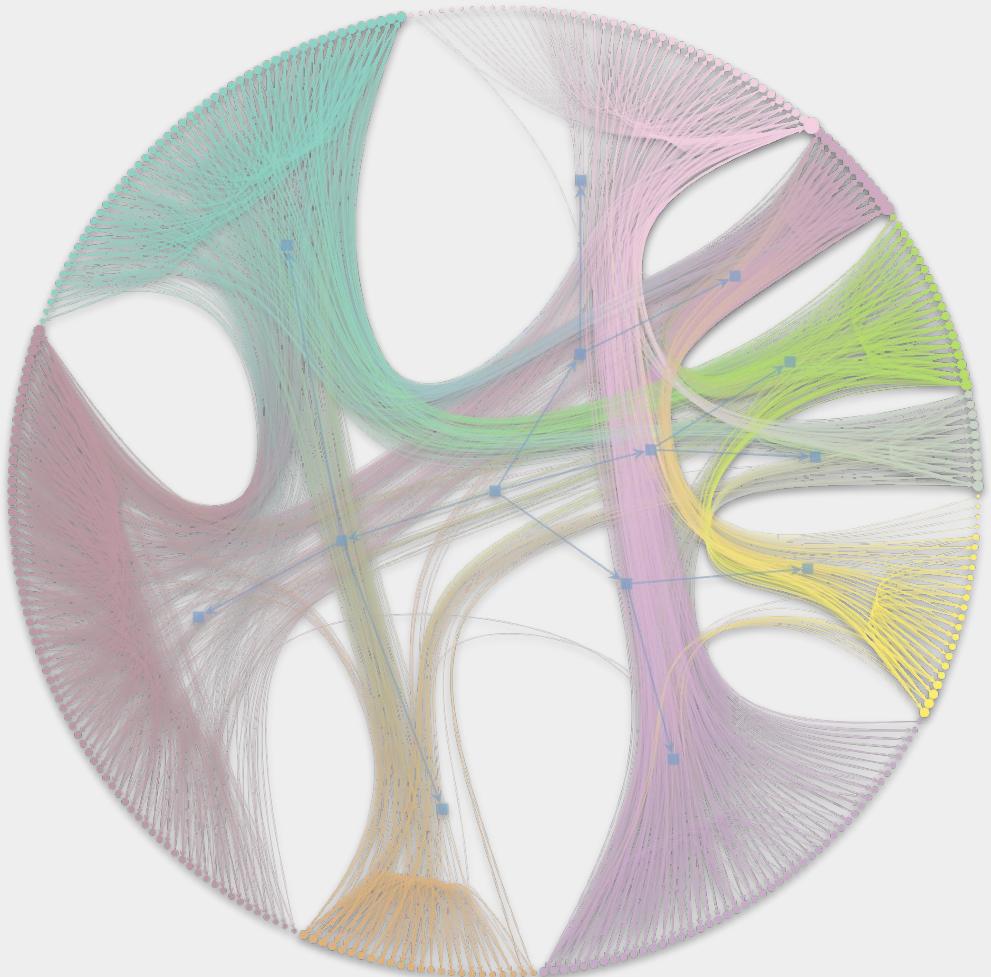


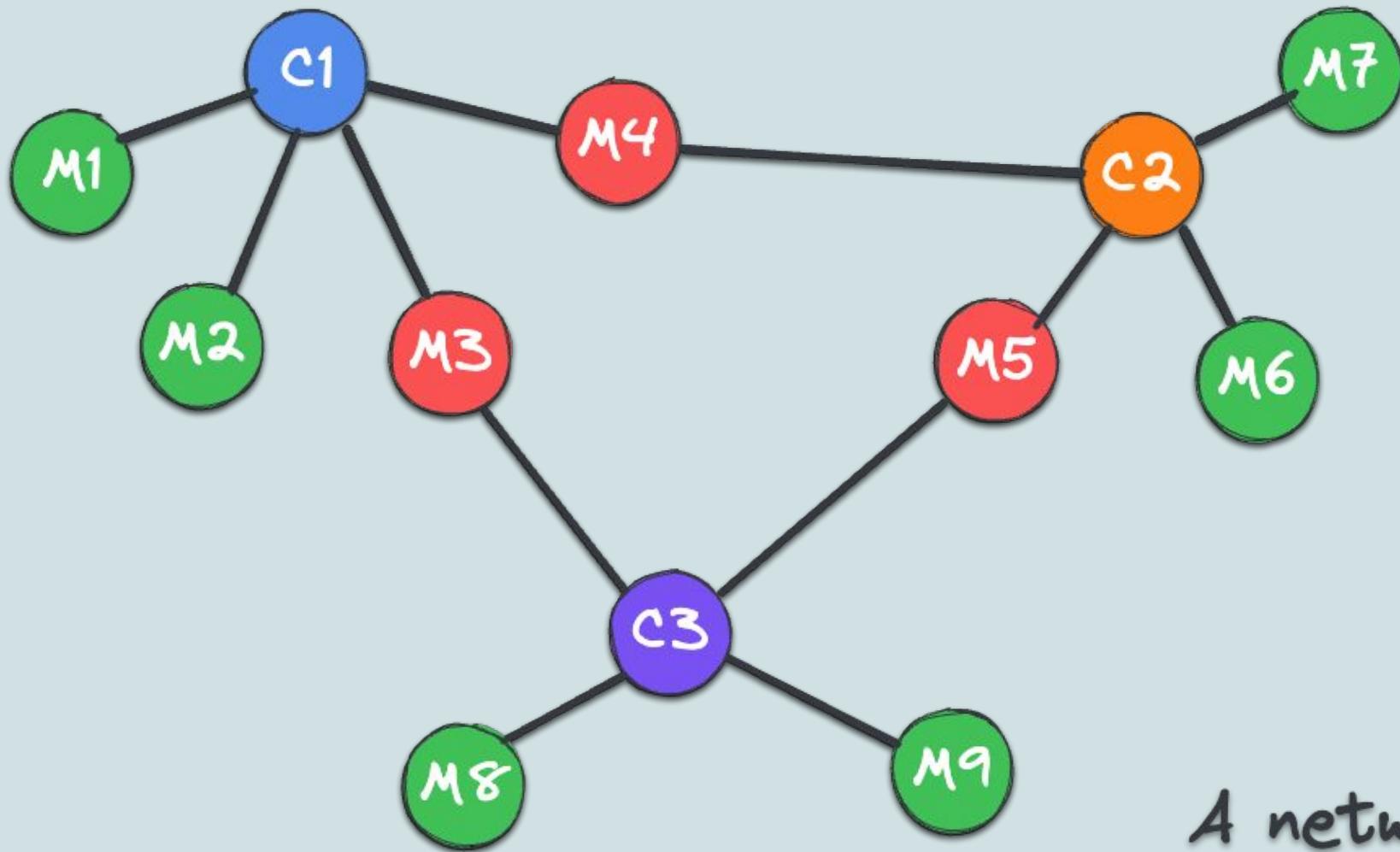
Network Elements

Part 01

ivanovitch.silva@ufrn.br
@ivanovitchm







A network

CHINA'S EXPORTS

BY REGION

2009

45% \$120B
22% \$55B
19% \$47B
3% \$8B
3% \$7B
2% \$5B
2% \$4B
1% \$3B



China has increased exports to South Asia, the Middle East, and Africa under its Belt & Road Initiative.

2022

\$1.3T
36%

EAST ASIA & PACIFIC

\$821B
23%

EUROPE & CENTRAL ASIA

\$637B
18%

NORTH AMERICA

U.S. 16%

\$252B
7%

LATIN AMERICA & CARIBBEAN

\$197B
5%

MIDDLE EAST & NORTH AFRICA

\$175B
5%

SOUTH ASIA

\$125B
3%

SUB-SAHARAN AFRICA

\$92B
2%

OTHER ASIA

Trade Tug of War:

America's Biggest Trade Deficits

The Trump administration has highlighted trade deficits—where the U.S. imports more than it exports—as one reason for tariffs.

Rank	1	2	3	4	5	6	7	8	9	10
------	---	---	---	---	---	---	---	---	---	----

China	Mexico	Vietnam	Ireland	Germany	Taiwan	Japan	S. Korea	Canada	India
-------	--------	---------	---------	---------	--------	-------	----------	--------	-------

-\$46B									
--------	--	--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--	--	--

