20738	20739	20740	20741	20742	20743	20744	20745	20746	20747	20748	20749	20750	20751	20752	20753	20754	20755	20756	20757	20758	20759	20760	20761	20762	20763	20764	20765	20766	20767	20768	20769	20770	20771	20772	20773	20774	20775	20776	20777	20778	20779	20780	20781	20782	20783	20784	20785	20786	20787	20788	20789	20790	20791	20792	20793	20794	20795	20796	20797	20798	20799	20800	20801	20802	20803	20804	20805	20806	20807	20808	20809	20810	20811	20812	20813	20814	20815	20816	20817	20818	20819	20820	20821	20822	20823	20824	20825	20826	20827	20828	20829	20830	20831	20832	20833	20834	20835	20836	20837	20838	20839	20840	20841	20842	20843	20844	20845	20846	20847	20848	20849	20850	20851	20852	20853	20854	20855	20856	20857	20858	20859	20860	20861	20862	20863	20864	20865	20866	20867	20868	20869	20870	20871	20872	20873	20874	20875	20876	20877	20878	20879	20880	20881	20882	20883	20884	20885	20886	20887	20888	20889	20890	20891	20892	20893	20894	20895	20896	20897	20898	20899	20900	20901	20902	20903	20904	20905	20906	20907	20908	20909	20910	20911	20912	20913	20914	20915	20916	20917

Statistics early stage



Italian: **Statista** ("statesman" or "politician")

German: **Statistik**, first introduced by Gottfried Achenwall (1749). Analysis of data about the state, thus the "science of state" (then called political arithmetic in English).

Ultimately, from Latin:
Statisticum collegium
("council of state")

So for decades statisticians, economists, demographers, were very happy doing data analysis, till...

The PC happened

thedayintech.wordpress.com/2013/03/08/4995-00-for-10-megabytes/



Circle 198 on inquiry card.

**The IBM Personal Computer XT.
More power to the person.**

Plenty of muscle. That's what the new IBM Personal Computer XT means to a person with heavyweight data to manage. Because one of the XT's many strong points is a 10-million-character fixed disk drive that helps give you the power to pump more productivity into your business. What's so special about a fixed disk? Exactly that. It's *already* fixed inside the system, with the capacity to store the facts, figures, names and numbers you need to work with.

(Rather than go from diskette to diskette, store up to 5,000 pages of text or up to 100,000 names and addresses in one place.)

Yet there's more built into the XT than its fixed disk. Reliability and quality are built in as well. Plus more than 30 years of IBM experience.

A new level of price/performance. And a remarkable compatibility of both software and hardware with the original IBM Personal Computer. So, with the introduction of XT comes a special tool designed to help you be more productive in high-volume applications.

WHAT'S THE DIFFERENCE?



BASE SYSTEM™

User Memory
64KB (expandable to 640KB)

Auxiliary Memory
Up to two 5 1/4" 300KB/500KB or
3.2MB/6.4MB diskette drives
optional



BASE SYSTEM™

User Memory
128KB (expandable to 640KB)

Auxiliary Memory
One 35 megabyte hard disk
One 35 megabyte tape drive
One 10 megabyte fixed disk drive
standard

* An expansion unit can also be added to both 16-bit (8088) systems for 6 more expansion slots. Added to the IBM Personal Computer, it can house two 10 megabyte hard disk drives or one 10 megabyte fixed disk drive. To use the 10 megabyte additional fixed disk drive the total of 20 megabytes.

Another tool for modern times to keep you going strong.

To find out where you can see the IBM Personal Computers, call 800-447-4700. In Alaska or Hawaii, 800-447-0890.



Then new analysts, accountants, quants,
econometricians were very happy doing
data analysis, till...

