Algorithms & Data Structures II
DCA 0209

ivanovitch.silva@ufrn.br
@ivanovitchm

Drive

Bike

Bike - Drive

6º Nível

Estrutura Curricular	Natureza	
DCA0104 - ARQUITETURA DE COMPUTADORES - 60h	*Obrigatória*	
DCA0110 - MODELAGEM E ANALISE DE SISTEMAS DINAMICOS - 60h	*Obrigatória*	
DCA0115 - OTIMIZACAO DE SISTEMAS - 60h	*Obrigatória*	
DCA0130 - REDES DE COMPUTADORES - 60h	*Obrigatória*	
DCA0205 - PROJETO E ENGENHARIA DE SOFTWARE - 45h	*Obrigatória*	
DCA0207 - BANCO DE DADOS - 45h	*Obrigatória*	
DCA0208 - ALGORITMOS E ESTRUTURAS DE DADOS I - 60h	*Obrigatória*	

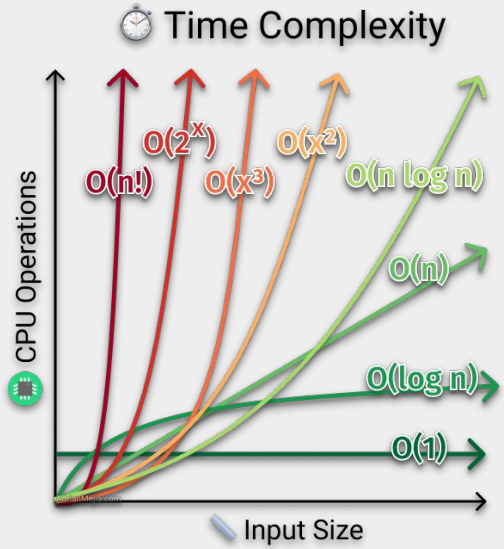
CH Total: 390h.

7º Nível

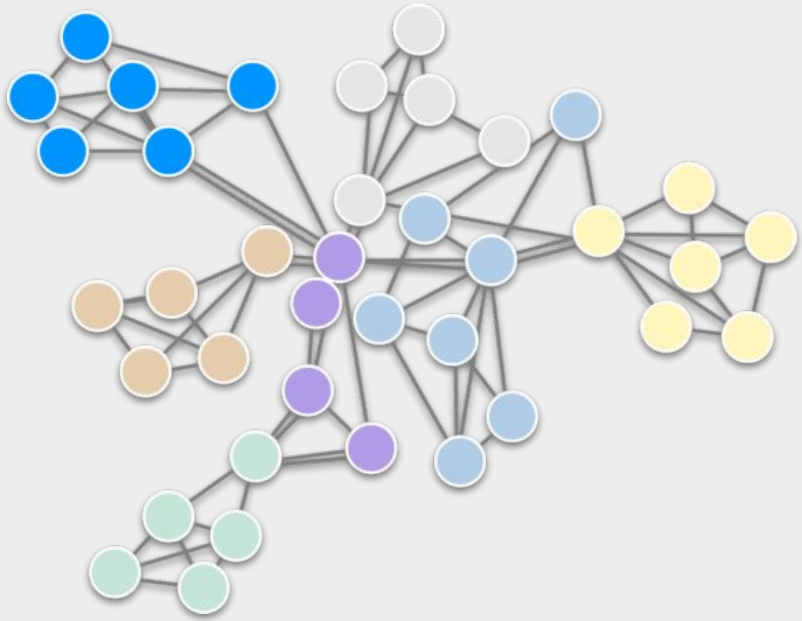
Estrutura Curricular	Natureza	
DCA0108 - SISTEMAS OPERACIONAIS - 60h	*Obrigatória*	
DCA0114 - COMPUTACAO GRAFICA - 60h	*Obrigatória*	
DCA0119 - SISTEMAS DIGITAIS - 60h	*Obrigatória*	
DCA0200 - INTELIGÊNCIA ARTIFICIAL - 60h	*Obrigatória*	
DCA0209 - ALGORITMOS E ESTRUTURAS DE DADOS II - 60h	*Obrigatória*	
DCA0210 - LINGUAGENS FORMAIS E AUTÔMATOS - 45h	*Obrigatória*	
DCA0211 - COMPILADORES - 45h	*Obrigatória*	

CH Total: 390h.

Course Outline



Algorithm Complexity



Graph

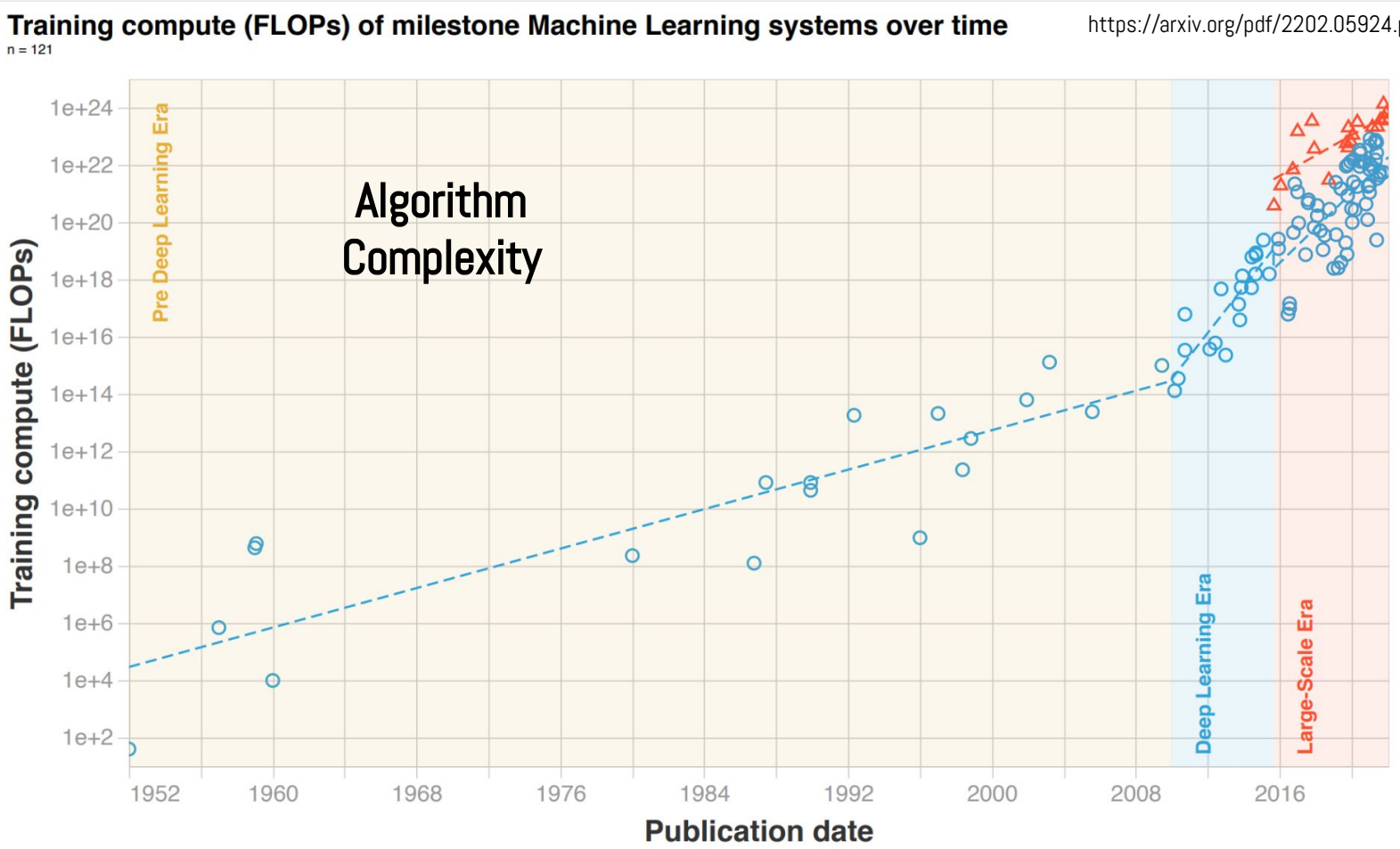
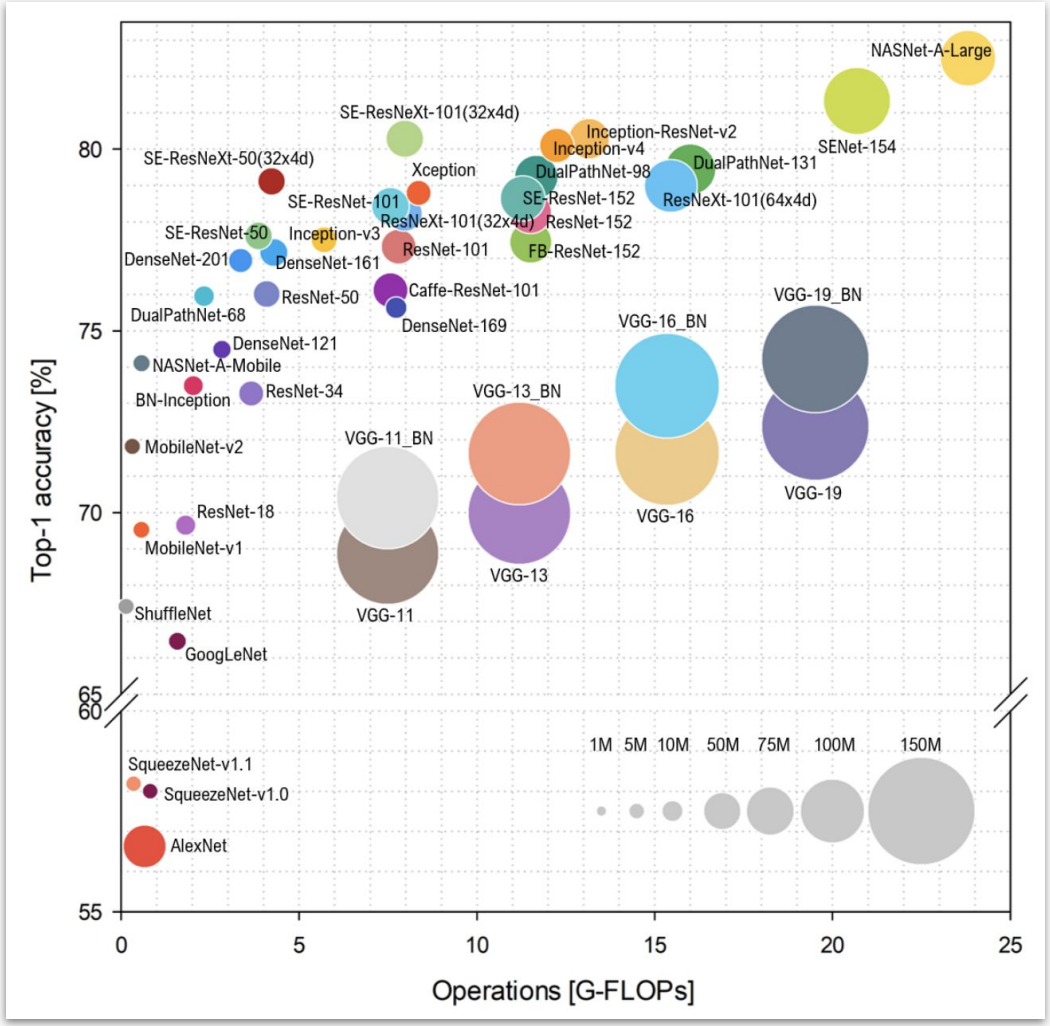