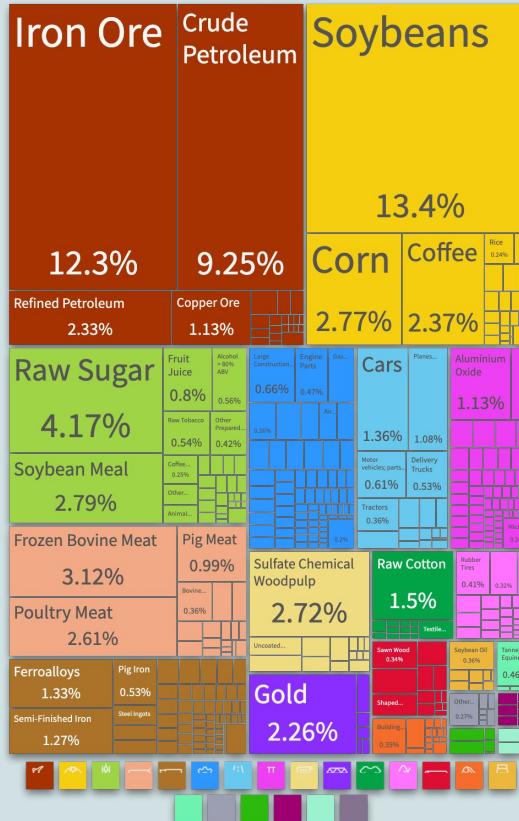
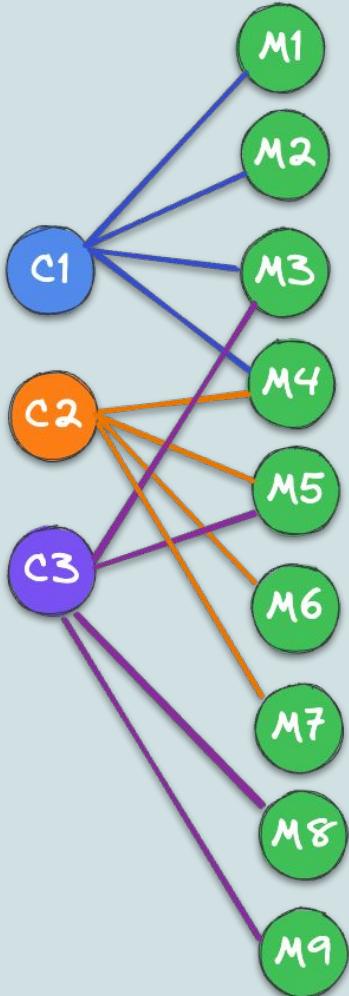
--	--	--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--	--	--

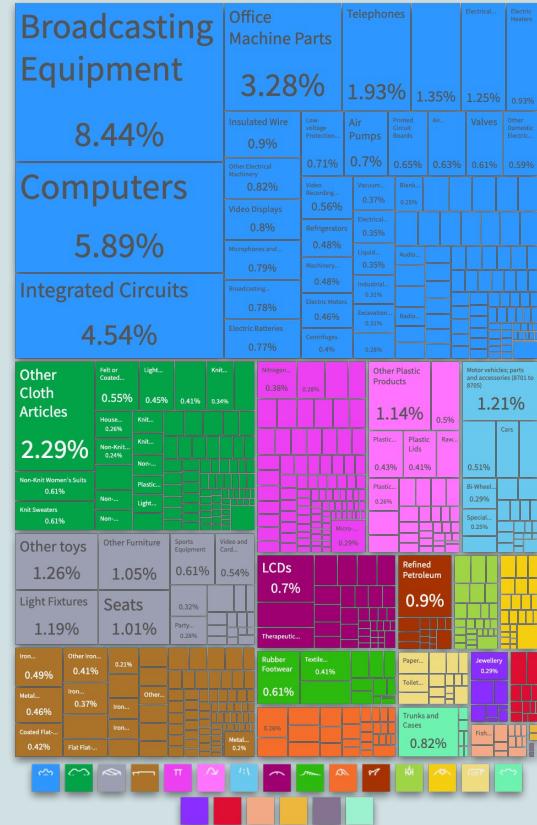
--	--	--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--	--	--

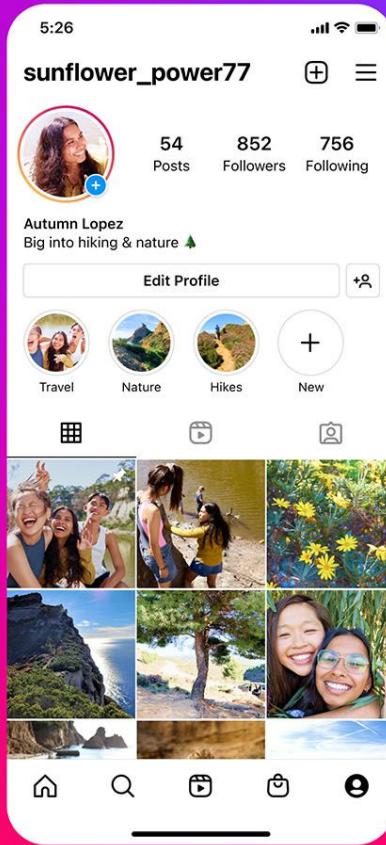
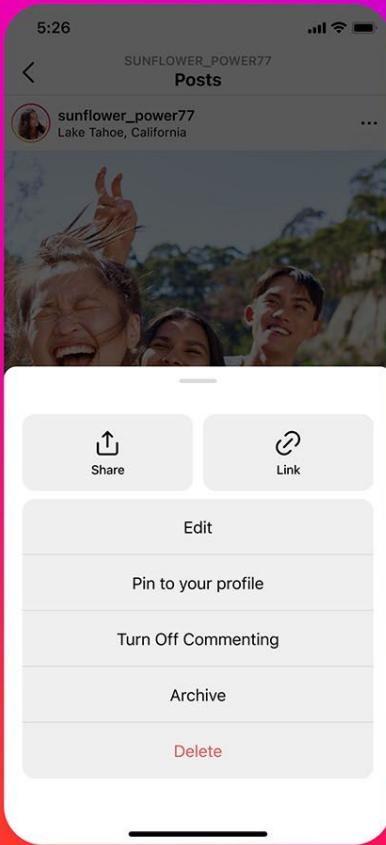