The Big Data happened



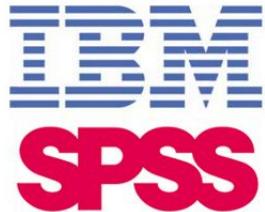
Paradigms

Manual



Maastricht University

User oriented



Purpose oriented

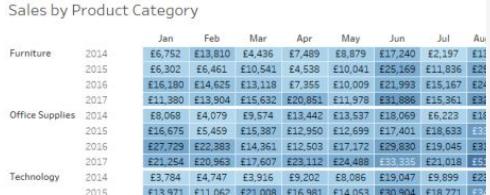
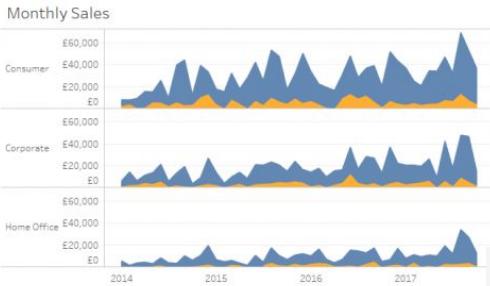
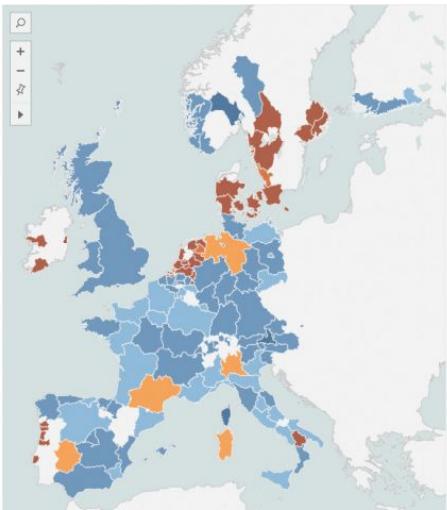


Software

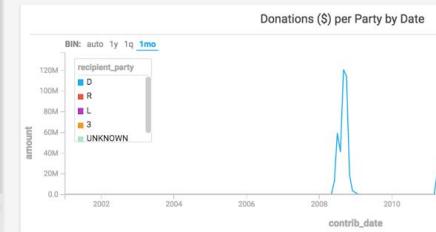
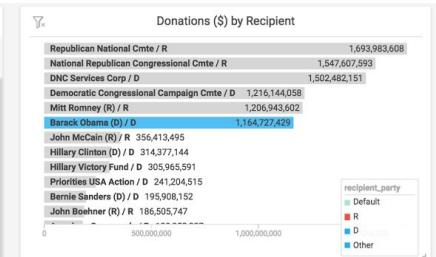
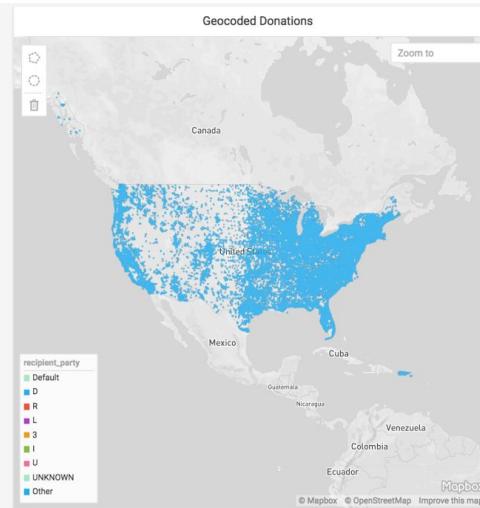
Programming Language



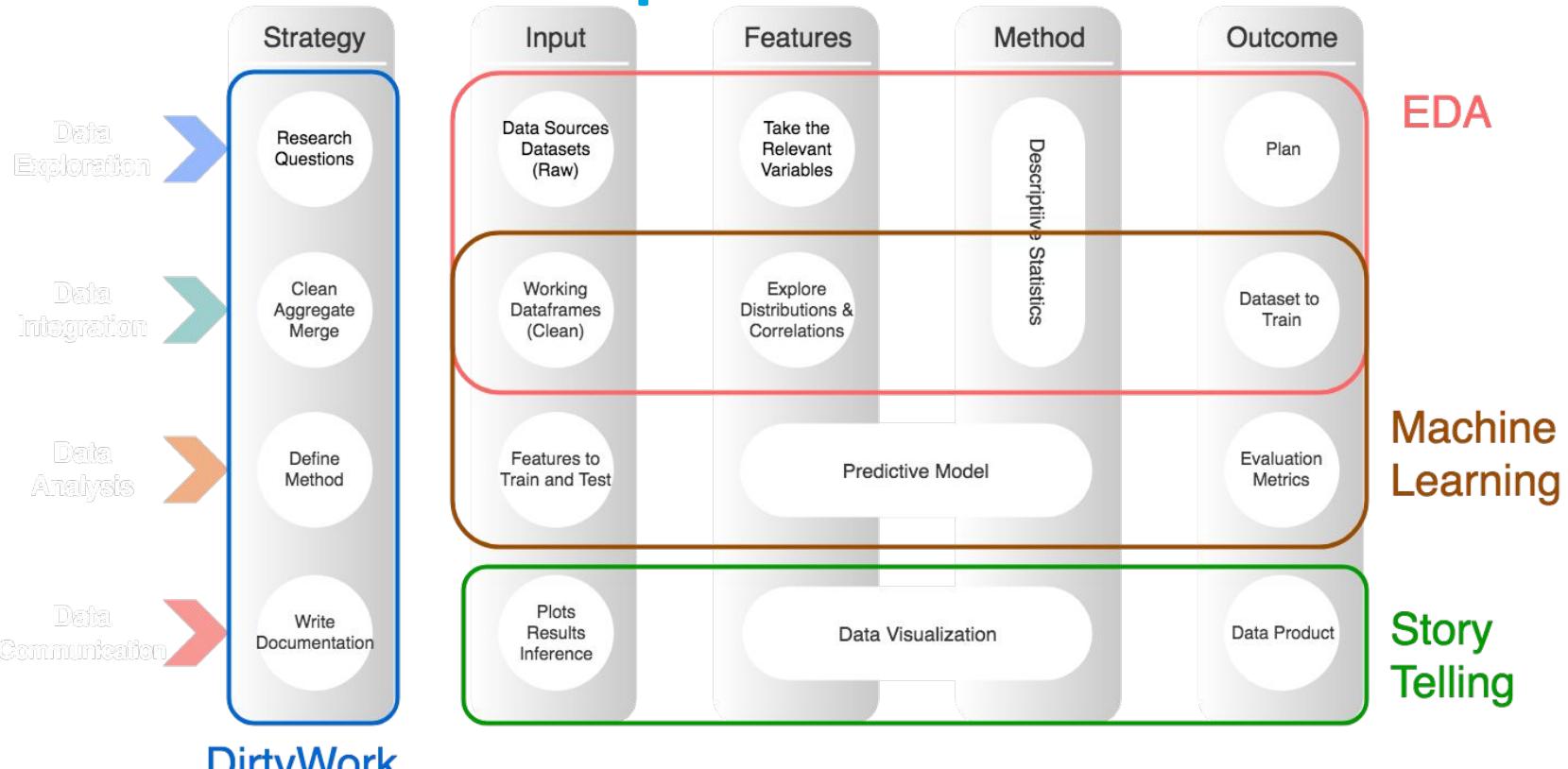
What is the difference?