Figure 1: Trends in $n = 121$ milestone ML models between 1952 and 2022. We distinguish three eras. Notice the change of slope circa 2010, matching the advent of Deep Learning; and the emergence of a new large-scale trend in late 2015.

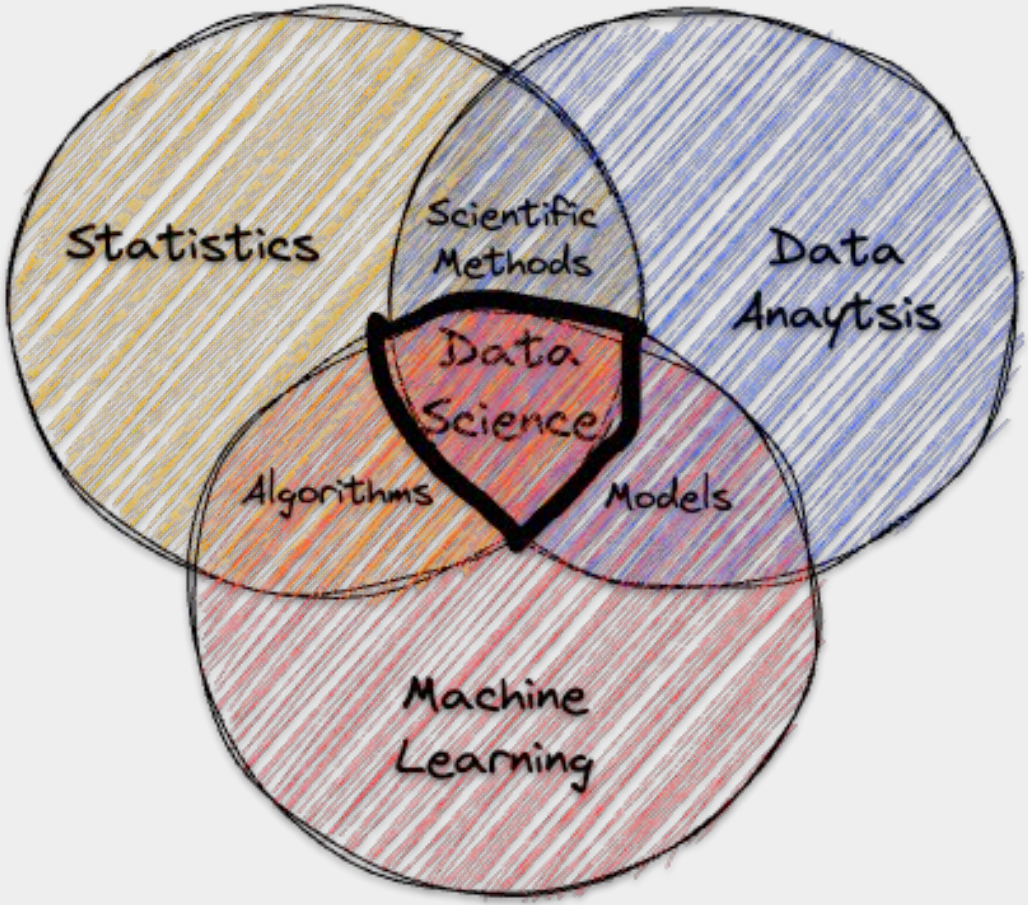


Algorithm Complexity

ML Model Evolution ImageNet

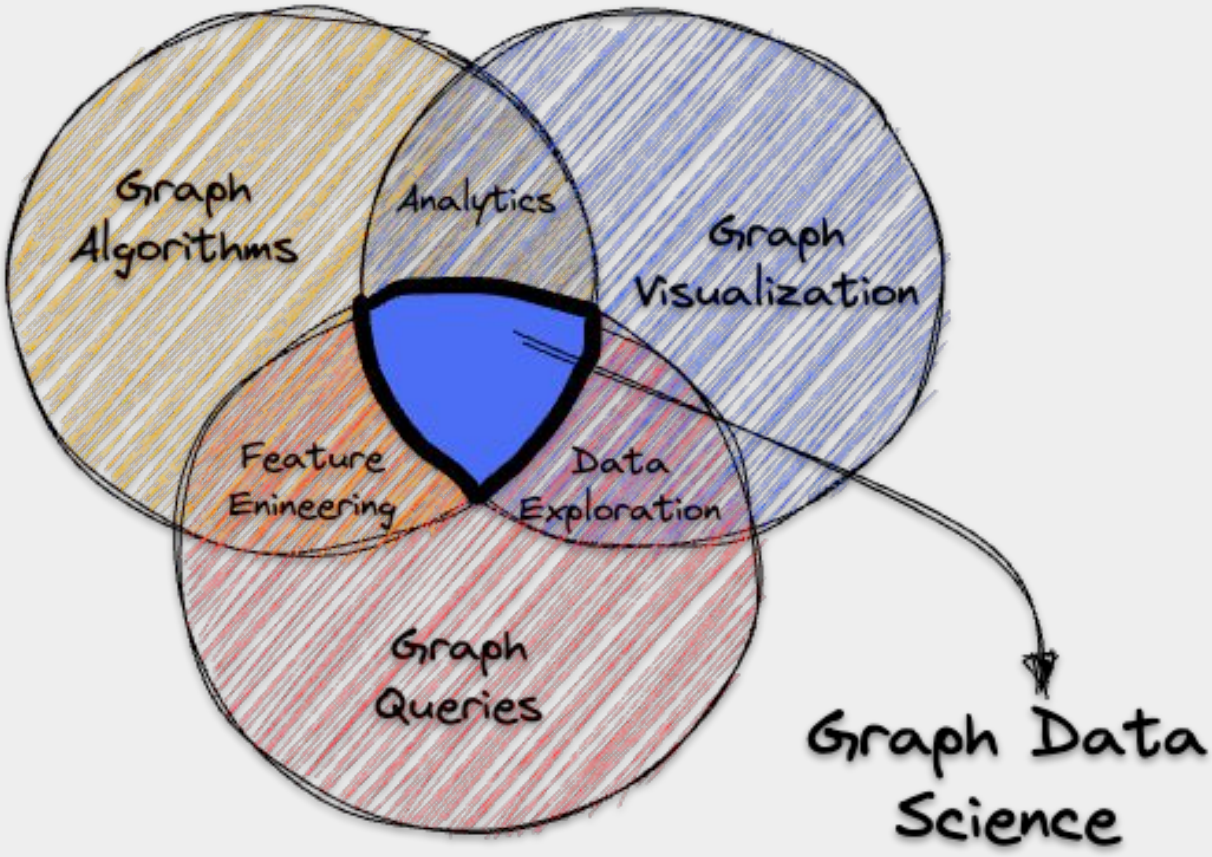
Source: S. Bianco, R. Cadene, L. Celona, and P. Napoletano, "Benchmark analysis of representative deep neural network architectures". IEEE Access, vol. 6, 2018.

And about graph?
Where and how use them?