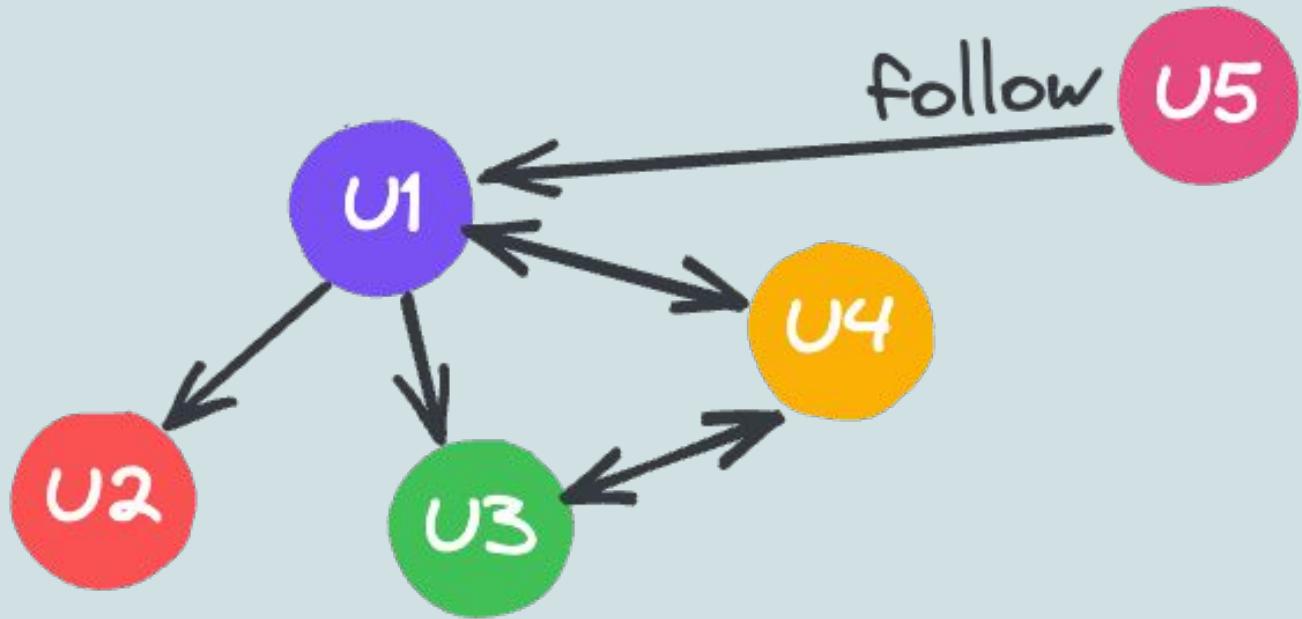
bipartite network

Exports (2020)
[Click to Select a Product]
Total: \$2.65T



<https://oec.world/en/profile/country/chn>





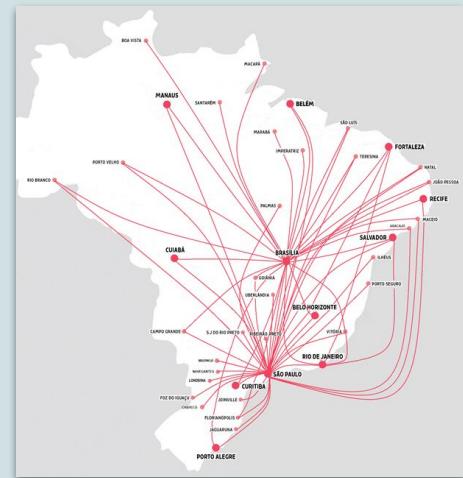
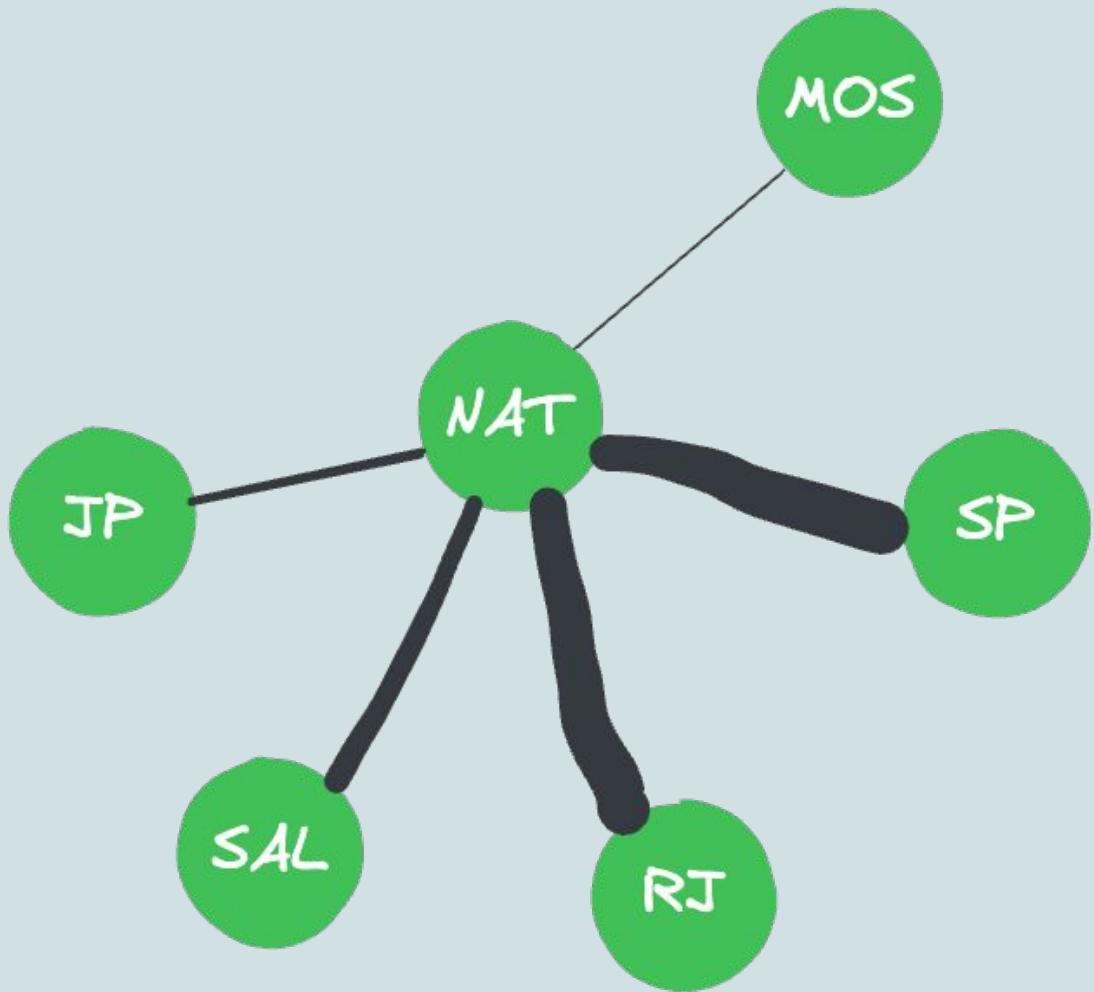
leomessi  Following Message ...

1,397 posts 506M followers 349 following

Leo Messi
Athlete
Bienvenidos a la cuenta oficial de Instagram de Leo Messi / Welcome to the official Leo Messi Instagram account
www.masbymessi.com/pages/1v1-pre-qualifiers and 3 more

A screenshot of the Instagram profile for the account 'leomessi'. The profile picture shows a smiling Lionel Messi holding a trophy. The bio reads: 'Bienvenidos a la cuenta oficial de Instagram de Leo Messi / Welcome to the official Leo Messi Instagram account' and includes a link to 'www.masbymessi.com/pages/1v1-pre-qualifiers and 3 more'. The account has 1,397 posts, 506M followers, and 349 following.







alvarofpp / dataset-flights-brazil

Type to search



Issues

Pull requests

Actions

Projects

Security

Insights



dataset-flights-brazil

Public



1



0



Starred

9



main

1 Branch

0 Tags

Go to file



Add file

Code

alvarofpp style: Applies linters

738139c · 2 months ago

38 Commits

.githooks

build: Adds Docker and Makefile

2 months ago

.github/workflows

ci: Adds integration workflow

2 months ago

data

chore: Updates data files

2 months ago

.gitignore

build: Adds Docker and Makefile

2 months ago

Dockerfile

build: Adds Docker and Makefile

2 months ago

LICENSE

docs: Adds LICENSE

2 months ago

Makefile

refact: Makefile

2 months ago

README.md

fix: Write the same file twice

2 months ago

docker-compose.yml

build: Adds Docker and Makefile

2 months ago

extract.py

style: Applies linters

2 months ago

requirements.txt

build: Adds Docker and Makefile

2 months ago

About

Flights in Brazil registered by ANAC
(Agência Nacional de Aviação Civil -
National Civil Aviation Agency)