Python



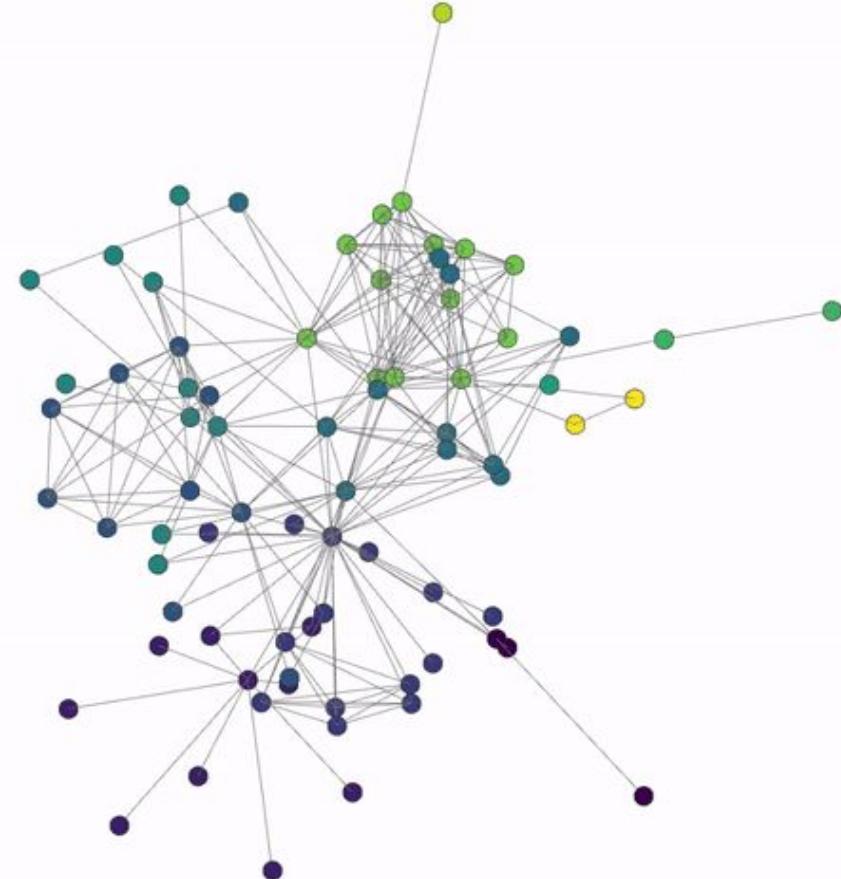
The Data Science Pipeline



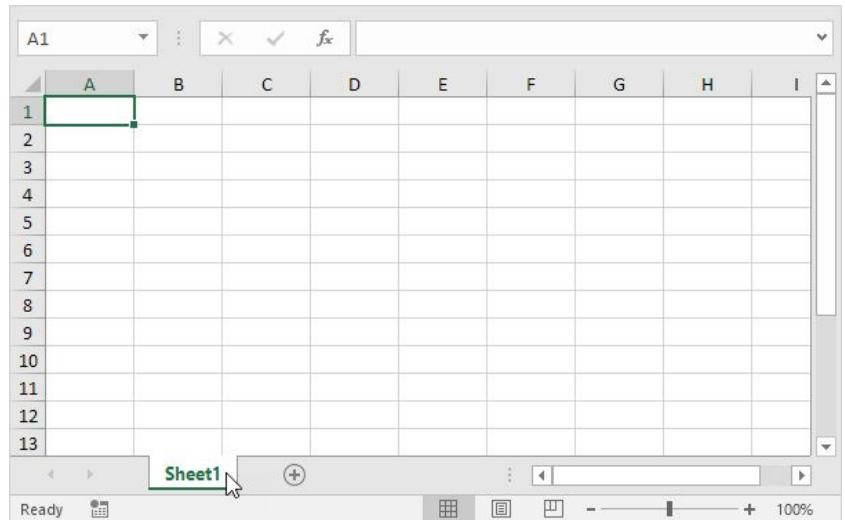
Data Representation

Data things...

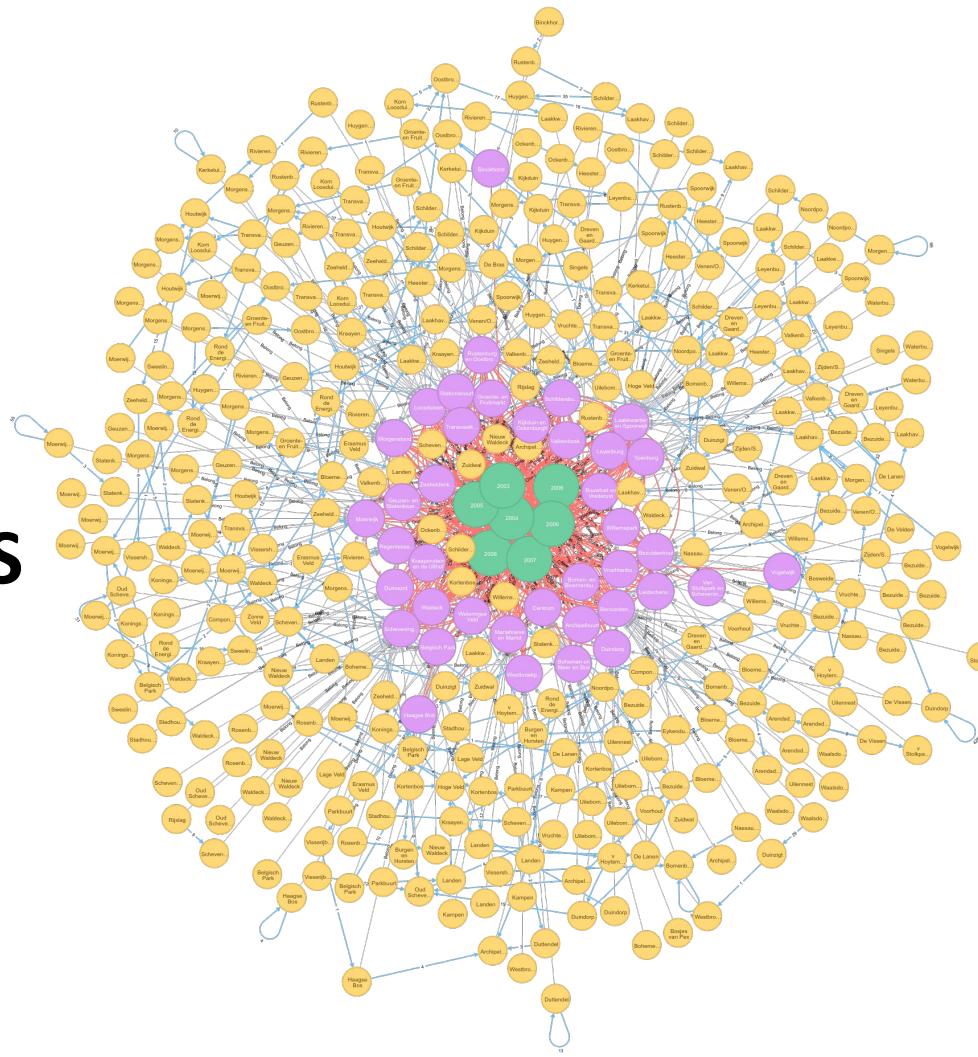
- Data Model
- Database
- Dataset
- Data Syntax
- **Data Format**



Data Format



VS



Tables

Columns

The diagram illustrates a table structure with several rows and columns. A horizontal arrow points from the word 'Columns' to the first column of the table, which is highlighted with a red border. A vertical arrow points from the word 'Rows' to the second row of the table, which is also highlighted with a red border.