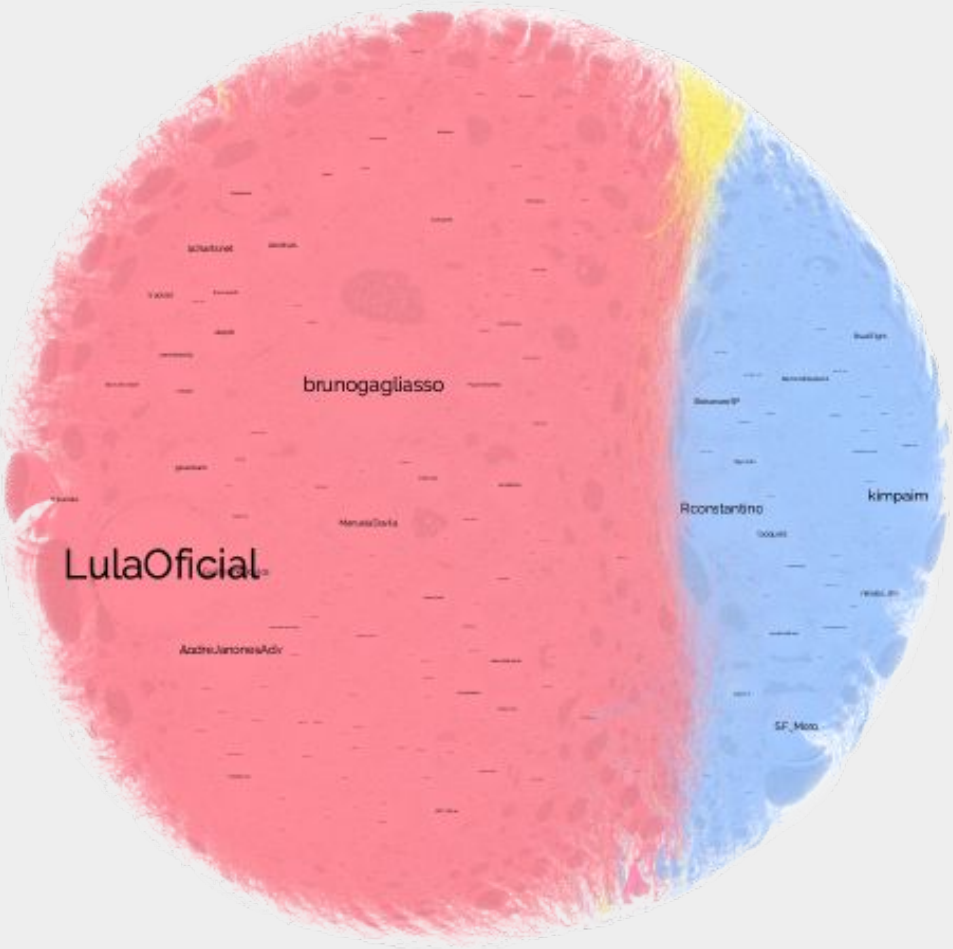
Data Science is an interdisciplinary field that use scientific methods, processes, algorithms and systems to extract knowledge and insights from structure and unstructured data.

Data Scientists use data to answer questions.



Graph Data Science is an science-driven approach to gain knowledge from the relationships and structures in data, typically to power predictions.

Data Scientists use relationships to answer questions.

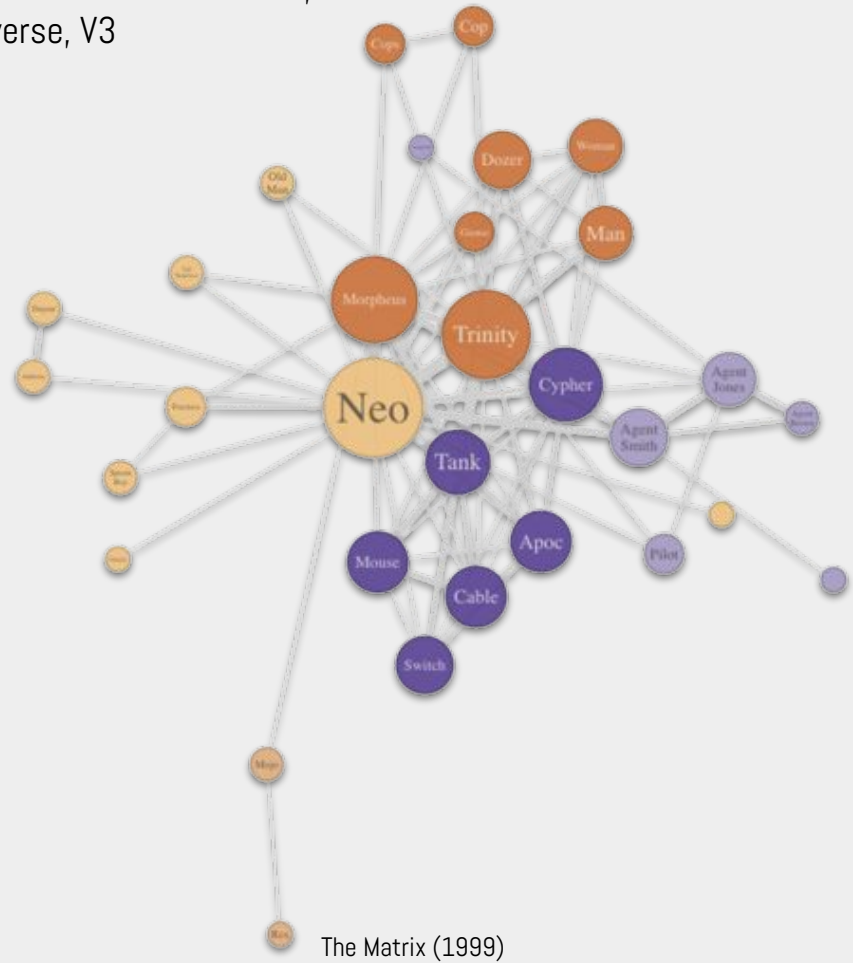


Visualizing Elections Feedback

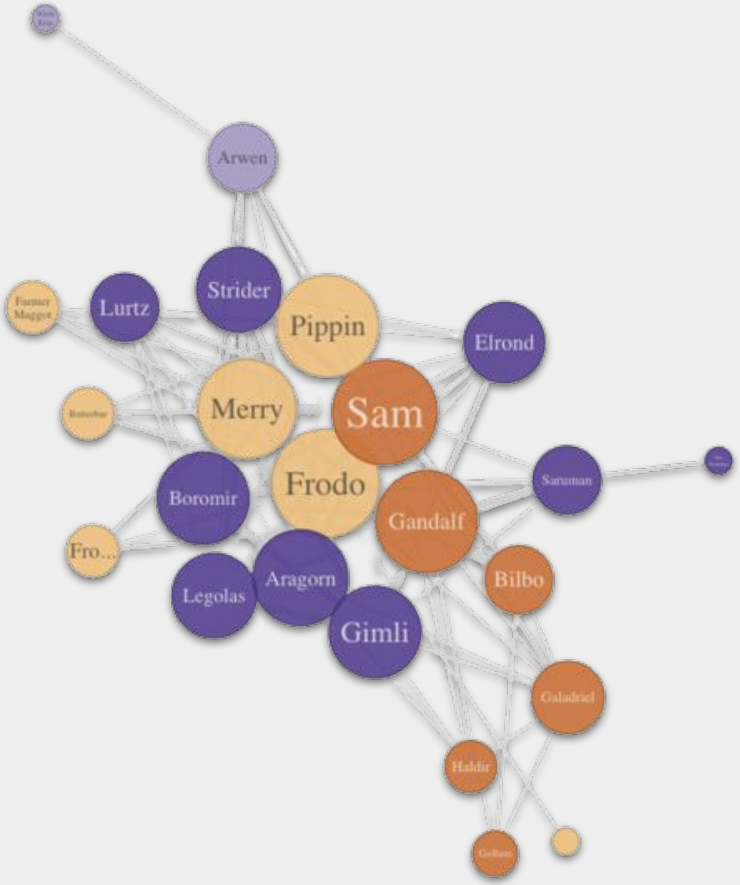
Clustering
Community Detection
Mention network

Kaminski et al., 2018, "Moviegalaxies - Social Networks in Movies", Harvard Dataverse, V3

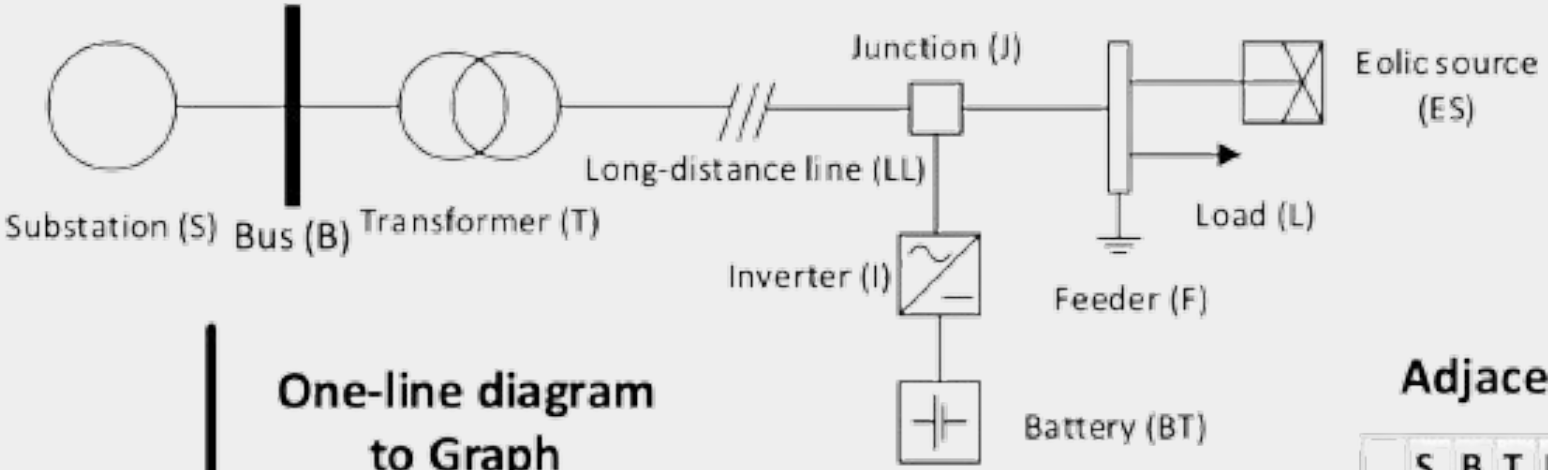
https://moviegalaxies.com



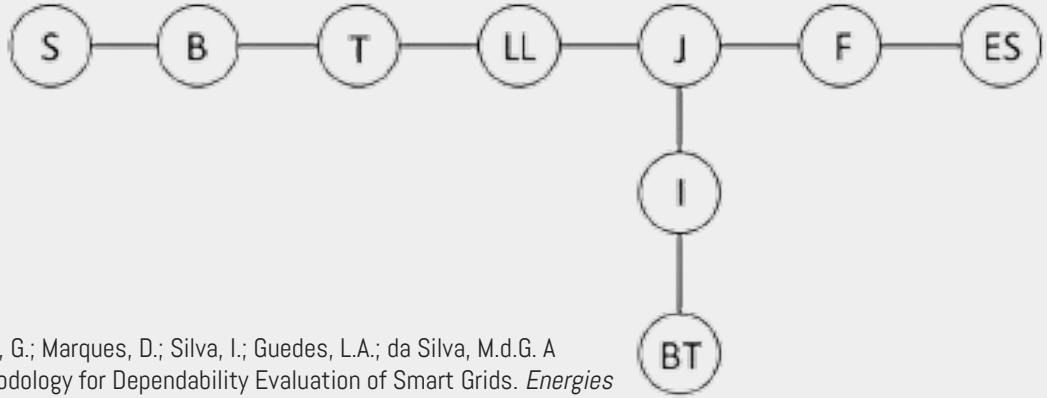
The Matrix (1999)