csv brazil python3 dataset

flights air-traffic graphml

air-traffic-data

Readme

View license

Activity

9 stars

1 watching

0 forks

Report repository

Languages



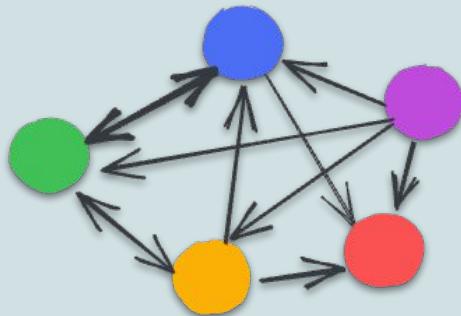


WhatsApp

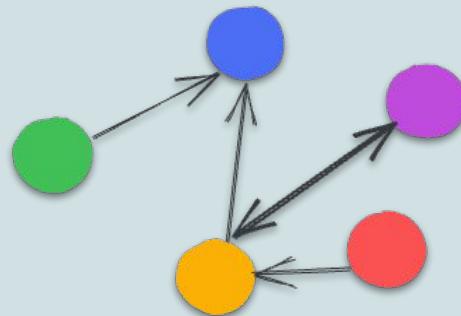


<https://github.com/kurasaitja/Whatsapp-Analysis>

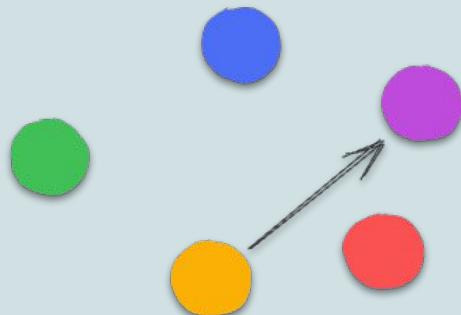
Monday



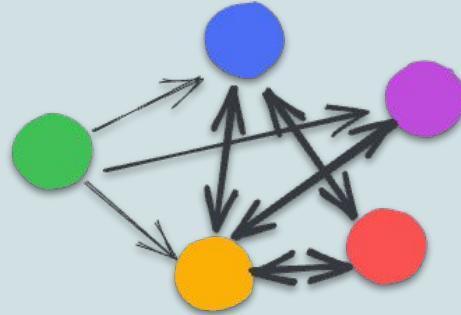
Tuesday



Wednesday



Thursday



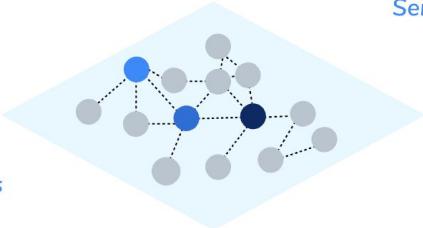
Temporal network



Data



Relationships



Graph

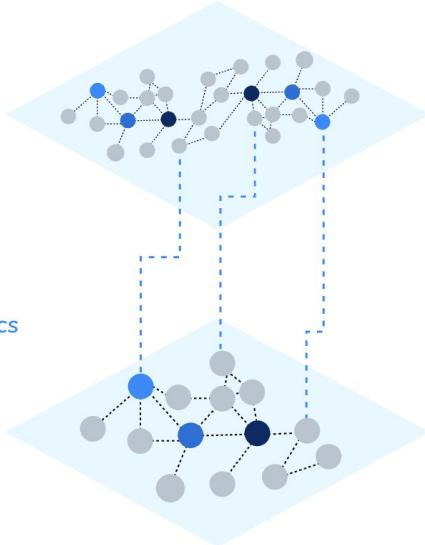
Dynamic Context

1. Data

Bridge together diverse and disparate data silos regardless of data type, such as structured, unstructured, and semi-structured.



Semantics



Knowledge Graph

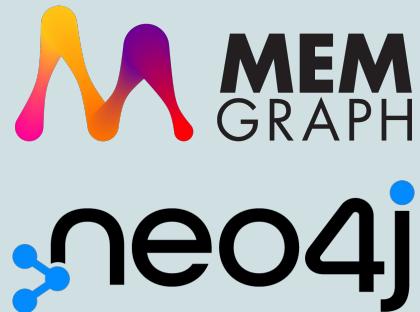
Deep Dynamic Context

2. Graph

Map data and draw connections among them for the first layer of dynamic context, which provides immediate understanding.

3. Semantics

Apply semantics to provide deeper context to connected data. The deeper the context, the more powerful the insights.



