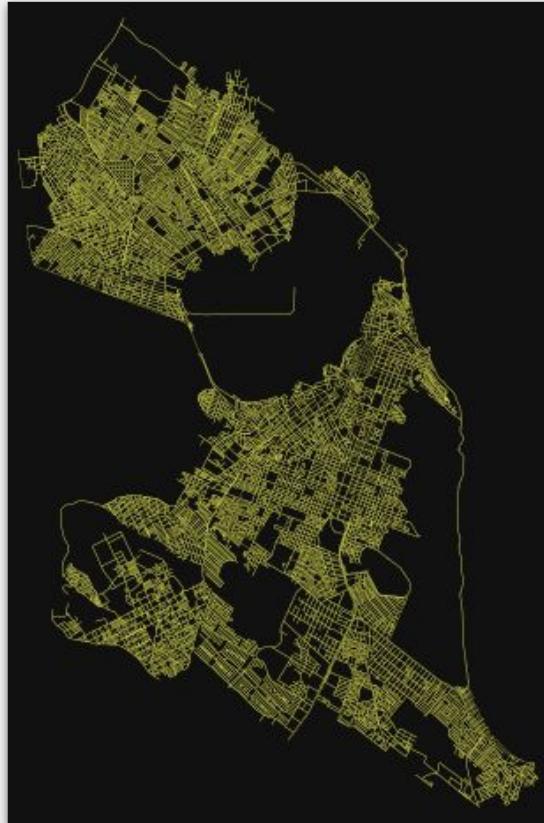


Algorithms & Data Structures II

DCA 0209

ivanovitch.silva@ufrn.br
@ivanovitchm

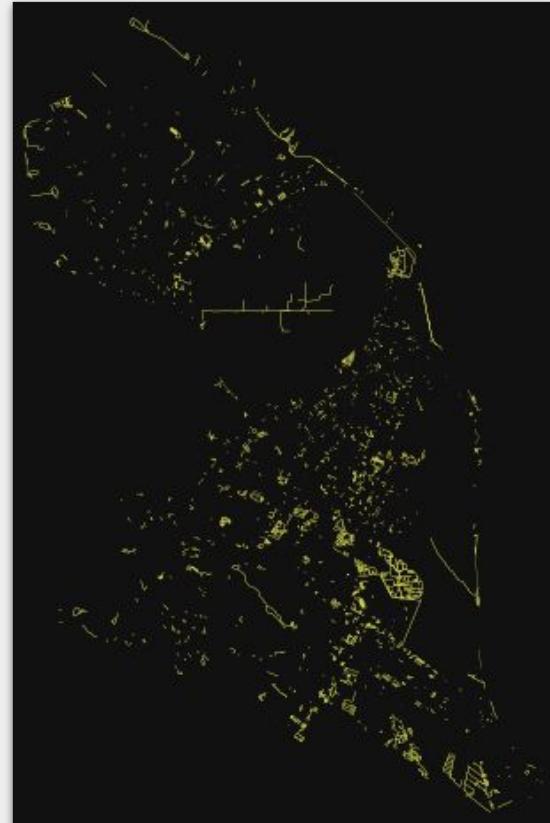




Drive



Bike



Bike - Drive

PRAZOS E CARGAS HORÁRIAS

Total Mínima: 3885h

Carga Horária Obrigatória

Subtotal de CH de Aula: 2970h

Subtotal de CH de Orientação Acadêmica/Profissional: 220h

Total: 3190h

Carga Horária Optativa Mínima: 495h

Carga Horária Complementar Mínima: 200h

Carga Horária Obrigatória Atividade Acadêmica Específica: 0h

Carga Horária Máxima de Componentes Eletivos: 120h

Carga Horária Máxima por Período Letivo: 600h

Prazo Para Conclusão (em semestres): Mínimo: 10 Médio: 10 Máximo: 12

Optativas	Complementares	1º Nível	2º Nível	3º Nível	4º Nível	5º Nível	6º Nível	7º Nível	8º Nível	9º Nível	10º Nível
-----------	----------------	----------	----------	----------	----------	----------	----------	----------	----------	----------	-----------

7º NÍVEL

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

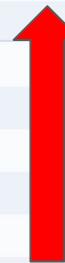


DCA0211 - COMPILADORES - 45h

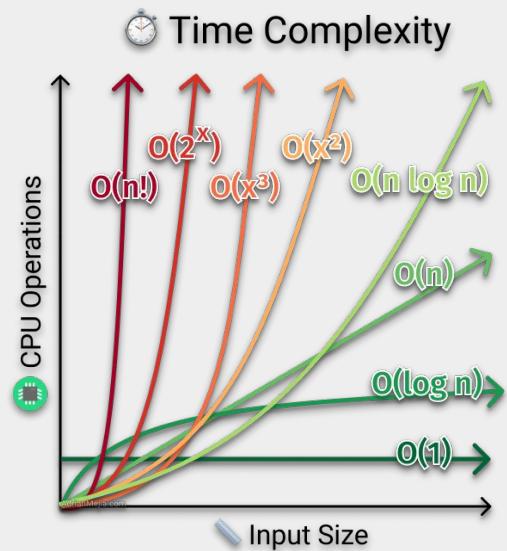
Obrigatória



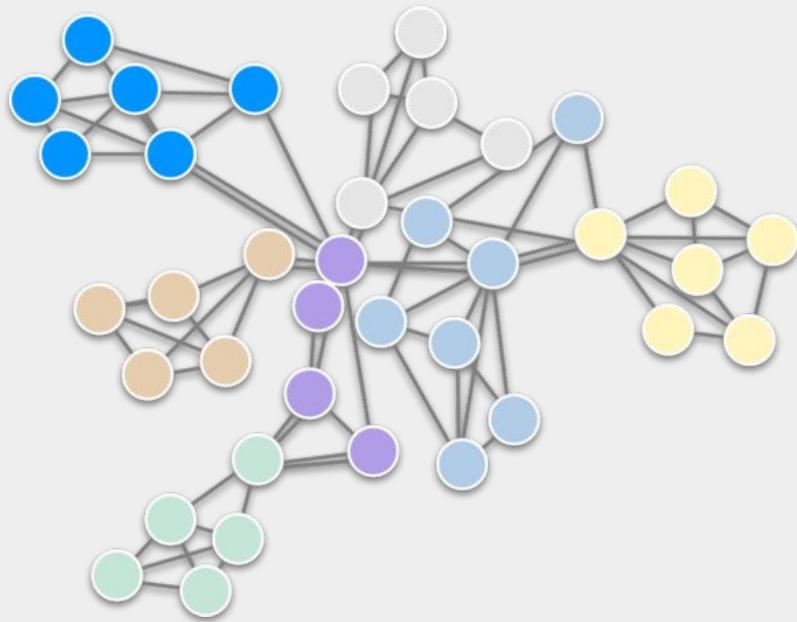
Carga Horária Total: 390h



Course Outline



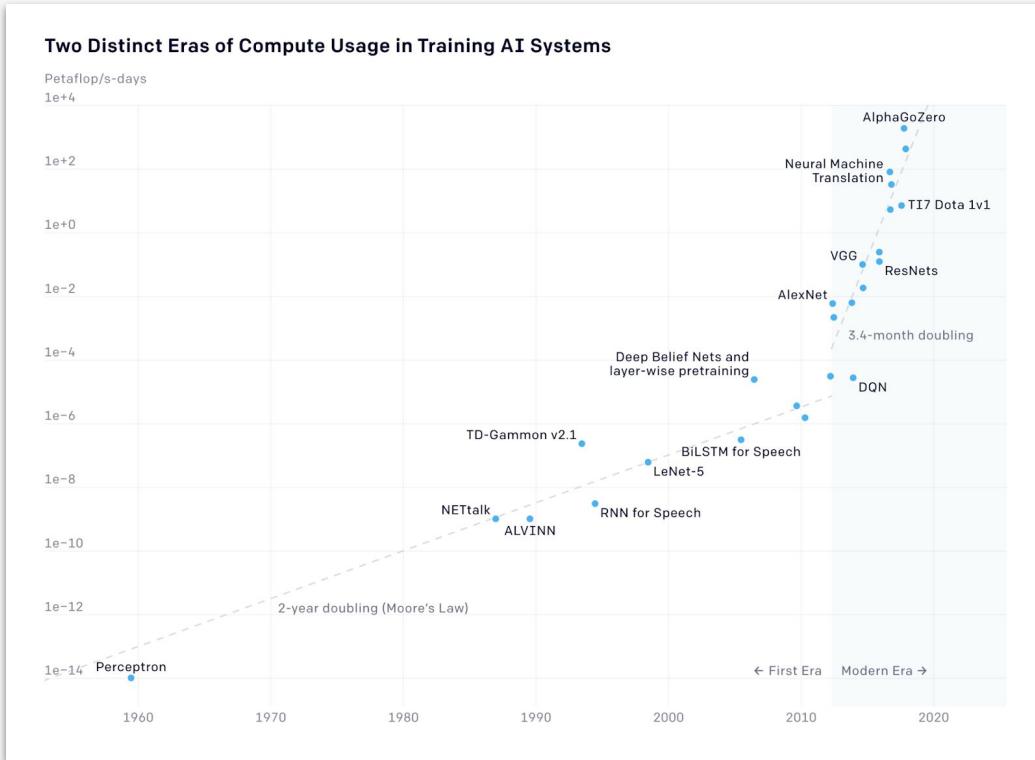
Algorithm Complexity



Graph

ML Compute Needs (from the 1960s)