The Lord of the Rings: The Fellowship of the Ring (2001)



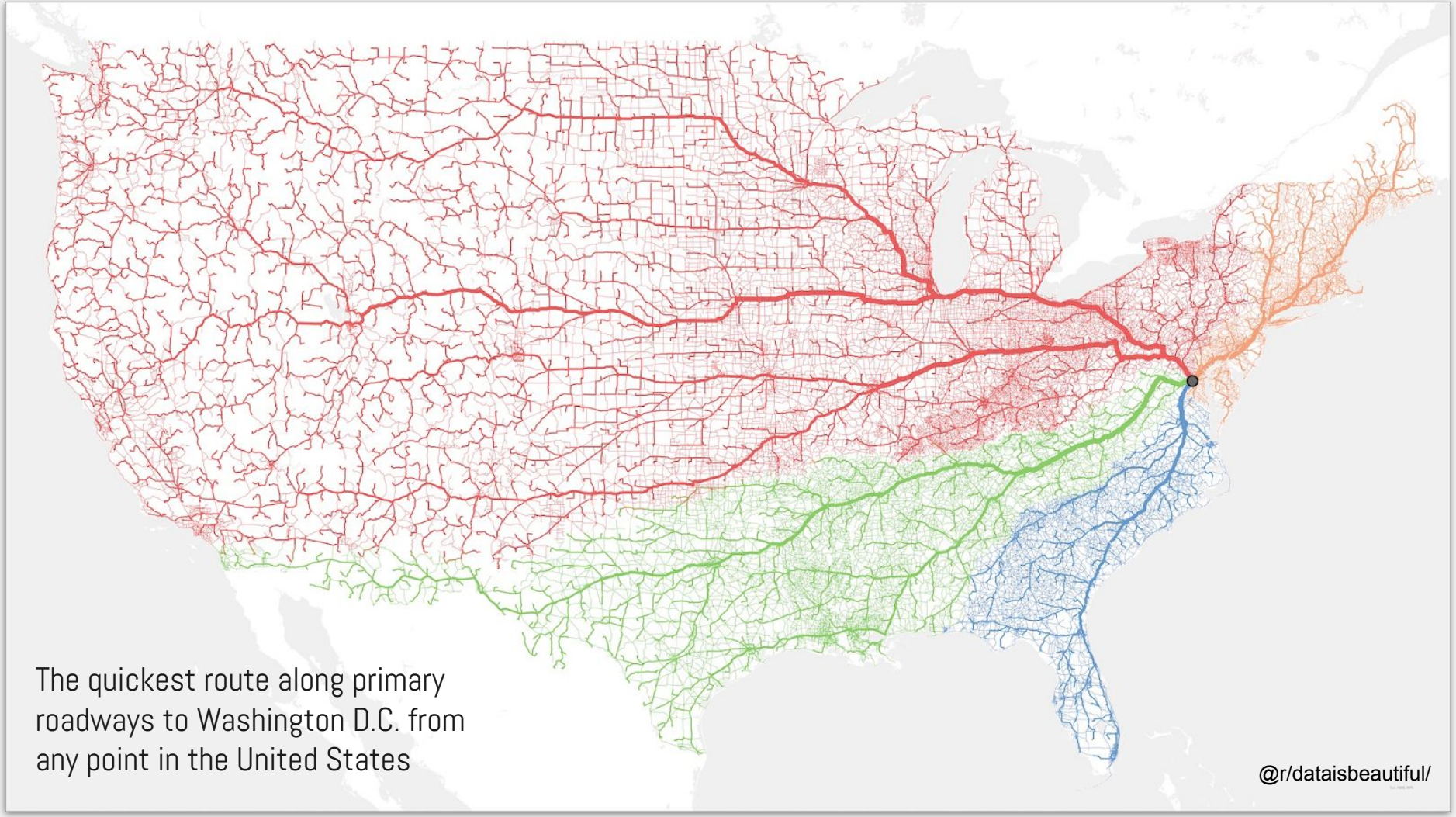
One-line diagram to Graph



Adjacency Matrix

	S	B	T	LL	J	I	BT	F	ES
S	0	1	0	0	0	0	0	0	0
B	1	0	1	0	0	0	0	0	0
T	0	1	0	1	0	0	0	0	0
LL	0	0	1	0	1	0	0	0	0
J	0	0	0	1	0	1	0	1	0
I	0	0	0	0	1	0	1	0	0
BT	0	0	0	0	0	1	0	0	0
F	0	0	0	0	1	0	0	0	1
ES	0	0	0	0	0	0	0	1	0

Alves, G.; Marques, D.; Silva, I.; Guedes, L.A.; da Silva, M.d.G. A Methodology for Dependability Evaluation of Smart Grids. *Energies* **2019**, *12*, 1817. https://doi.org/10.3390/en12091817

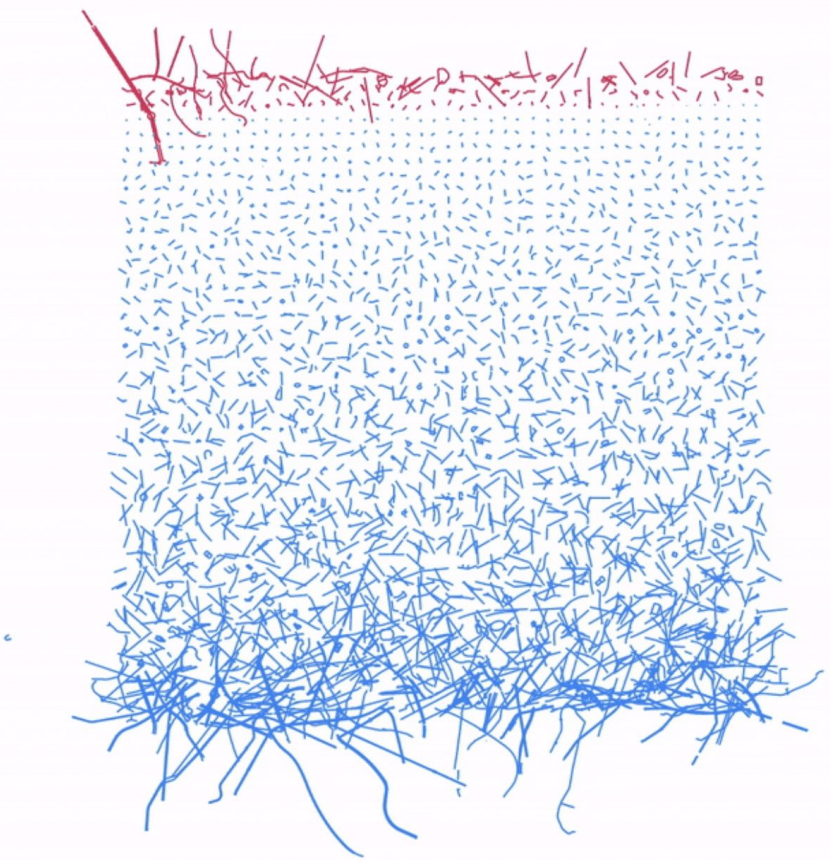

The quickest route along primary roadways to Washington D.C. from any point in the United States
@r/dataisbeautiful/

Drive

Bike

Bike - Drive

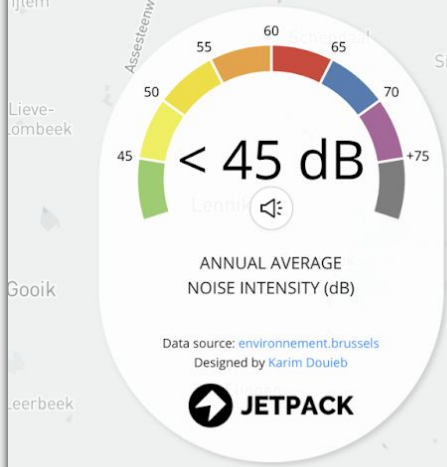
Only 6% of Brussels streets are named after women. Open Knowledge BE organized the production of these statistics with the help of 60 volunteers who tagged the gender of each street in Brussels.