Retrieval Augmented Generation (RAG)

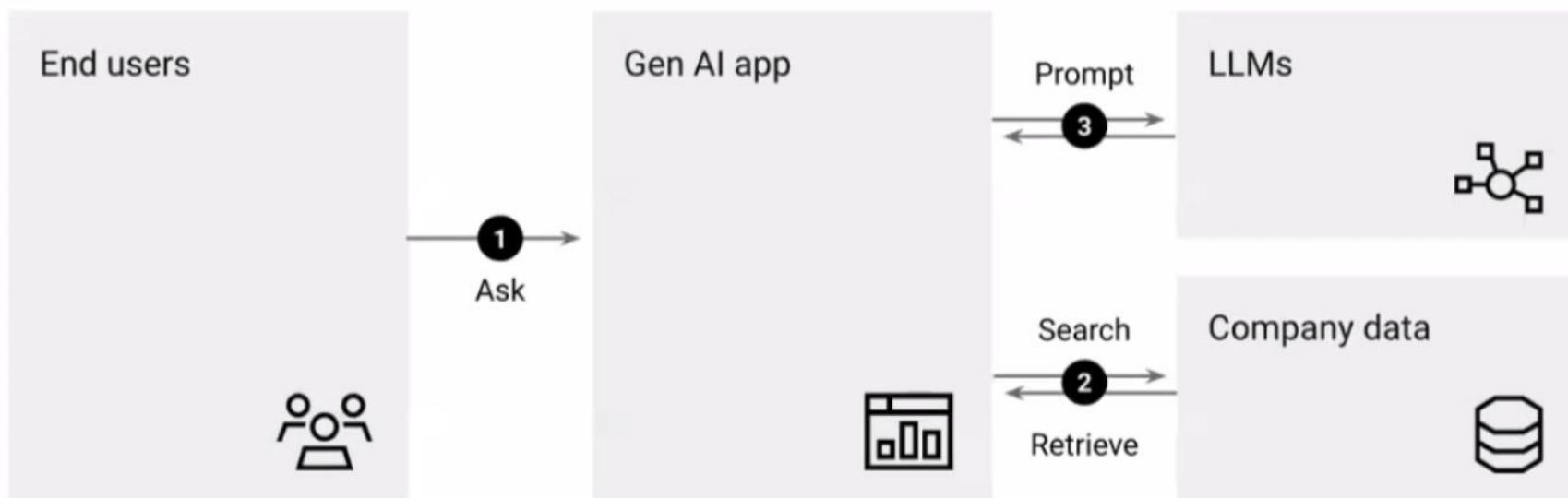
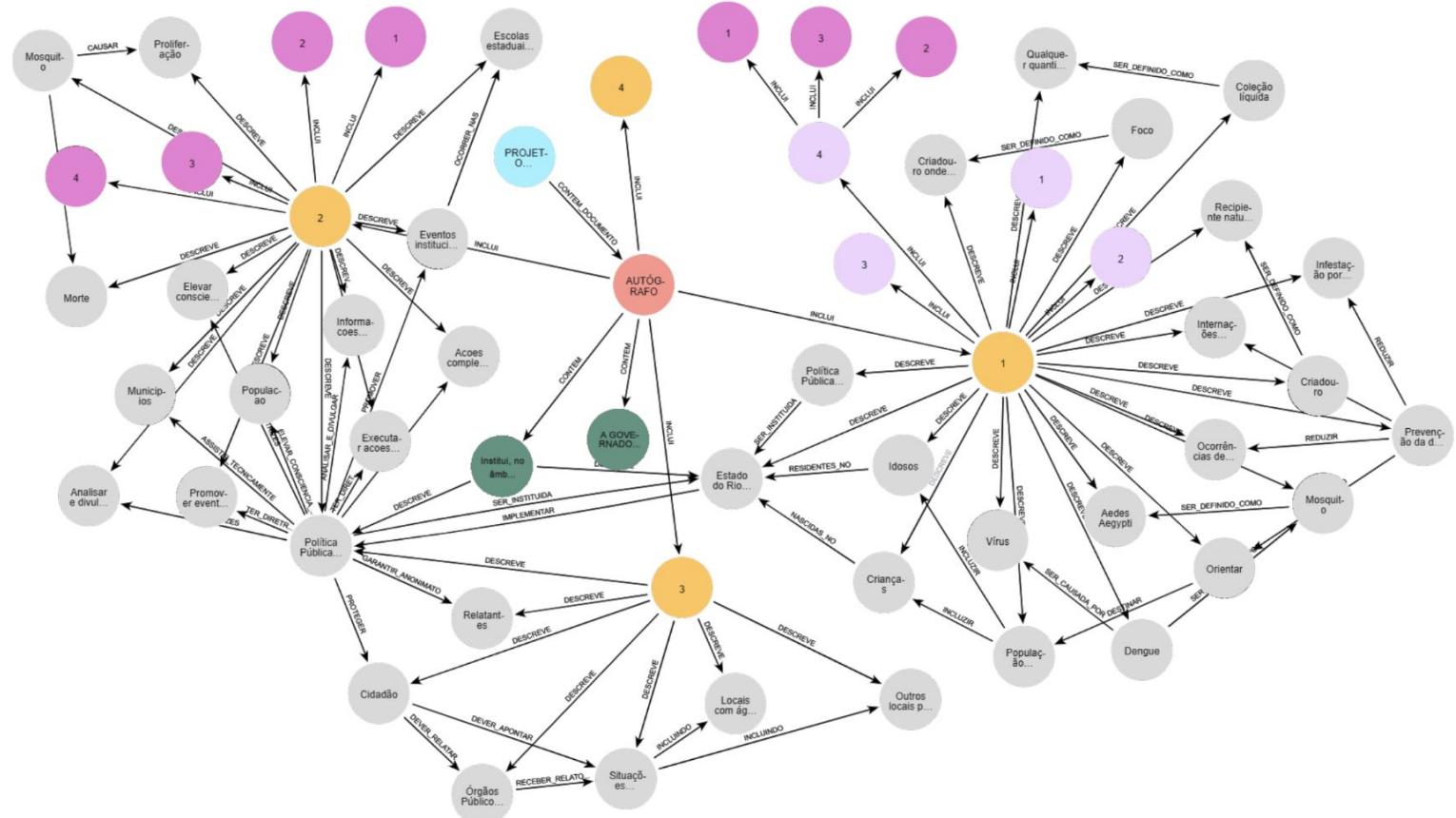