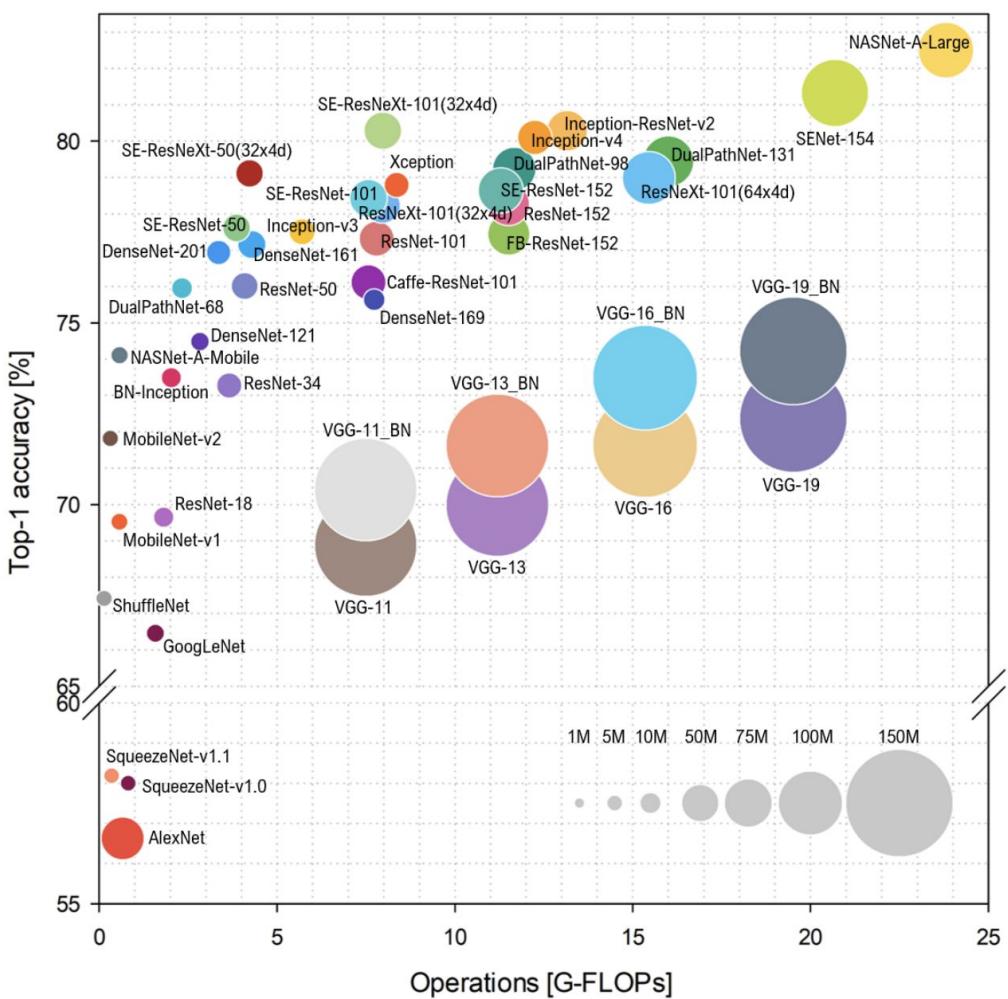
Algorithm Complexity



In recent years, the amount of computing needed has grown remarkably fast.

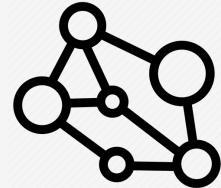
Computer requirements are **doubling nearly every 3 to 4 months.**