Country	Name	Year Passed	Executive	climate_change_laws.csv	Categories	Document
Japan	Act on the Improvem...	01/01/2015	Legislative	null	Energy De...	Law
Macedoni...	Action Plan on Rene...	01/01/2015	Executive	null	Energy Sup...	Plan
Czech Rep...	Adaptation strategy ...	01/01/2015	Executive	Adapt...	Adaptation	Strategy
Niue	Agriculture Sector Pl...	01/01/2015	Executive	null	Adaptation...	Plan
Thailand	Alternative Energy D...	01/01/2015	Executive	null	Energy Sup...	Plan
United Sta...	Clean Power Plan	01/01/2015	Executive	null	Energy Sup...	Plan
Malta	Climate Action Act	01/01/2015	Legislative	Mitig...	Adaptation...	Law
Ireland	Climate Action and L...	01/01/2015	Legislative	Mitig...	Adaptation...	Law
Ireland	Climate Action and L...	01/01/2015	Legislative	Mitig...	Adaptation...	Law

Tables

Country	Name	Year Passed	Executive	Mitigation	Adaptation	Document
Japan	Act on the Improvem...	01/01/2015	Legislative	null	Energy De...	Law
Macedoni...	Action Plan on Rene...	01/01/2015	Executive	null	Energy Sup...	Plan
Czech Rep...	Adaptation strategy ...	01/01/2015	Executive	Adapt...	Adaptation	Strategy
Niue	Agriculture Sector Pl...	01/01/2015	Executive	null	Adaptation...	Plan
Thailand	Alternative Energy D...	01/01/2015	Executive	null	Energy Sup...	Plan
United Sta...	Clean Power Plan	01/01/2015	Executive	null	Energy Sup...	Plan
Malta	Climate Action Act	01/01/2015	Legislative	Mitig...	Adaptation...	Law
Ireland	Climate Action and L...	01/01/2015	Legislative	Mitig...	Adaptation...	Law
Ireland	Climate Action and L...	01/01/2015	Legislative	Mitig...	Adaptation...	Law