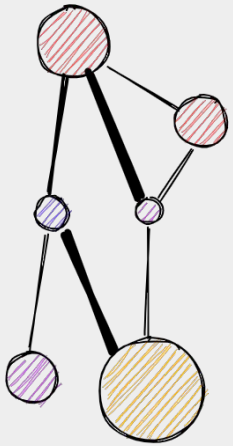


https://www.karim.news/project/street-gender

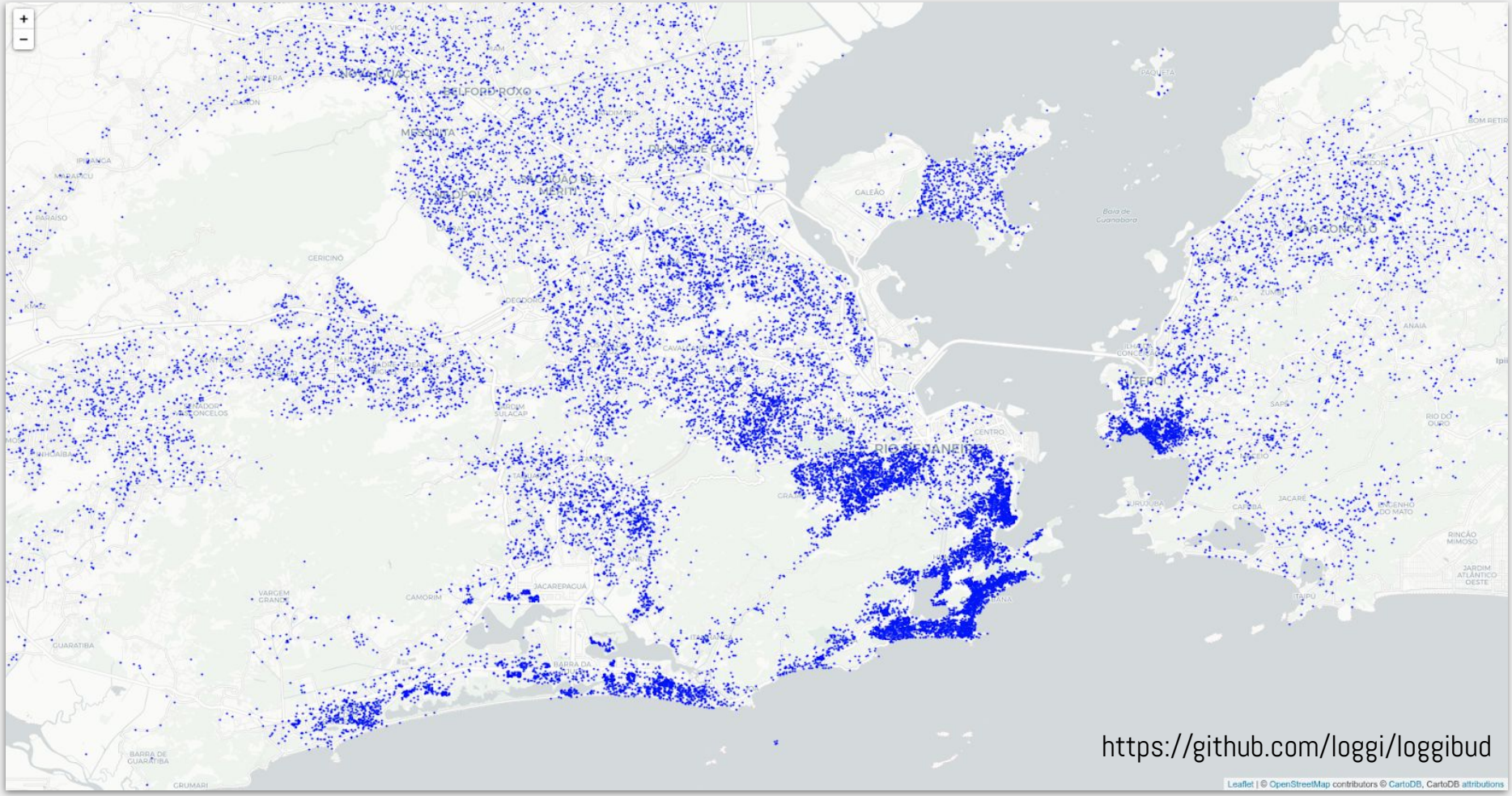
Noisy City

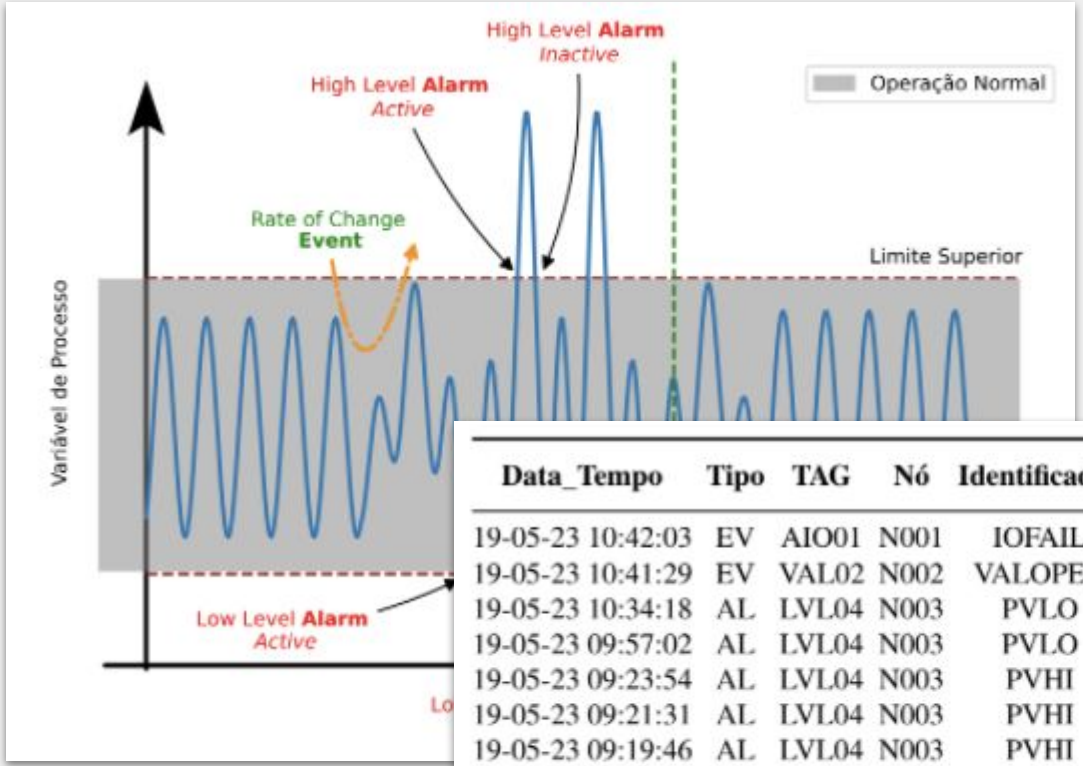
Audible data visualization on Brussels noise pollution.
Crank up the volume and mouse over the city.





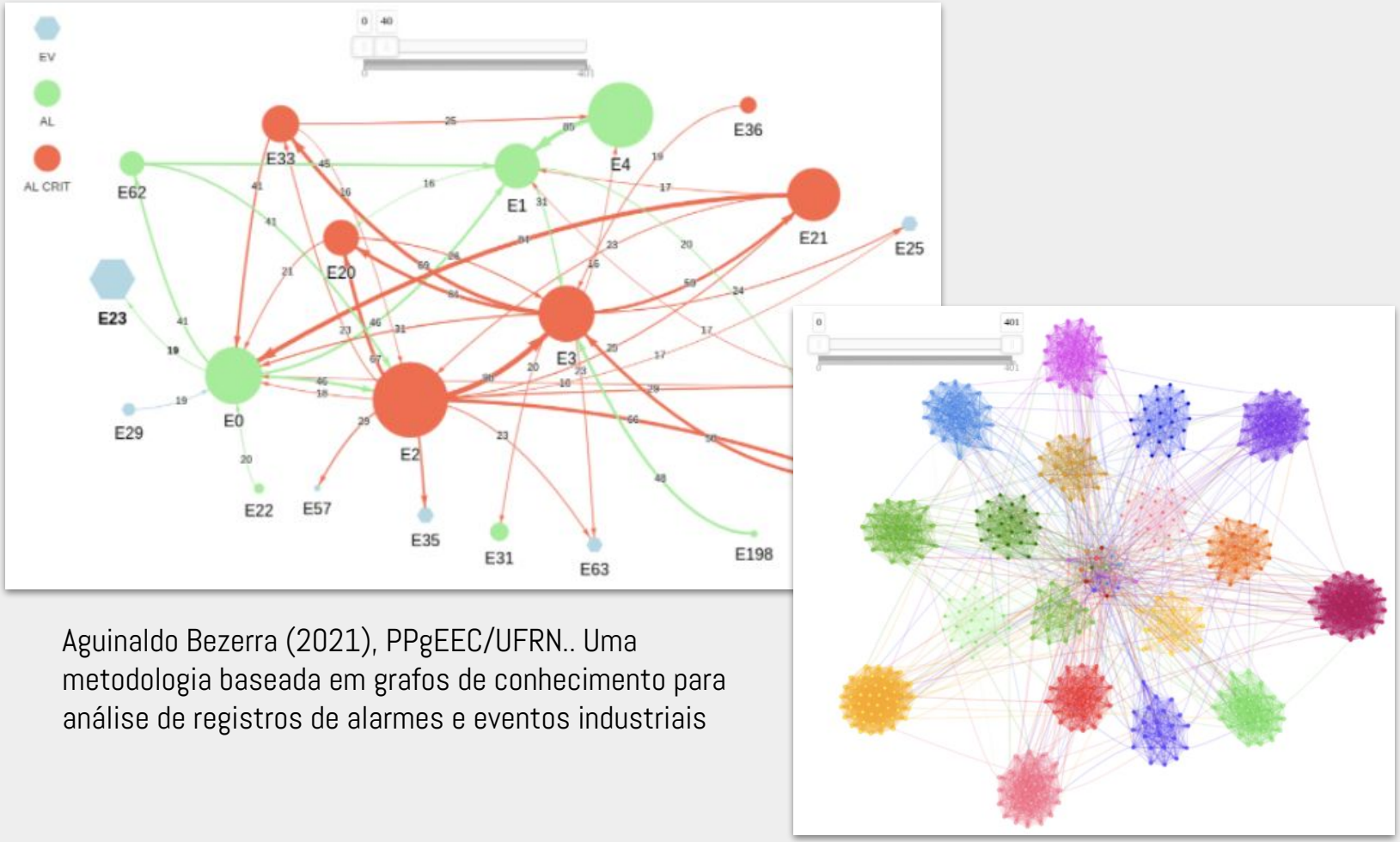
https://noisy-city.jetpack.ai/


https://github.com/loggi/loggibud
Leaflet | © OpenStreetMap contributors © CartoDB, CartoDB attributions