Algorithm Complexity

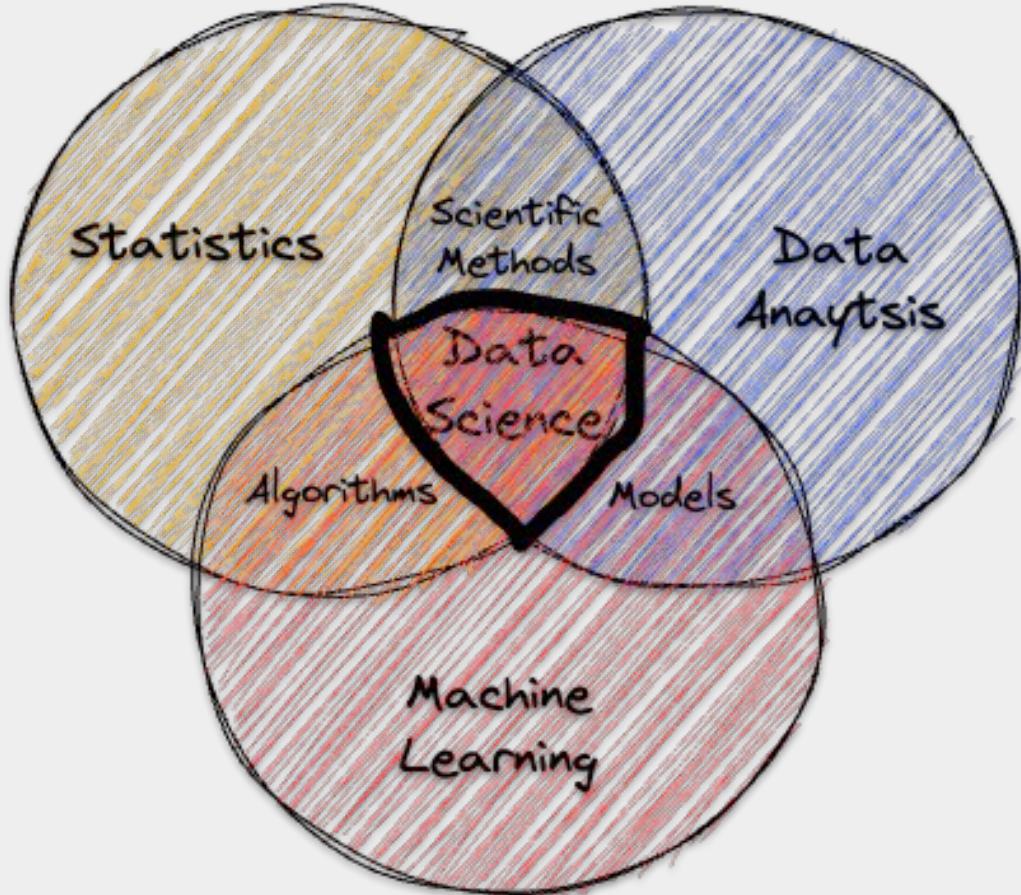


ML Model Evolution ImageNet

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

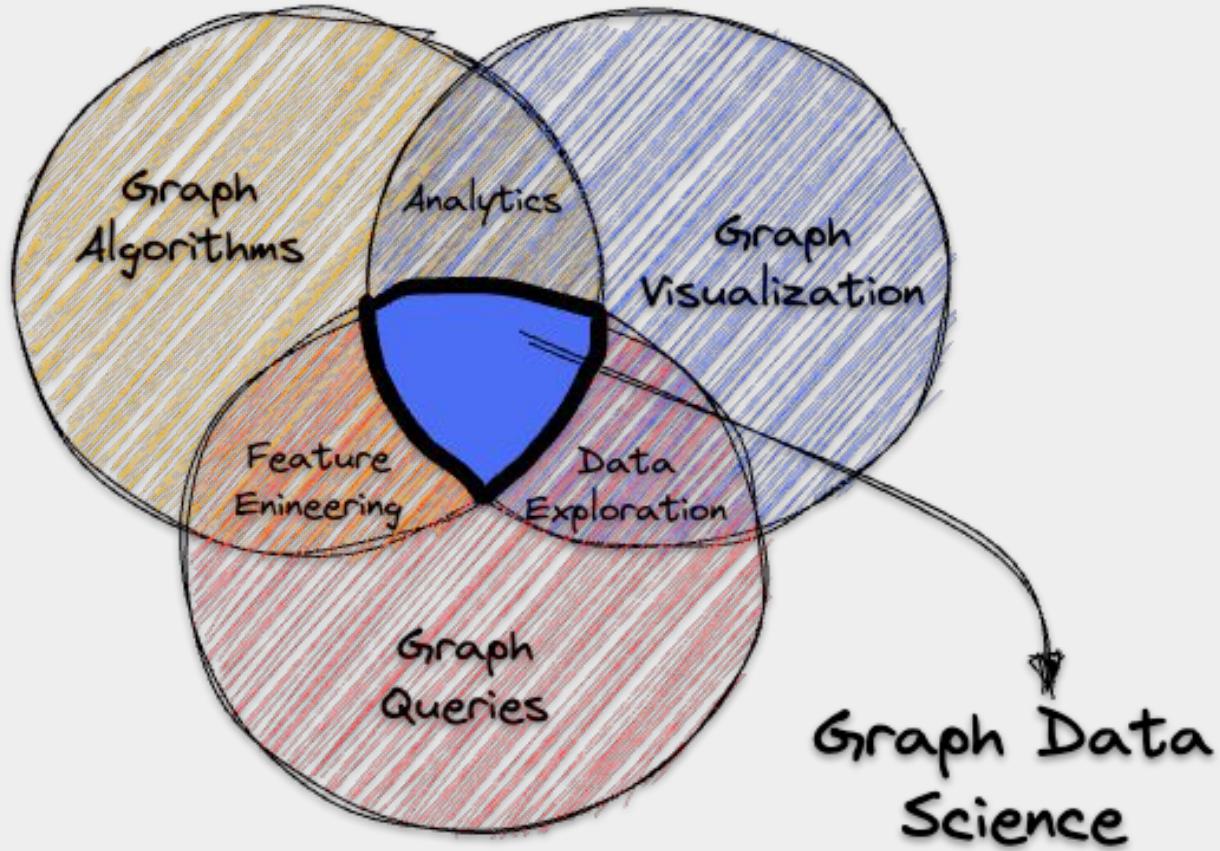


And about graph?
Where and how use them?



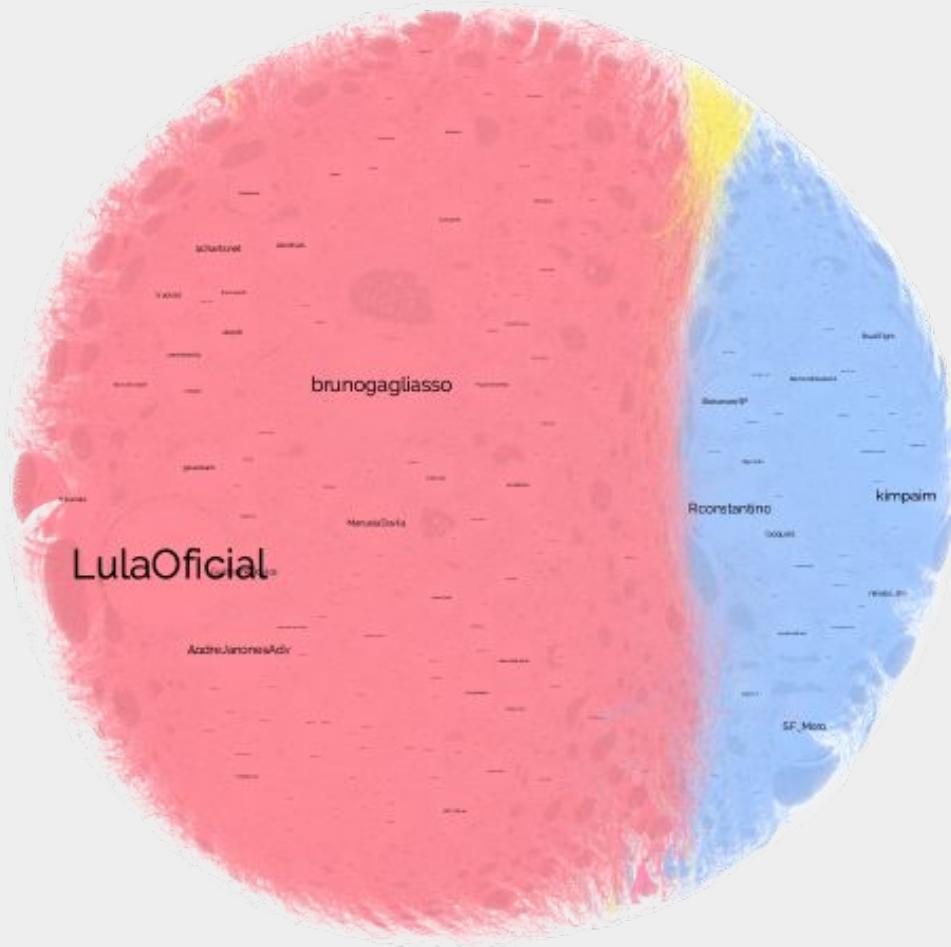
Data Science is an interdisciplinary field that uses scientific methods, processes, algorithms and systems to extract knowledge and insights from structured and unstructured data.

Data Scientists use data to answer questions.



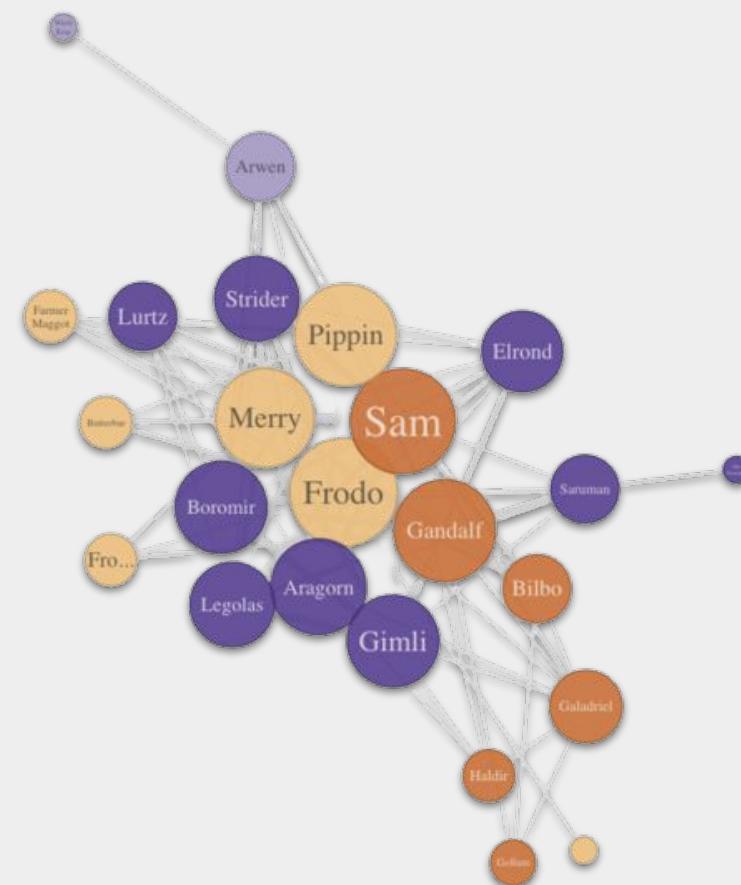
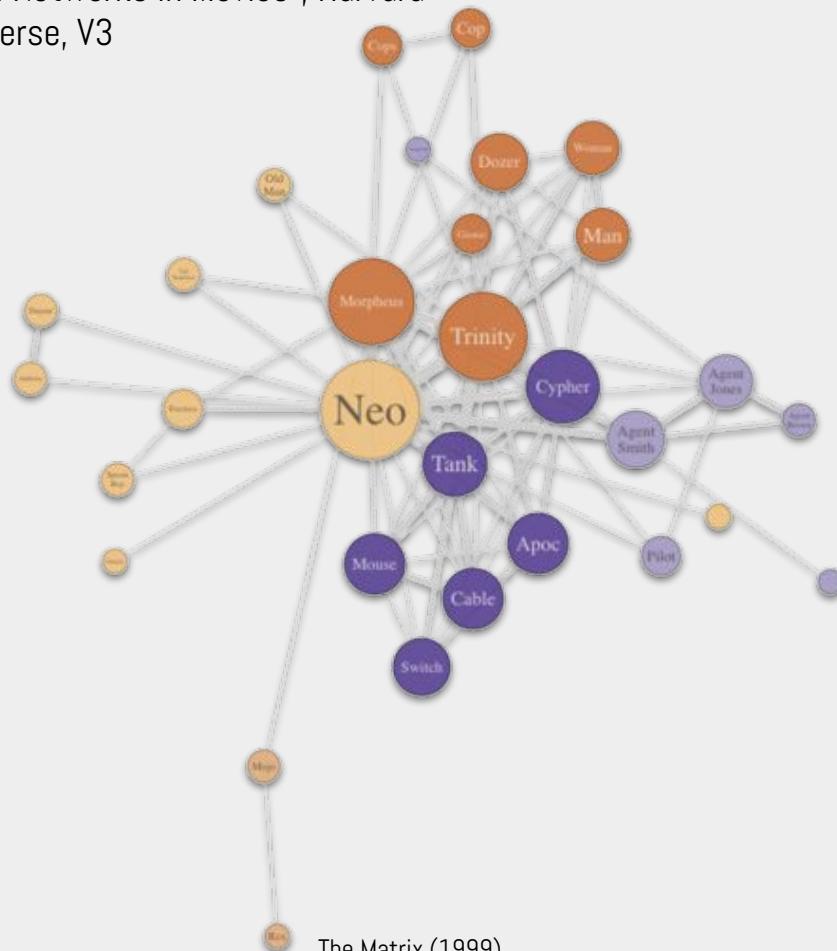
Graph Data Science is a science-driven approach to gain knowledge from the relationships and structures in data, typically to power predictions.