.XLS

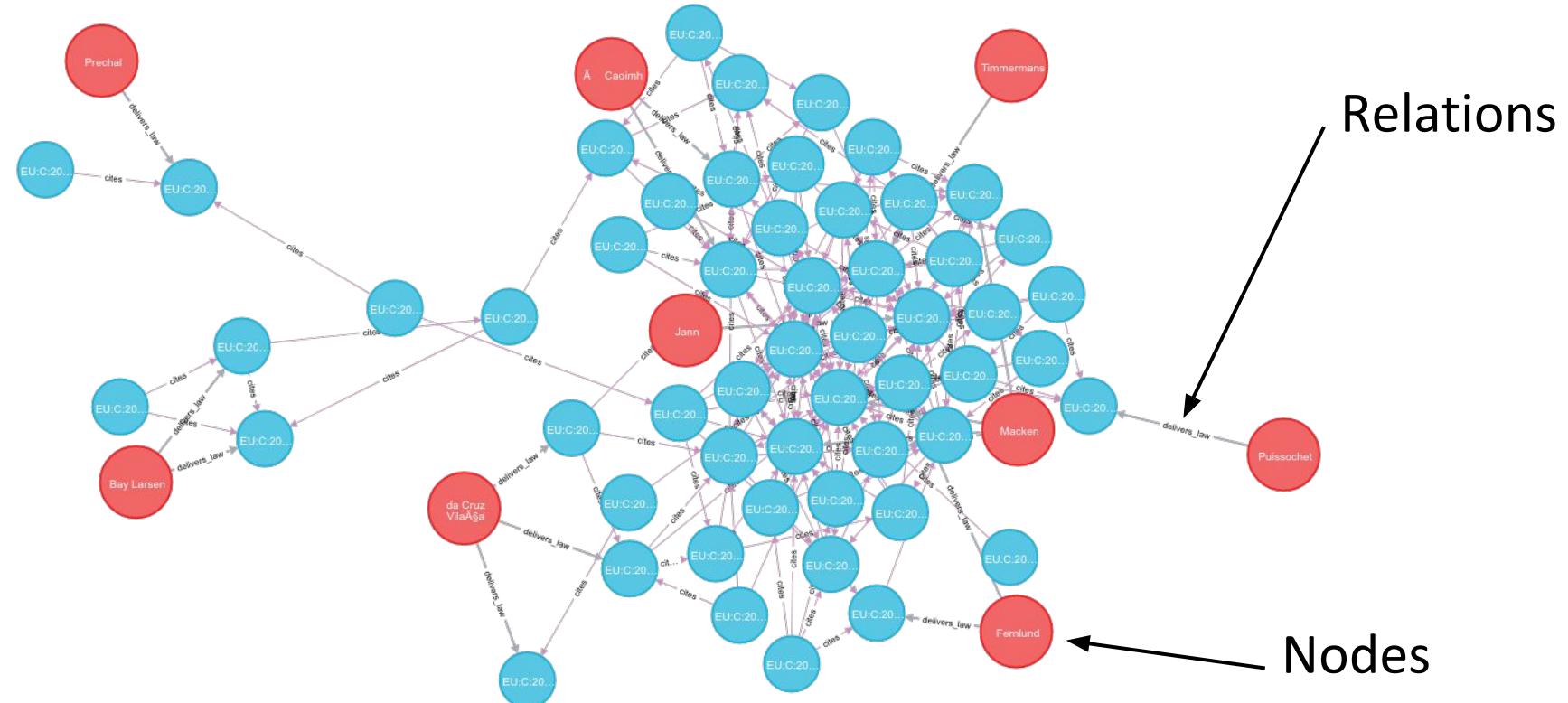
.CSV

.TSV

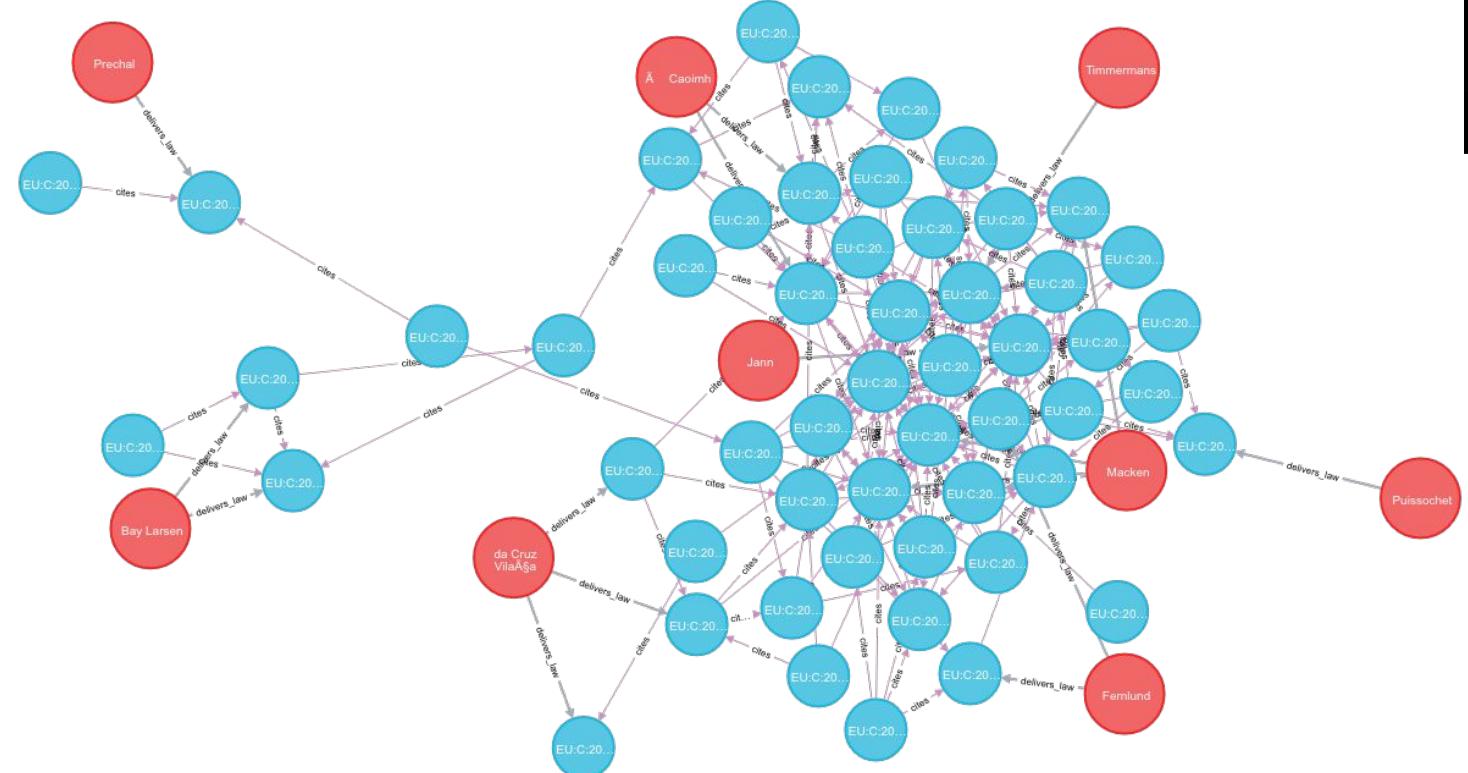
.SPSS

.DATA

Graphs



Graphs



.n3
.nt
.ttl
.gexf
.grapML

Documents

```
{  
    first_name: 'Paul',  
    surname: 'Miller',  
    cell: 447557505611,  
    city: 'London',  
    location: [45.123,47.232],  
    Profession: ['banking', 'finance', 'trader'],  
    cars: [  
        { model: 'Bentley',  
         year: 1973,  
         value: 100000, ... },  
        { model: 'Rolls Royce',  
         year: 1965,  
         value: 330000, ... }  
    ]  
}
```

Fields

String

Number

Geo-Coordinates

Typed field values

Fields can contain arrays

Fields can contain an array of sub-documents



Documents

```
{  
    first_name: 'Paul',  
    surname: 'Miller',  
    cell: 447557505611,  
    city: 'London',  
    location: [45.123,47.232],  
    Profession: ['banking', 'finance', 'trader'],  
    cars: [  
        { model: 'Bentley',  
            year: 1973,  
            value: 100000, ... },  
        { model: 'Rolls Royce',  
            year: 1965,  
            value: 330000, ... }  
    ]  
}
```



.json
.xml
.yaml

Python Data Products

Applications

RESEARCH-ARTICLE

CrowdED: Guideline for Optimal Crowdsourcing Experimental Design

Create a synthetic dataset of workers

```
import crowded.simulate as cs

#define your parameters
total_workers = 40
alpha = 28
beta = 2
#create task dataset
df_workers = cs.Workers(alpha, beta).create(total_workers)
```

Assign easily and fairly workers to tasks

```
import crowded.simulate as cs

#workers per task should always be smaller than the number of workers