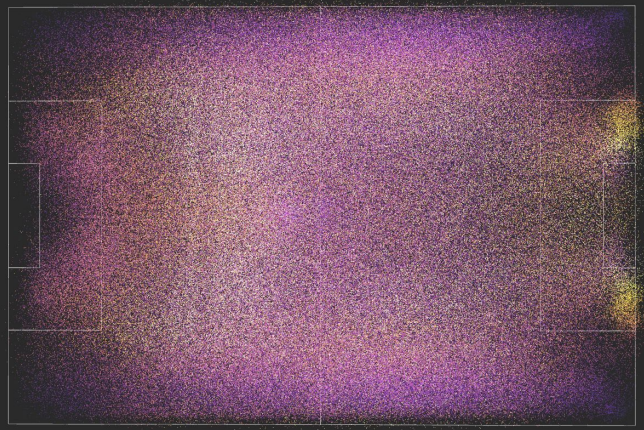


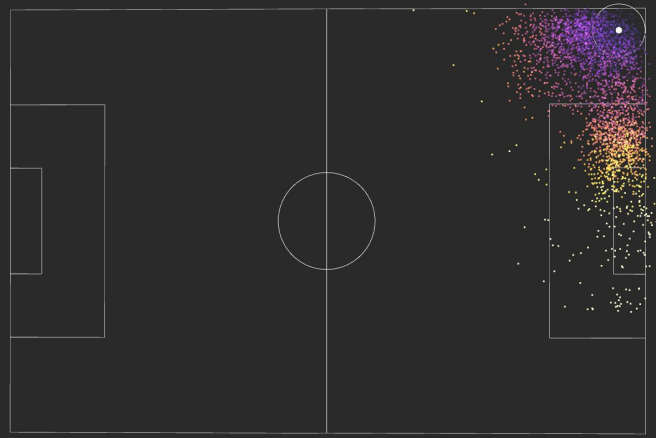
Data_Tempo	Tipo	TAG	Nó	Identificador	Estado	Prioridade	...	Descrição	Id
19-05-23 10:42:03	EV	AIO01	N001	IOFAIL	ACTIVE	WARNING	...	I/O Failure ...	1048
19-05-23 10:41:29	EV	VAL02	N002	VALOPEN	ACTIVE	INFO	...	Valve Open ...	1045
19-05-23 10:34:18	AL	LVL04	N003	PVLO	INACTIVE	CRITICAL	...	Low Level ...	1037
19-05-23 09:57:02	AL	LVL04	N003	PVLO	ACTIVE	CRITICAL	...	Low Level ...	1031
19-05-23 09:23:54	AL	LVL04	N003	PVHI	INACTIVE	CRITICAL	...	High Level ...	1027
19-05-23 09:21:31	AL	LVL04	N003	PVHI	ACTIVE	CRITICAL	...	High Level ...	1025
19-05-23 09:19:46	AL	LVL04	N003	PVHI	INACTIVE	CRITICAL	...	High Level ...	1022
19-05-23 09:17:34	AL	LVL04	N003	PVHI	ACTIVE	CRITICAL	...	High Level ...	1019
19-05-23 09:15:16	AL	LVL04	N003	PVLO	INACTIVE	CRITICAL	...	Low Level ...	1017
19-05-23 09:12:57	AL	LVL04	N003	PVLO	ACTIVE	CRITICAL	...	Low Level ...	1010
19-05-23 09:04:22	EV	LVL04	N003	PVRATE	ATIVO	WARNING	...	Rate of Chan...	0996

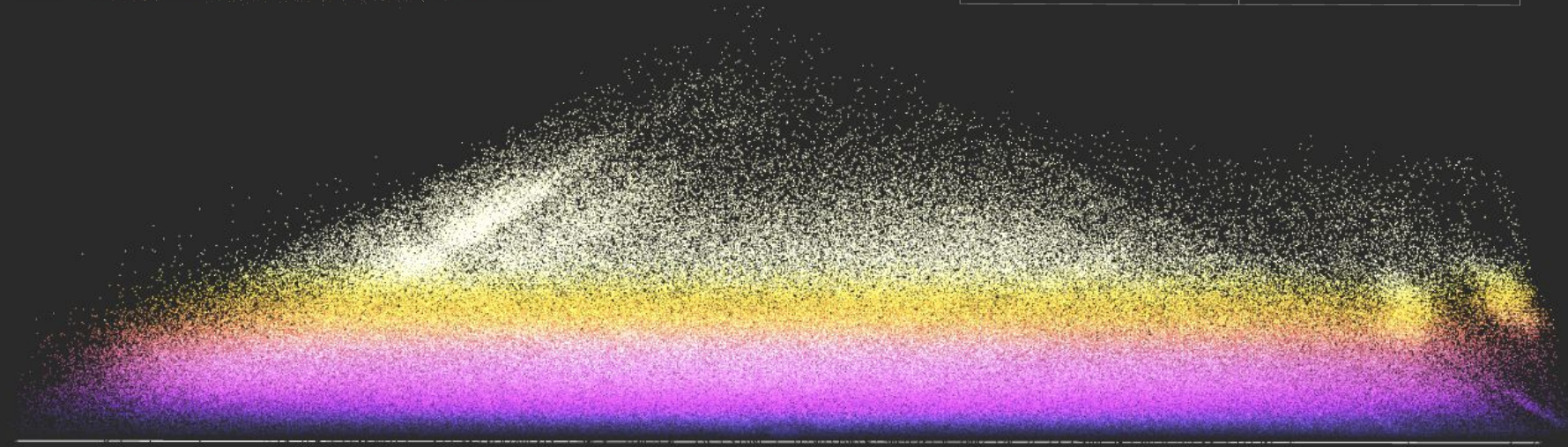
Aguinaldo Bezerra (2021), PPgEEC/UFRN. Uma metodologia baseada em grafos de conhecimento para análise de registros de alarmes e eventos industriais



Aguinaldo Bezerra (2021), PPgEEC/UFRN.. Uma metodologia baseada em grafos de conhecimento para análise de registros de alarmes e eventos industriais



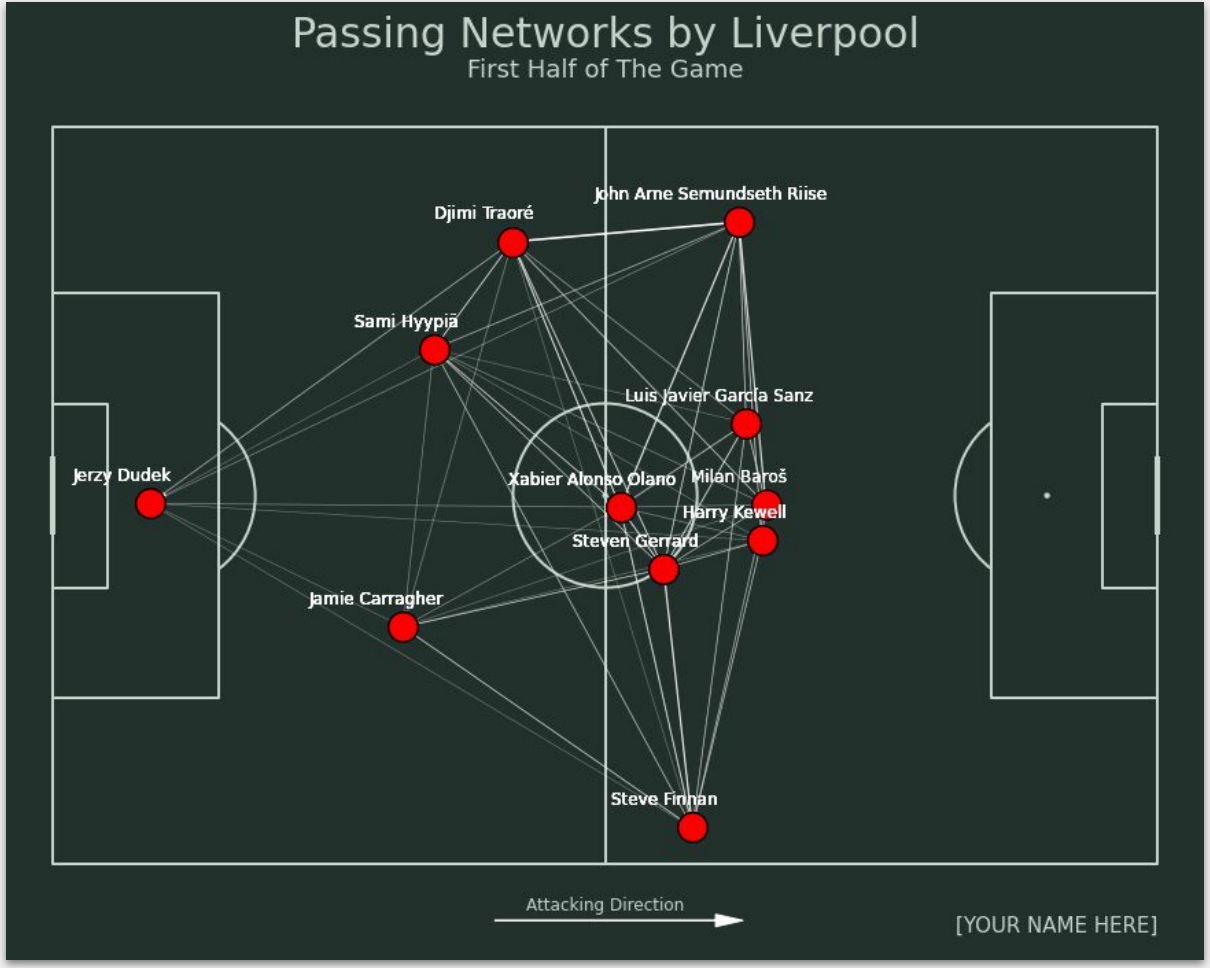




https://statsbomb.com/

https://github.com/statsbomb/open-data

@karim_douieb



https://betterprogramming.pub/how-to-visualize-football-passing-networks-using-python-6f6582aa8005