Data Scientists use relationships to answer questions.

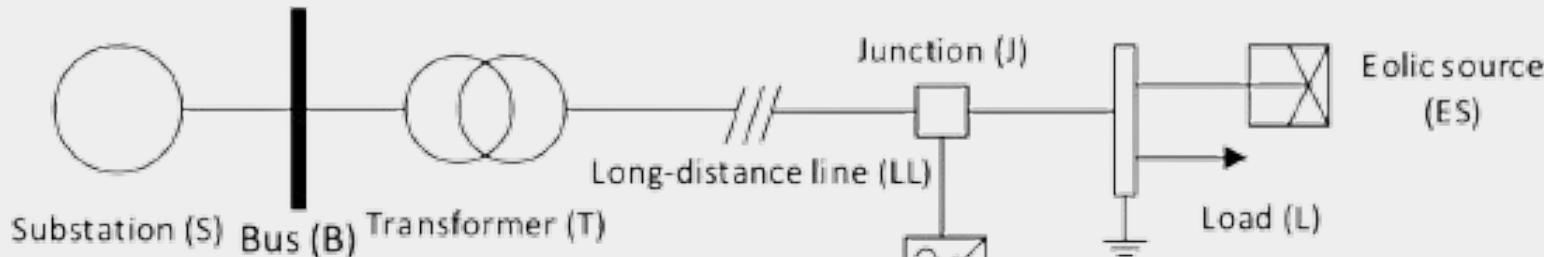


Visualizing Elections Feedback

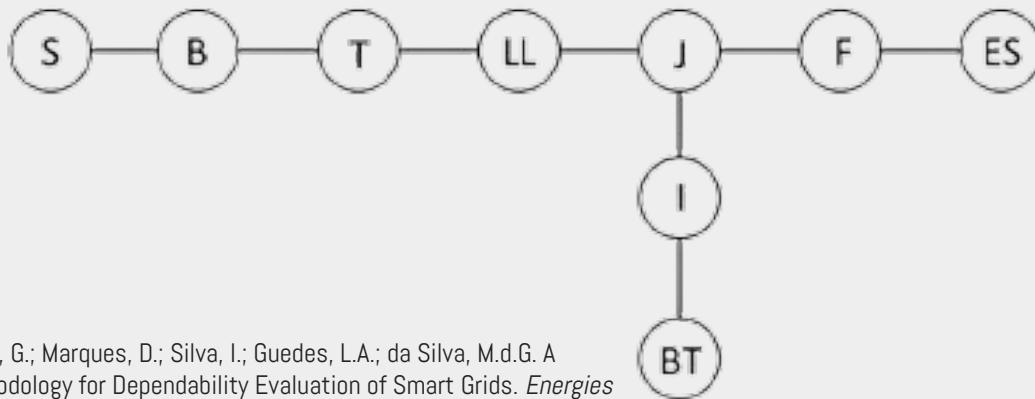
Clustering
Community Detection
Mention network



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

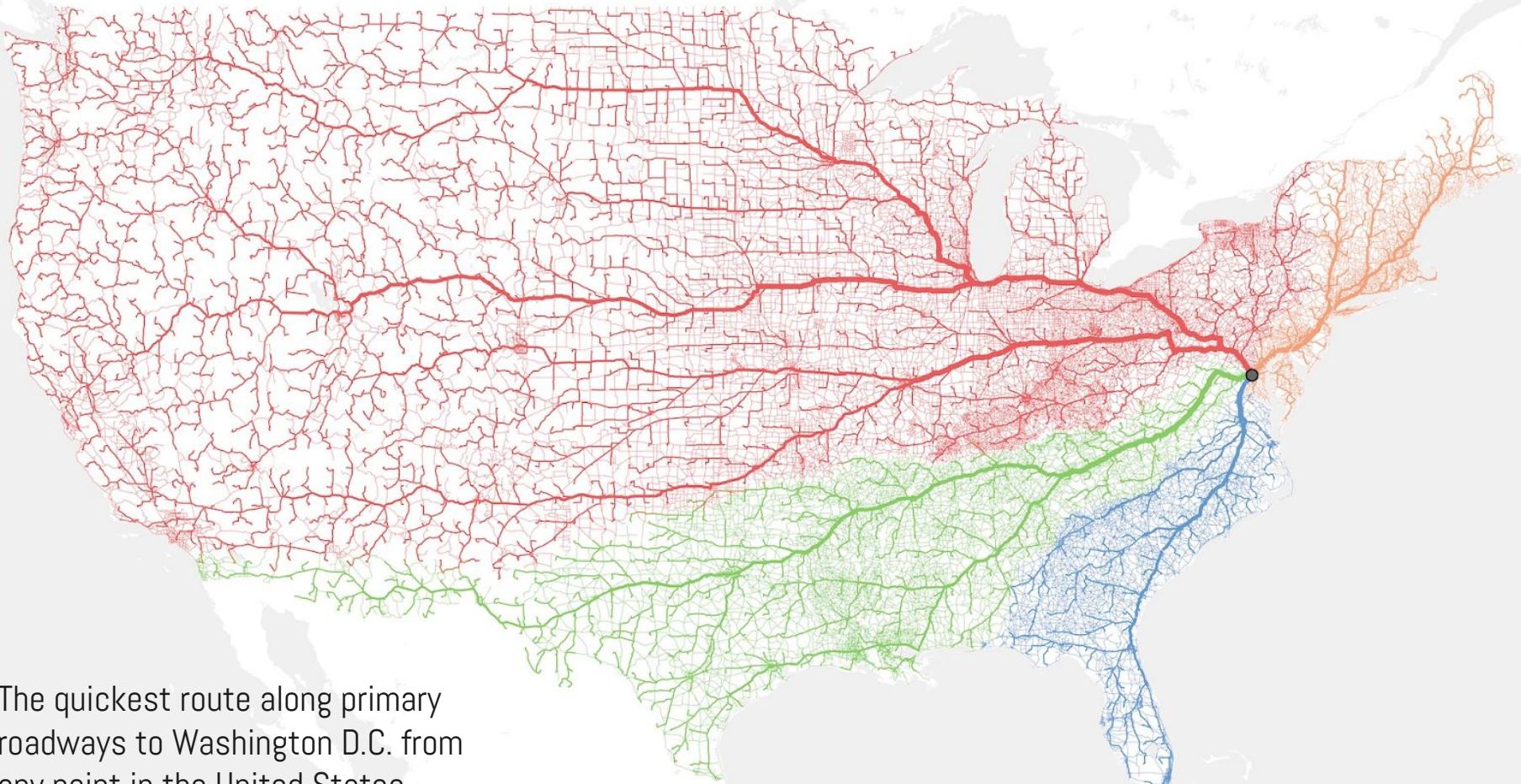


**One-line diagram
to Graph**



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



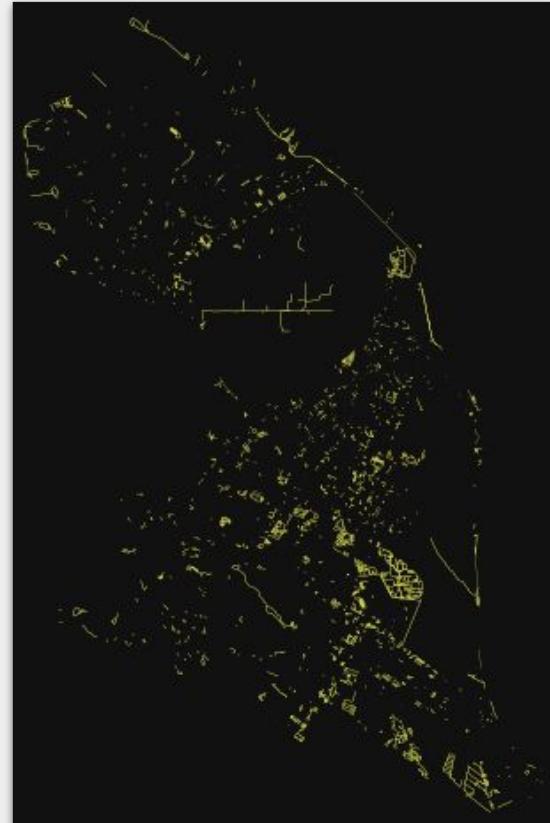
The quickest route along primary
roadways to Washington D.C. from
any point in the United States