wpt = 5
#create assignment
df_tw = cs.AssignTasks(df_tasks, df_workers, wpt).create()
```

Compute Bayes probability and predict worker answers

```
import crowded.method as cm

#workers per task should always be smaller than the number of workers
wpt = 5
#create assignment
df_tw = cs.AssignTasks(df_tasks, df_workers, wpt).create()
```

Compute Bayes probability and Predict answers of the workers

```
import crowded.method as cm

#define the parameters
x = df_tw['prob_task'] #vector of probabilities of tasks
y = df_tw['prob_worker'] #vector of probabilities of workers
z = df_tasks['true_answers'].unique() #vector of valid answers in the experiment
#compute probability
cp = cm.ComputeProbability(x, y, z)
```

Authors:  Amrapali Zaveri,  Pedro Hernandez Serrano,  Manisha Desai,  Michel Dumontier

[Authors Info & Affiliations](#)

Publication: WWW '18: Companion Proceedings of The Web Conference 2018 • April 2018 • Pages 1
1116 • <https://doi.org/10.1145/3184558.3191543>

Applications

Cross-border Corporate Mobility in the EU: Empirical Findings 2019 (Vol. 1)

85 Pages • Posted: 20 Jun 2019

Thomas Biermeyer

Maastricht University - Faculty of Law

Marcus Meyer

Maastricht University - Faculty of Law

Date Written: June 12, 2019

Abstract

This report on cross-border mobility in the European Union focuses, in its third edition, particularly on cross-border mergers and cross-border seat transfers between 2013 and 2019.

Keywords: cross-border mobility, cross-border mergers, cross-border seat transfers, cross-border divisions, empirical findings