Appetite 159 (2021) 105048

Contents lists available at ScienceDirect

Appetite

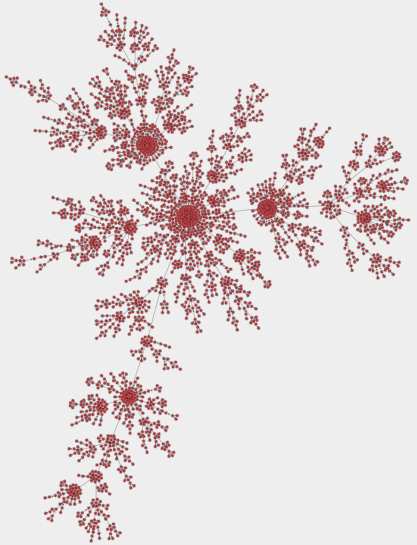
journal homepage: www.elsevier.com/locate/appet

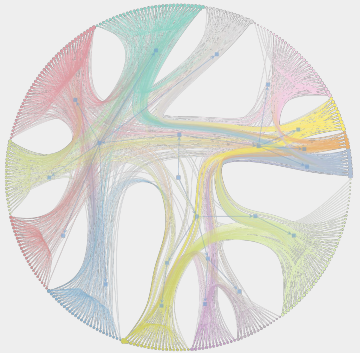
Research review

The contribution of network science to the study of food recipes. A review paper

Juan C.S. Herrera

Nutrition and Food Studies, Food Studies, New York University, New York, NY, 10003, USA





A B S T R A C T

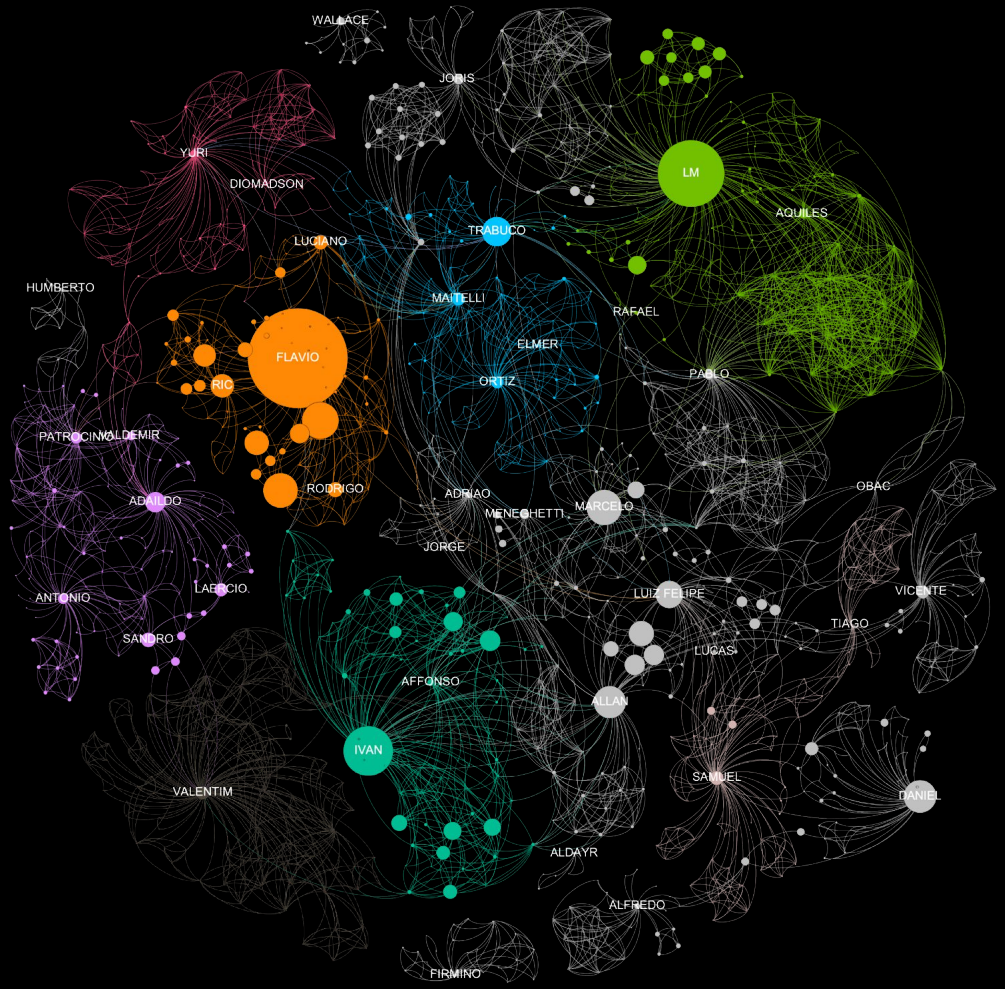
Recently, scholars have applied network science, which examines interconnected systems, to the study of food recipes. By examining the current literature, this review paper analyses the contribution of network science to recipes, and finds evidence of two main contributions. First, the pioneer studies showed the potential of network science for reducing the complexity of recipes and proposing theories to model ingredient pairings and recipe evolution. The second contribution built upon the previous theories and expanded them to cover different regions of the world as the field moved towards understanding the granularity of human culture with rich and detailed studies that examine different cuisines as more recipe datasets became available. Network science studies of recipes allowed researchers to discover insights in recipes to explain sociocultural aspects of cuisines, and include large numbers of recipes in the analysis, which would be nearly impossible using other techniques.

1. Introduction

Network science is a well-established quantitative method that researchers use when studying relationships in systems. Scholars have recently adopted this methodology to study recipes, where recipe networks might have ingredients, preparation techniques, and recipe titles linked to one another and in doing so, has made many contributions to the food studies literature. This paper presents a review of the literature

Catanzaro, 2004), among other academic disciplines. Network science was first used in 1736 in mathematics (Barabási and Pósfai 2016) and the 1940s in sociology (Moreno, 1945), and has gained popularity in the 21st century as it empowers "everything from Google to Facebook, CISCO, and Twitter" (Barabási and Pósfai 2016).

Since the late 2000s, a combination of factors –such as the recent abundance of recipes on the Internet, a general growing social interest in food, and food politics movements– led to the emergence of a body of



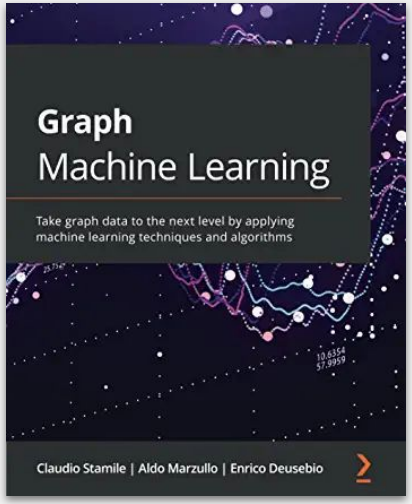
Edsger W. Dijkstra
co-authored 1 paper with
John R. Rice
co-authored 9 papers with
Dan C. Marinescu
co-authored 2 papers with
Theo Lynn
co-authored 7 papers with
Ivanovitch Silva
distance = 4

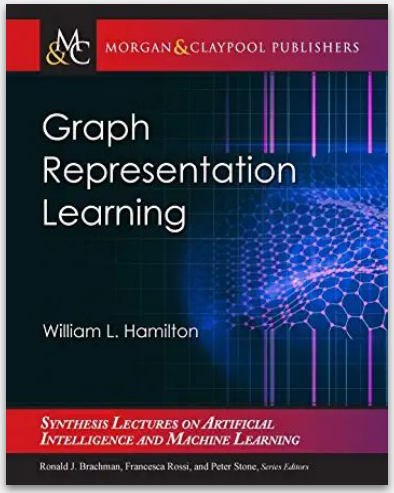
https://www.csauthors.net/distance/edsger-w-dijkstra/ivanovitch-silva

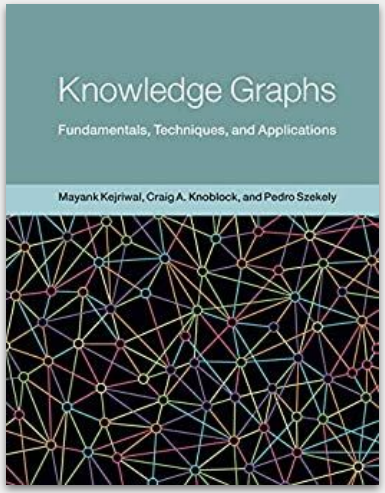
Co-authorship Network PPgEEC 2017-2021

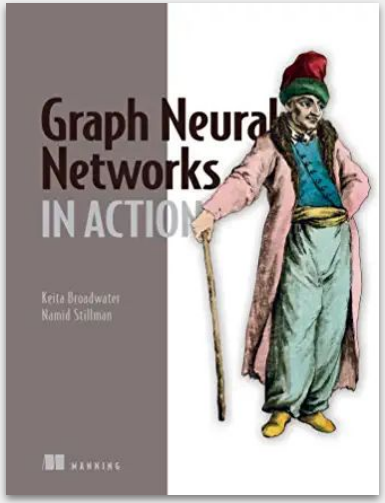
State of AI Report 2022

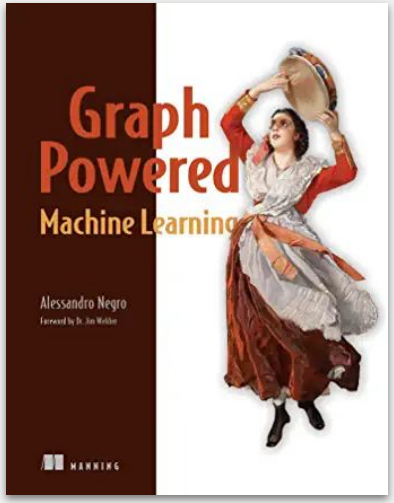
The **State of AI Report** analyses the most interesting developments in AI. We aim to trigger an informed conversation about the state of AI and its implication for the future. The Report is produced by AI investors **Nathan Benaich** and **Ian Hogarth**.