Drive

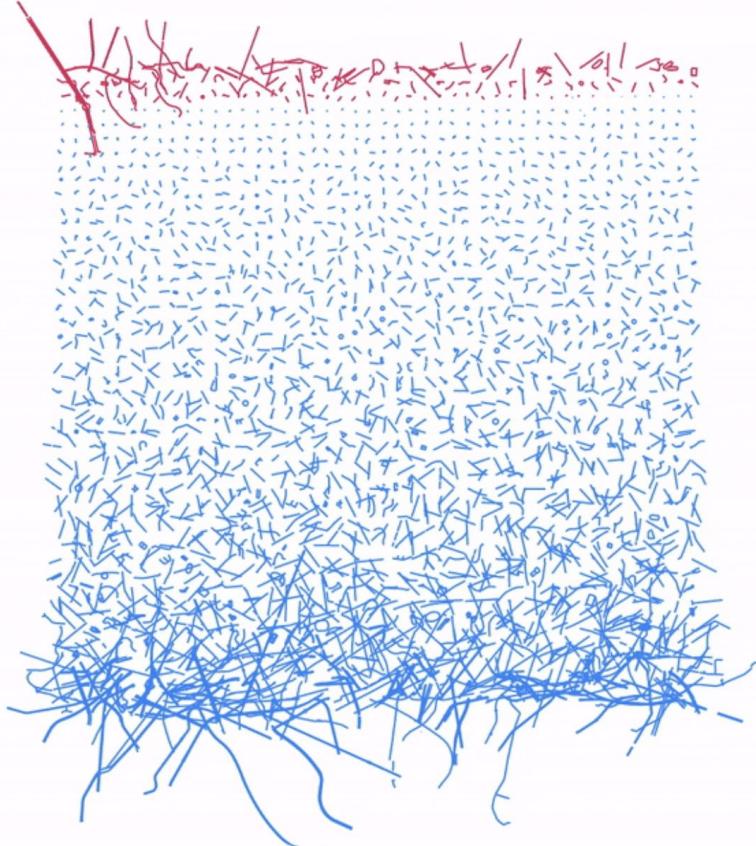


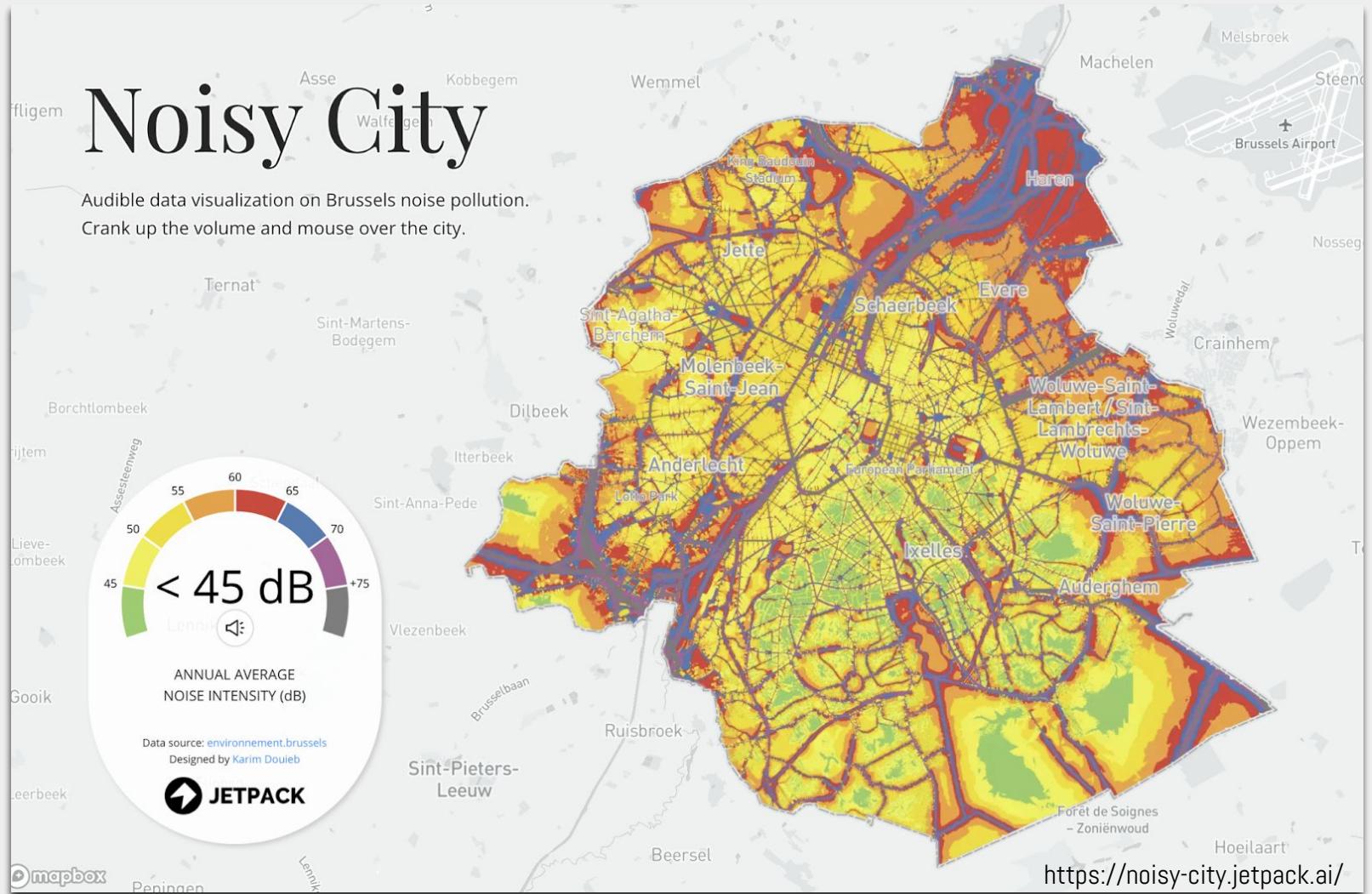
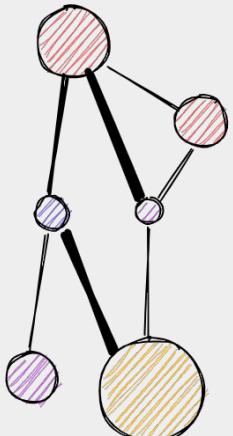
Bike