Bekanntmachungstext

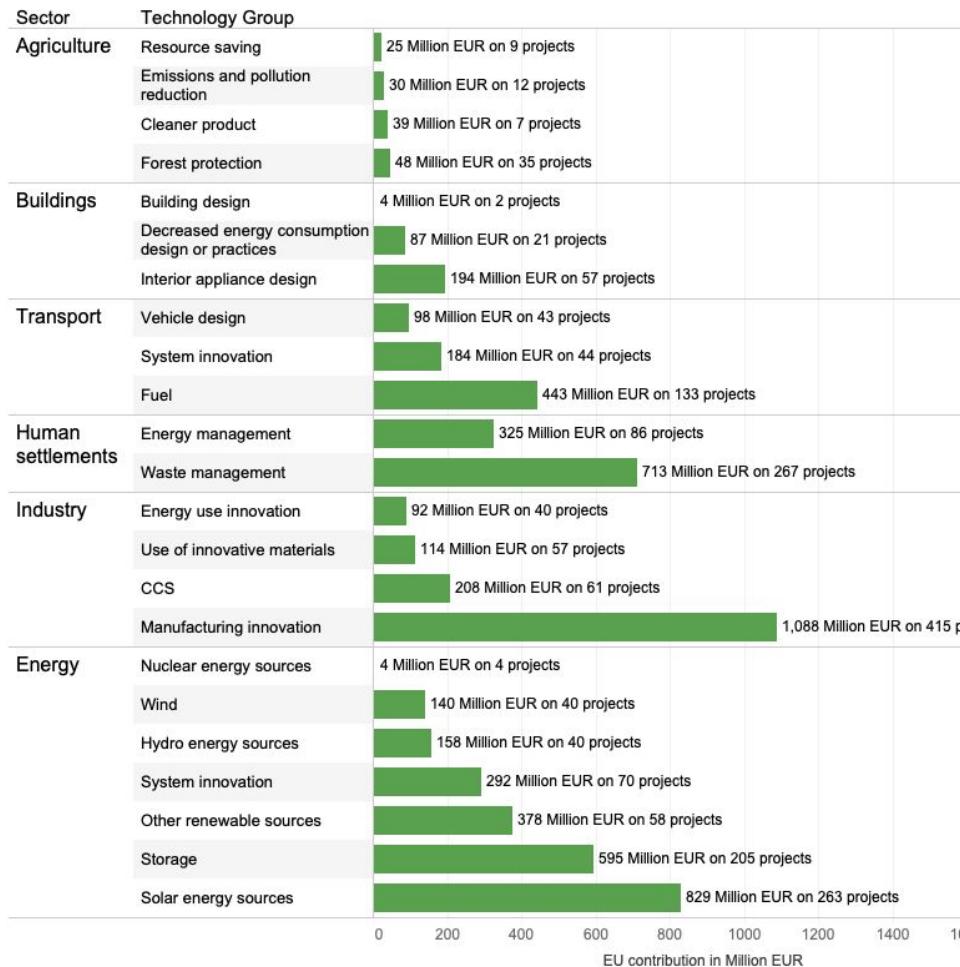
In () gesetzte Angaben der Anschrift und des Geschäftszweiges erfolgen ohne Gewähr: Vorgänge ohne Eintragung 11.01.2019 HRB 27380: BVO Ortner GmbH, Bernau a.Chiemsee, Geigelsteinstr. 8, 83233 Bernau a.Chiemsee. Beim Handelsregister des Amtsgerichts Traunstein wurde am 17.12.2018 der Entwurf des Verschmelzungsplans vom 22. November 2018 (Verschmelzungsplan) über die grenzüberschreitende Verschmelzung der BVO Vertrieb Limited mit dem Sitz in 69 Great Hampton Street, Birmingham, West Midlands, B18 6EW, Großbritannien als übertragende Gesellschaft auf die BVO Ortner GmbH mit Sitz in Bernau am Chiemsee, Deutschland, als aufnehmende Gesellschaft eingereicht. Bei der übertragenden BVO Vertrieb Limited handelt es sich um eine Gesellschaft mit beschränkter Haftung nach dem Recht von England und Wales. Die bekannt zu machenden Angaben gem. § 122d Satz 3 UmwG haben folgenden Inhalt: 1. An der Verschmelzung sind beteiligt als übertragende Gesellschaft die BVO Vertrieb Limited, eine Gesellschaft mit beschränkter Haftung nach dem Recht von England und Wales mit dem Sitz in 69 Great Hampton Street, Birmingham, West Midlands, B18 6EW, Großbritannien und als aufnehmende Gesellschaft die BVO Ortner GmbH, eine Gesellschaft mit beschränkter Haftung deutschen Rechts mit dem Sitz in Bernau am Chiemsee, Deutschland. Die übertragende Gesellschaft ist eingetragen im Gesellschaftsregister für England und Wales unter der Nummer 05293246. Die aufnehmende Gesellschaft ist eingetragen im Handelsregister des Amtsgerichts Traunstein, Deutschland, unter HRB 27380. 2.a) Die Rechte der Gläubiger der übernehmenden deutschen GmbH ergeben sich aus § 122a Abs. 2 UmwG i. V. m. § 22 UmwG. Danach ist den Gläubigern

Applications

Text Mining meets H2020 projects within the context of climate change

Pedro Hernandez
Seun Adekunle
Zahar Koretsky

A research collaboration between
MUSTS (FASOS) and IDS.



Github repository:
github.com/pedrohserrano/data-science-bootcamp

Notebook help:
bit.ly/2RkqKMa