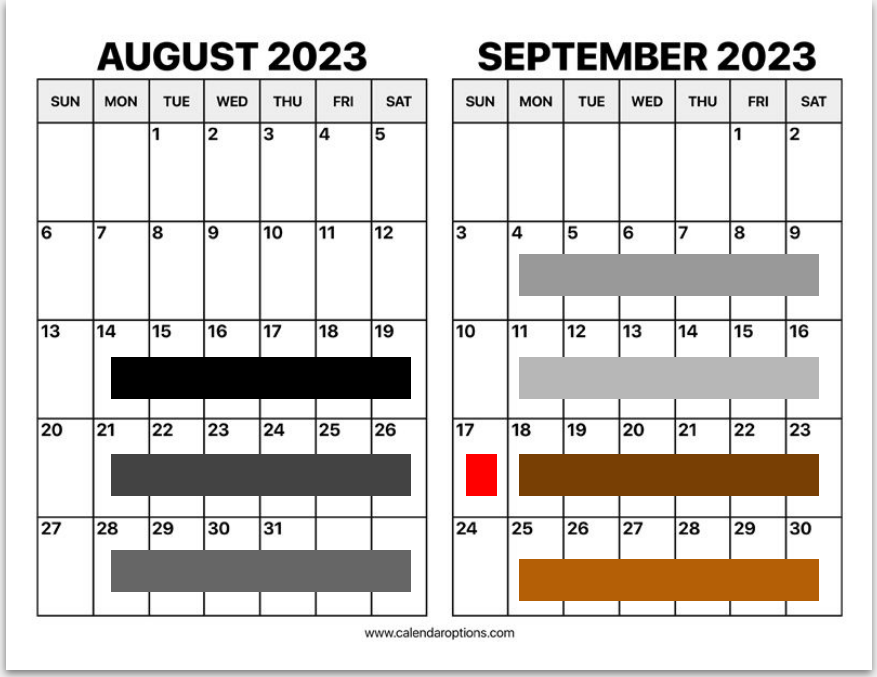


SOTA Papers

https://paperswithcode.com/area/graphs

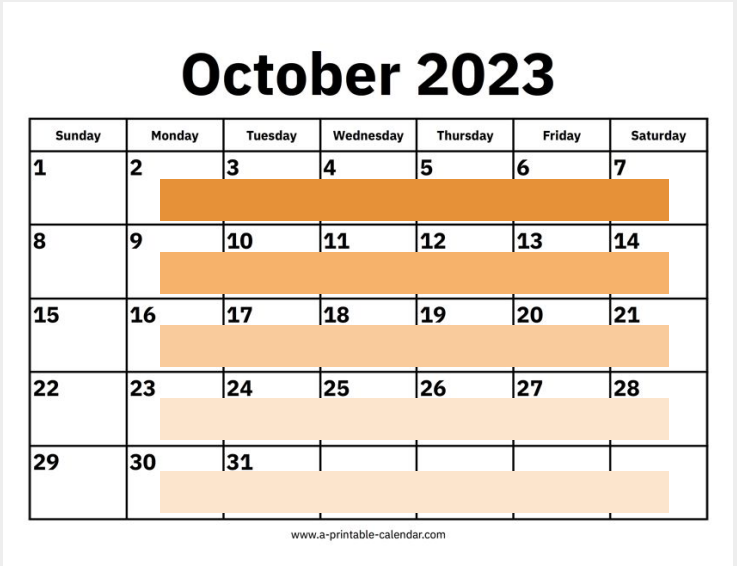
Course Syllabus

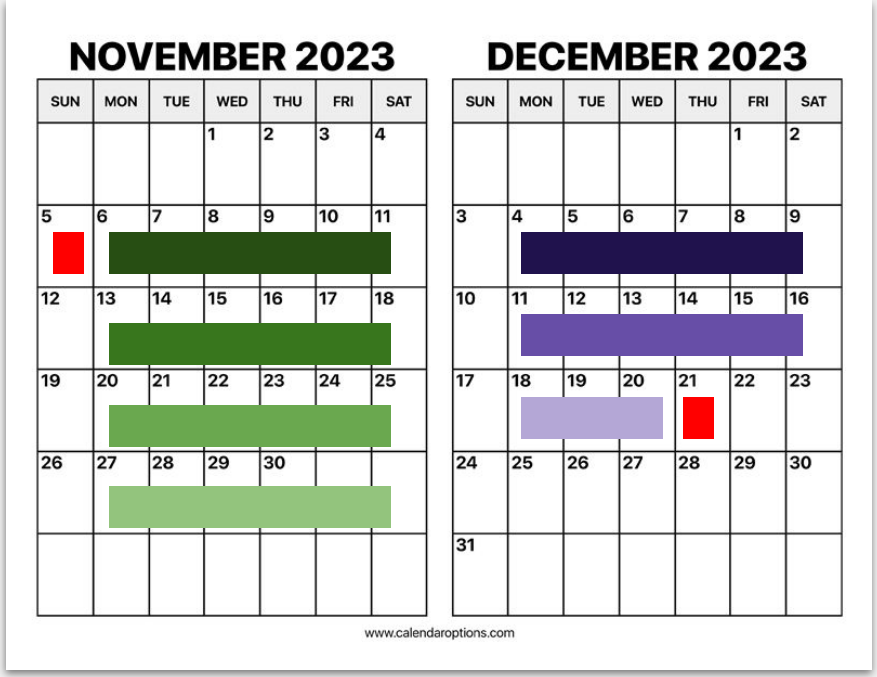
1. Fundamentals of Python, Git
2. Data structure review
3. Algorithms complexity
4. Data Pipeline
5. Network elements, Small worlds, Hub, Communities
6. Directed Networks
7. Case Studies
    a. Social Networks
    b. Scientometrics
    c. Data Visualization
    d. Mobility



Week #00: Planning
Week #01: Course Outline, Python, Git
Week #02: Recursion, Binary and Search Trees
Week #03: Complexity of Algorithms I
Week #04: Complexity of Algorithms II
17 September: end of unit 1

Week #05: Graph from Data Pipeline
Week #06: Project about Data Pipeline
Week #07: Graph fundamentals
Week #08: Small world
Week #09: Project: infrastructure networks
Week #10: Hubs
Week #11: Project: directed networks

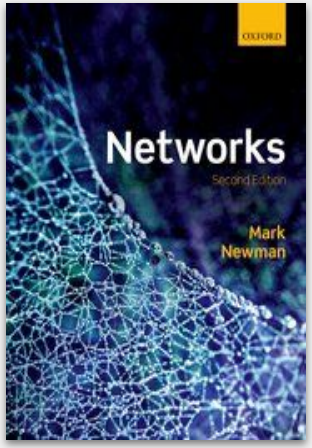


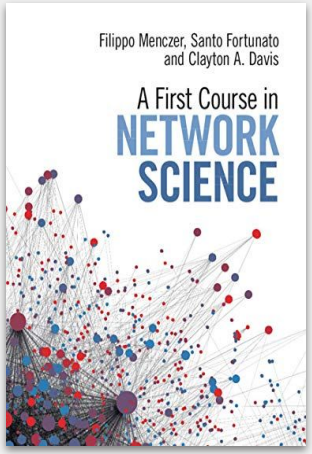


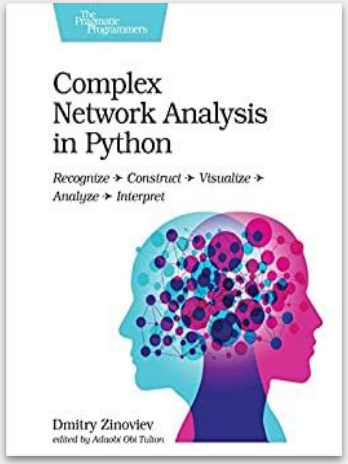
05 November: end of unit 2
Week #12: Graph visualization
Week #13: Case study: scientometric networks
Week #14: Case study: social networks
Week #15: Case study: mobility

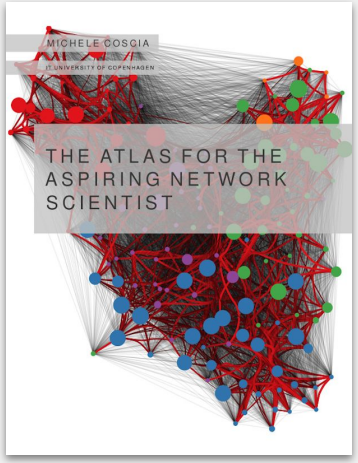
Week #16: Final Project: dev
Week #17: Final Project: dev
Week #18: Final Project: presentation
21 December: end of unit 3

References


OXFORD
Networks
Second Edition
Mark
Newman


Filippo Menczer, Santo Fortunato
and Clayton A. Davis
A First Course in
NETWORK
SCIENCE


The Pragmatic Programmers
Complex
Network Analysis
in Python
Recognize → Construct → Visualize →
Analyze → Interpret
Dmitry Zinoviev
edited by Adaobi Obi Tulton


MICHELE COSCIA
IT UNIVERSITY OF COPENHAGEN
THE ATLAS FOR THE
ASPIRING NETWORK
SCIENTIST

Clone me!!!!

https://github.com/ivanovitchm/datastructure