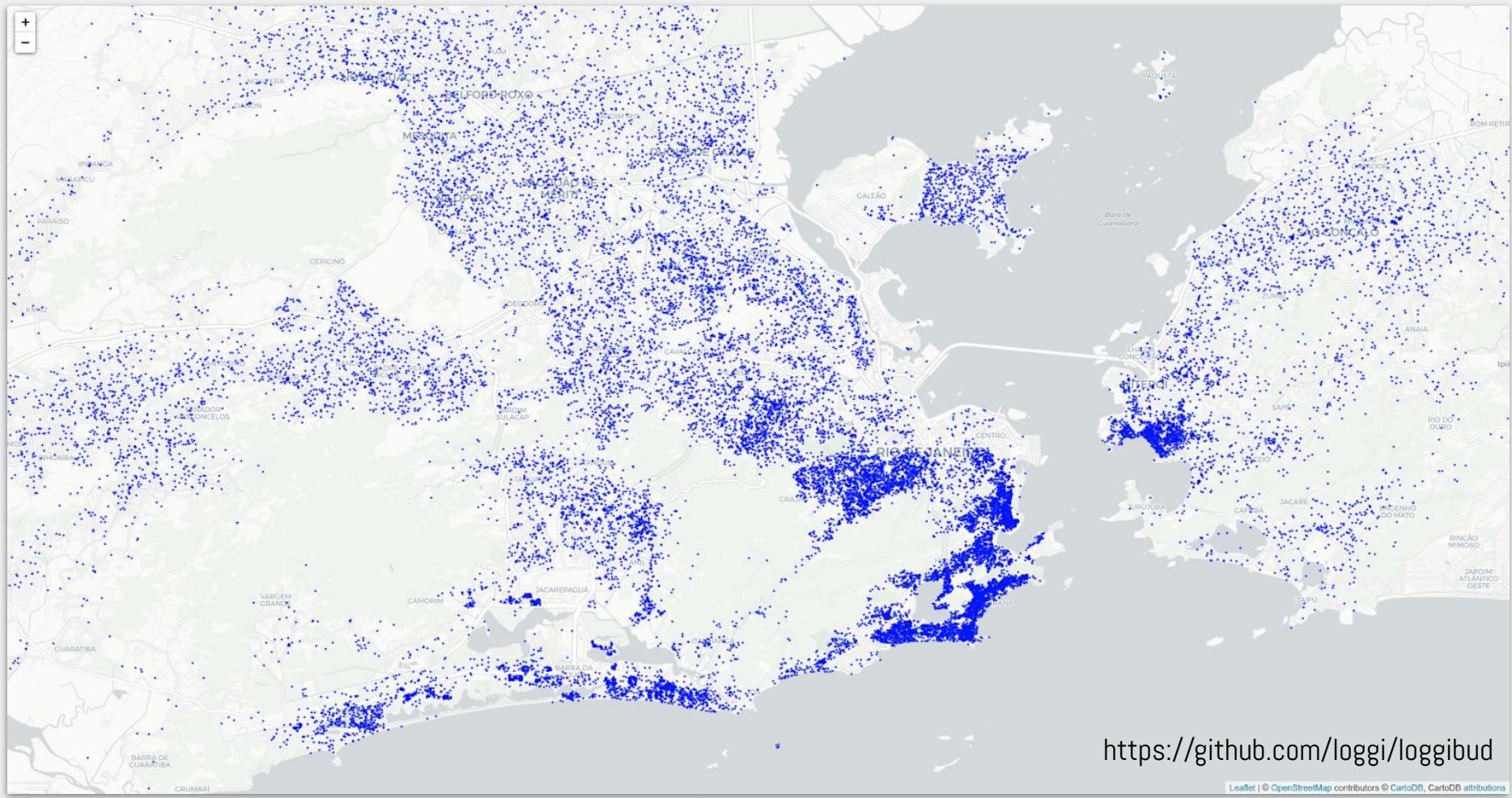


Bike - Drive

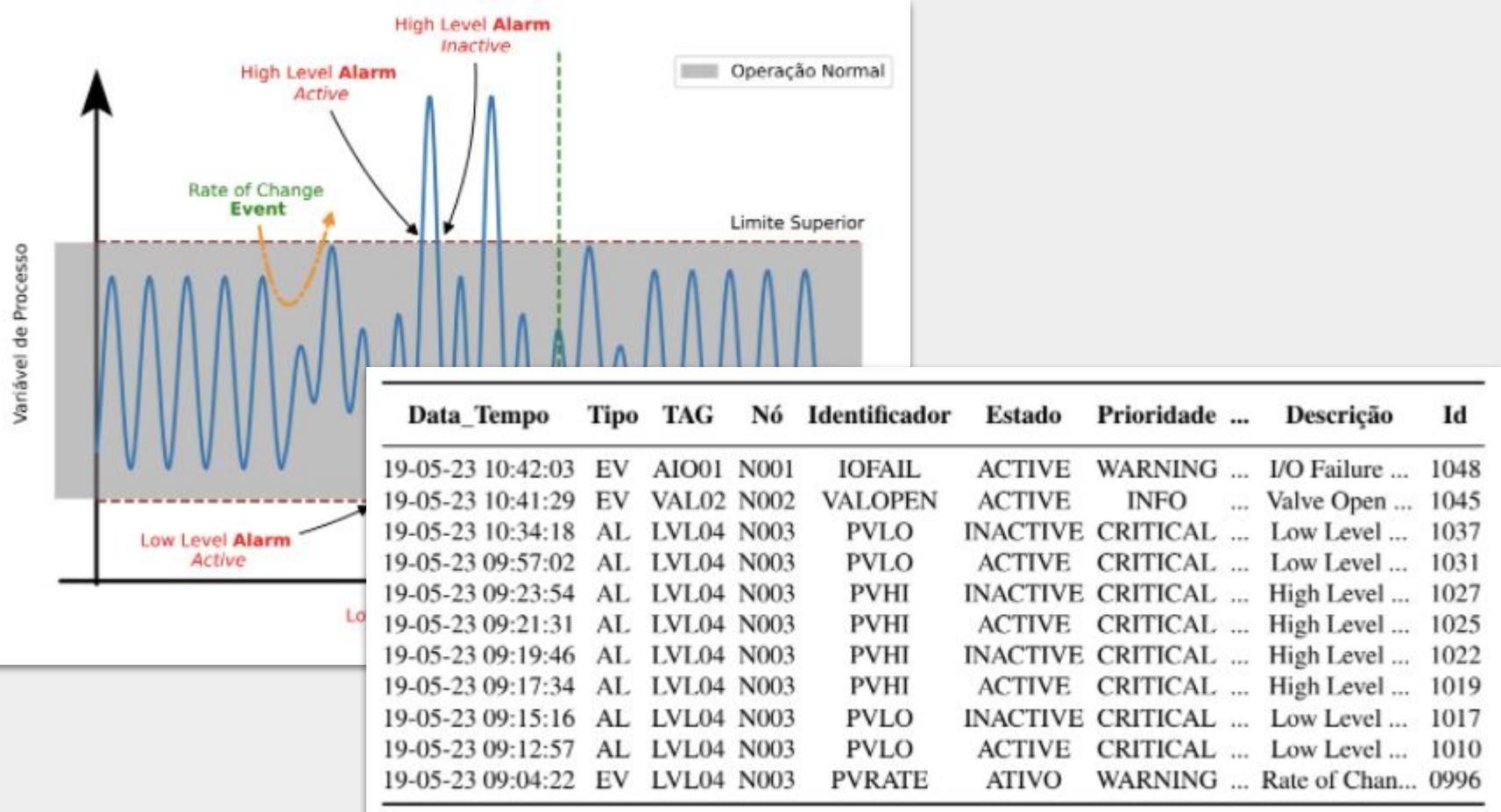
Only 6% of Brussels streets are named after women. [Open Knowledge BE](#) organized the production of these statistics with the help of 60 volunteers who tagged the gender of each street in Brussels.



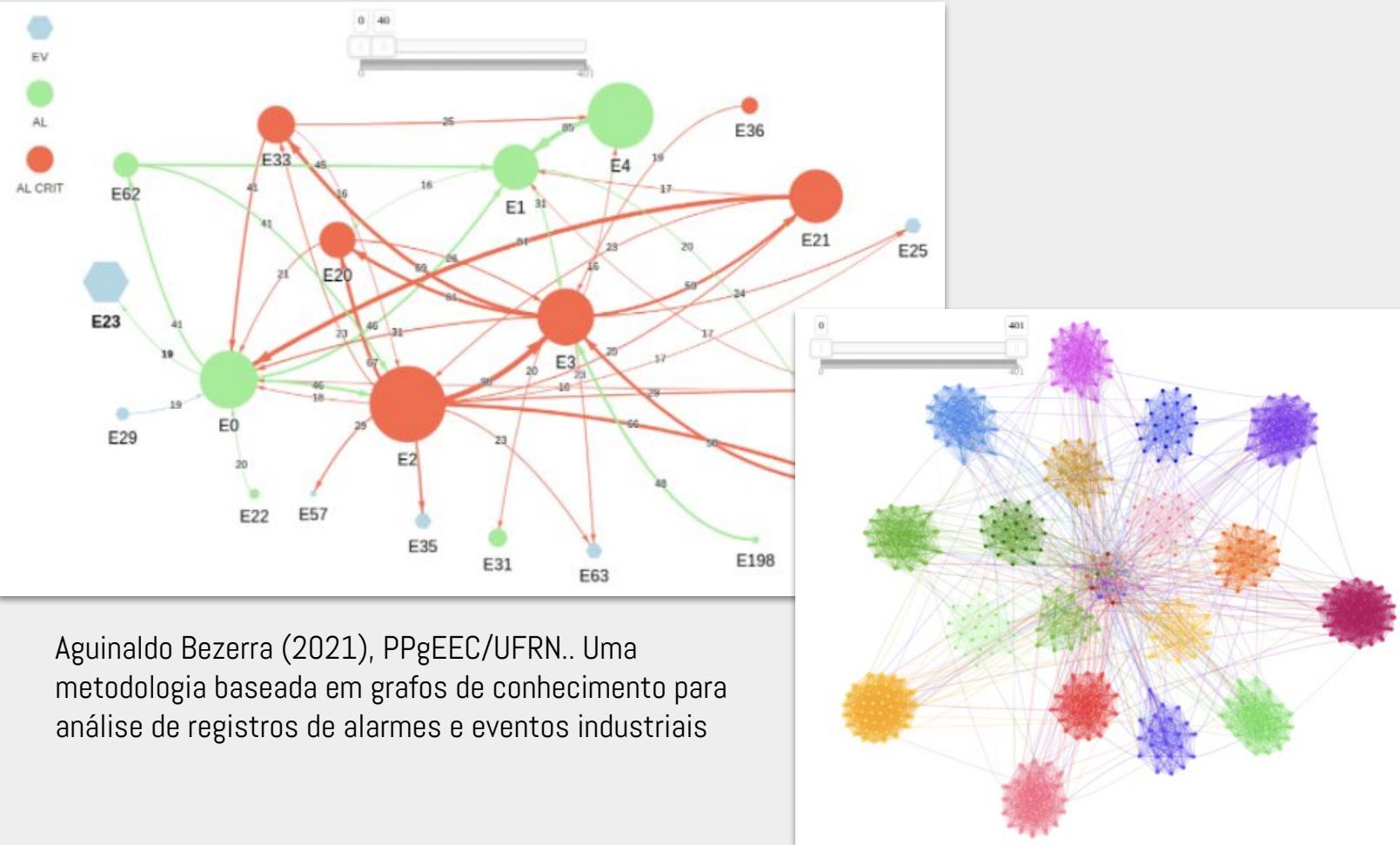


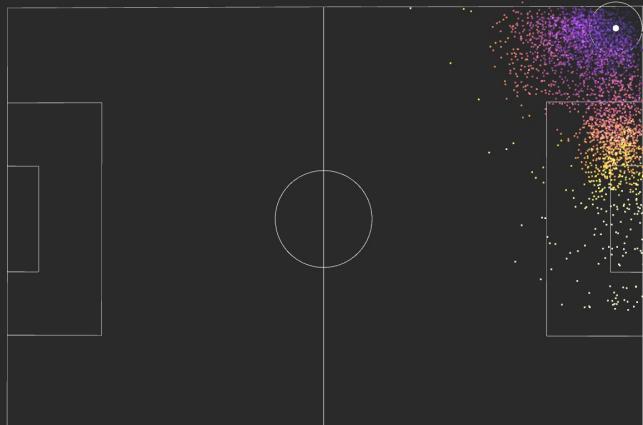
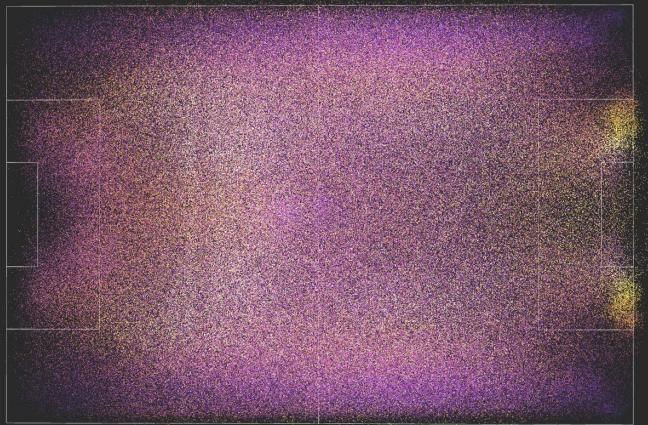


<https://github.com/loggi/loggibud>



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





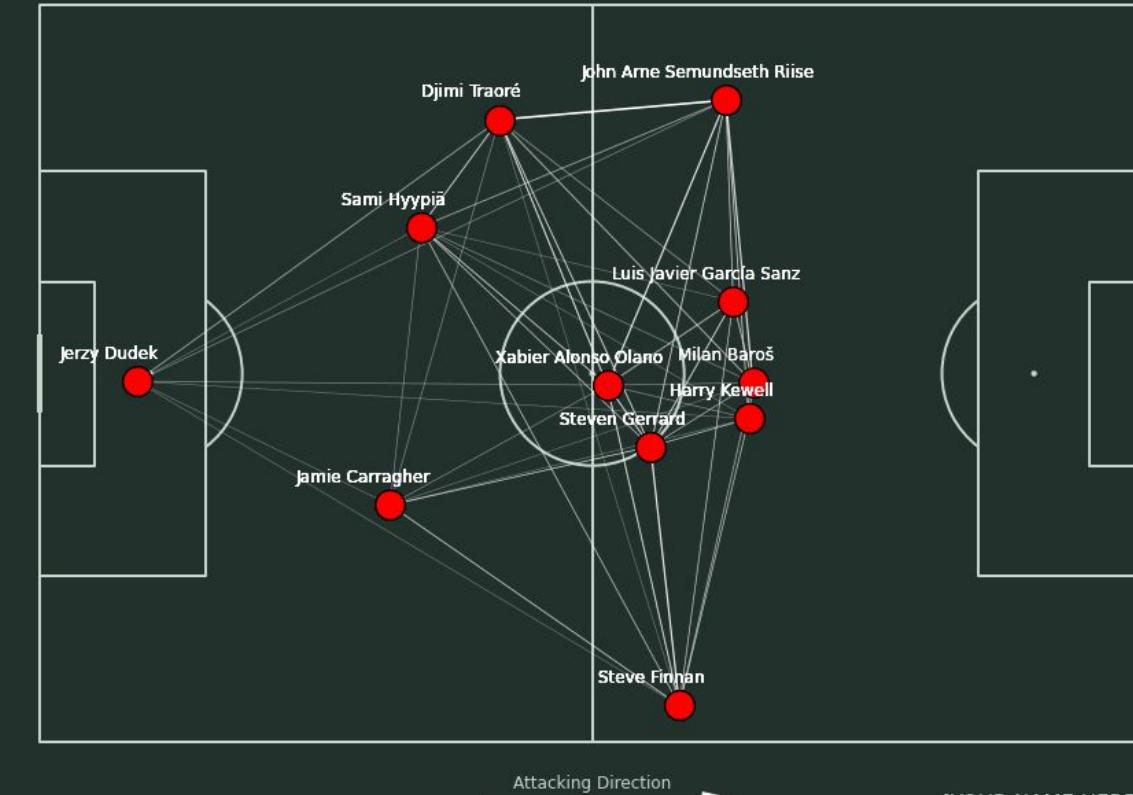
<https://statsbomb.com/>

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

@karim_douieb

Passing Networks by Liverpool

First Half of The Game





Appetite



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

ABSTRACT

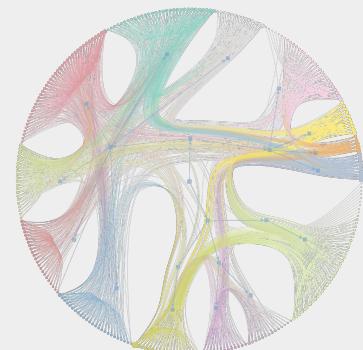
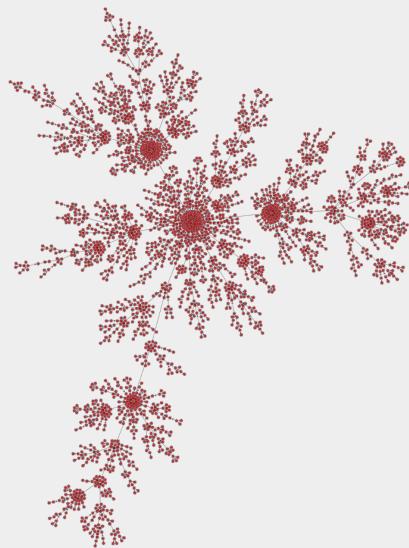
Recently, scholars have applied network science, which examines interconnected systems, to the study of food recipes. By examining the current literature, this review paper analyses the contribution of network science to recipes, and finds evidence of two main contributions. First, the pioneer studies 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.

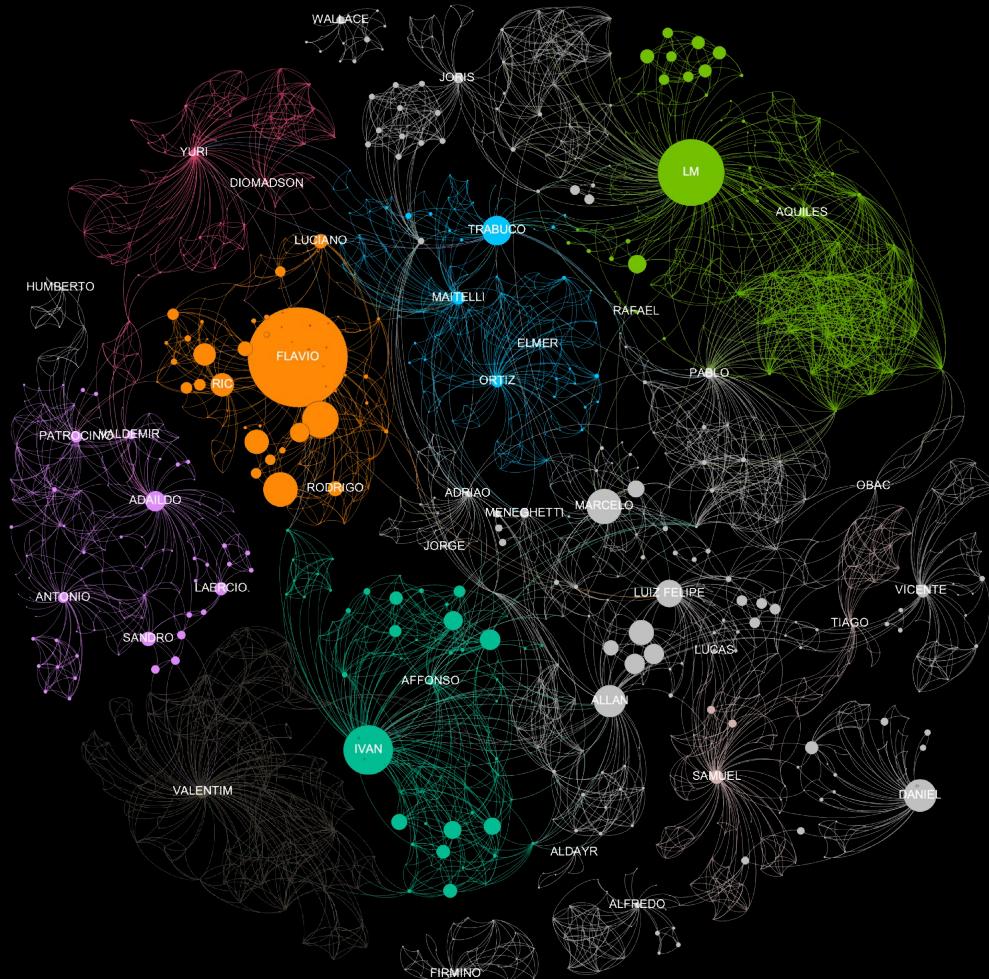
1. Introduction

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





Co-authorship Network PPgEEC 2017-2021

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>

State of AI Report 2021

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](#).

stateof.ai #stateofai

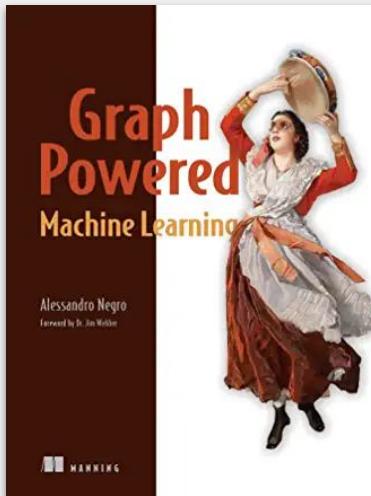
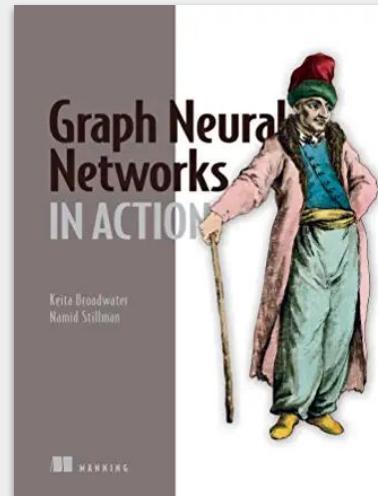
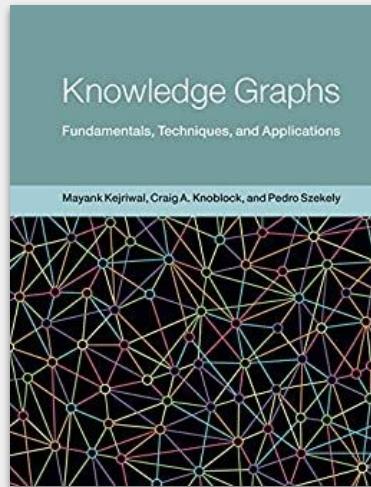
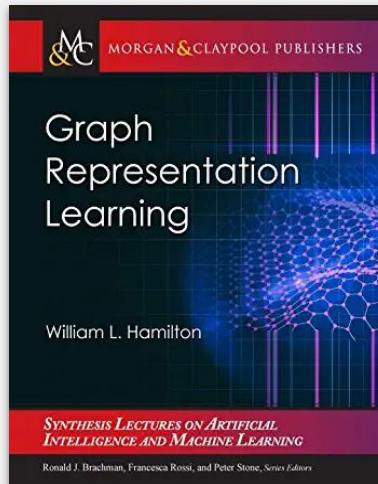
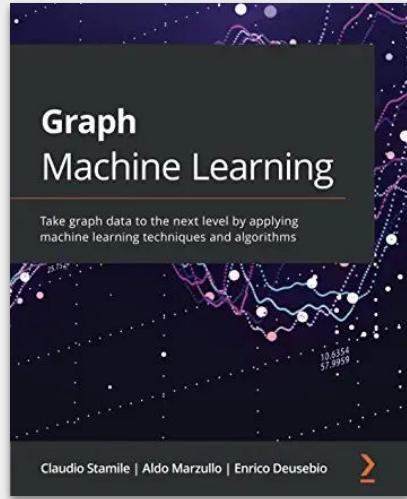
State of AI Report

October 12, 2021

Nathan Benaich https://www.stateof.ai/ Ian Hogarth

< 1 > :

Google Slides



SOTA Papers

<https://paperswithcode.com/area/graphs>

Course Syllabus

1. Fundamentals of Python
2. Algorithms complexity
3. Data structure review
4. Network elements, Small worlds, Hub, Communities
5. Directed Networks
6. Case Studies
 - a. Social Networks
 - b. Documents
 - c. Community Detection
 - d. Anomalies and others.

colab

graph-tool



Medium

YouTube

Gephi

loom

GitHub

NetworkX
Network Analysis in Python

python™

August 2022

Sun	Mon	Tue	Wed	Thu	Fri	Sat
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			

www.a-printable-calendar.com

September 2022

Sun	Mon	Tue	Wed	Thu	Fri	Sat
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	

Week #05: data structure review

Week #06: data structure review

End of Unit 01: 05 october

- Week #01: python fundamentals I, git
- Week #02: python fundamentals II, OOP
- Week #03: algorithm complexity
- Week #04: algorithm complexity, data viz

OCTOBER 2022

SUN	MON	TUE	WED	THU	FRI	SAT
25	26	27	28	29	30	1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	31	1	2	3	4	5

Holidays and Observances: 10: Columbus Day, 31: Halloween

Homemade
COFFEE MADE EASY

OCTOBER 2022

SUN	MON	TUE	WED	THU	FRI	SAT
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	31					

www.calendaroptions.com

NOVEMBER 2022

SUN	MON	TUE	WED	THU	FRI	SAT
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30			

Week #11: hub

Week #12: directed graphs

Week #13: project

Week #14: project

End of Unit 02: 30 november

Week #07: network elements

Week #08: exercise

Week #09: small worlds

Week #10: exercise

DECEMBER 2022

SUN	MON	TUE	WED	THU	FRI	SAT
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31

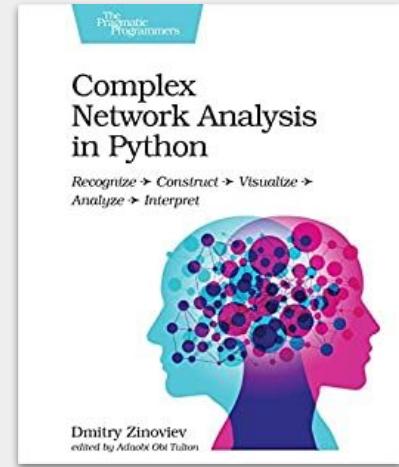
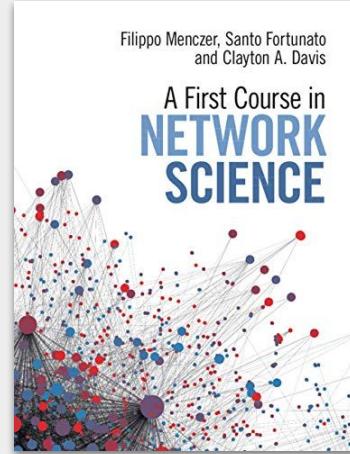
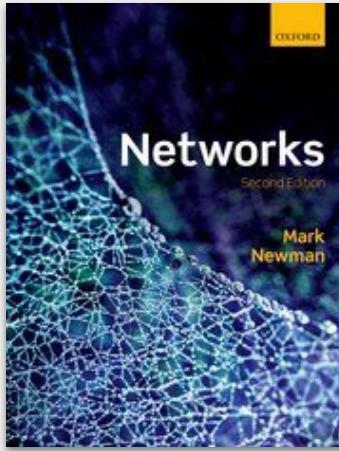
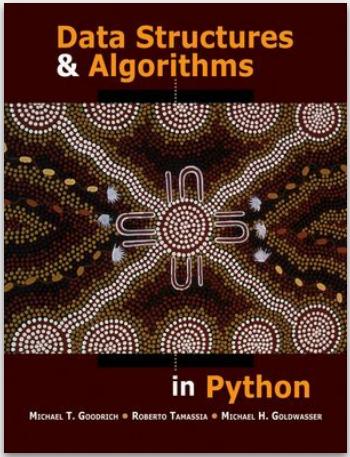
www.calendaroptions.com

Week #15: direct graphs II

Week #16: final project

End of Unit 03: 14 december

Week #17: final exam



DATAQUEST

Clone me!!!!

<https://github.com/ivanovitchm/datastructure>