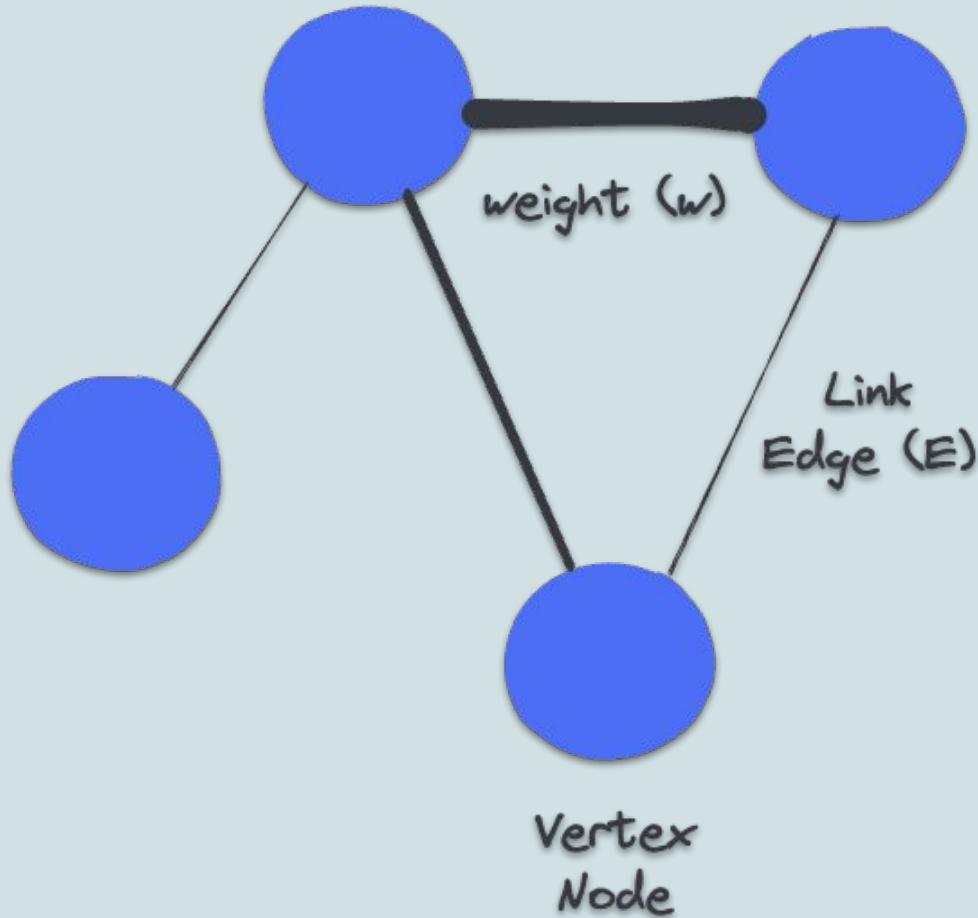


Figure 6.16: Contextually enriched KG of Bill of Law N° 239/2019.



Source: Created by the author (2025).



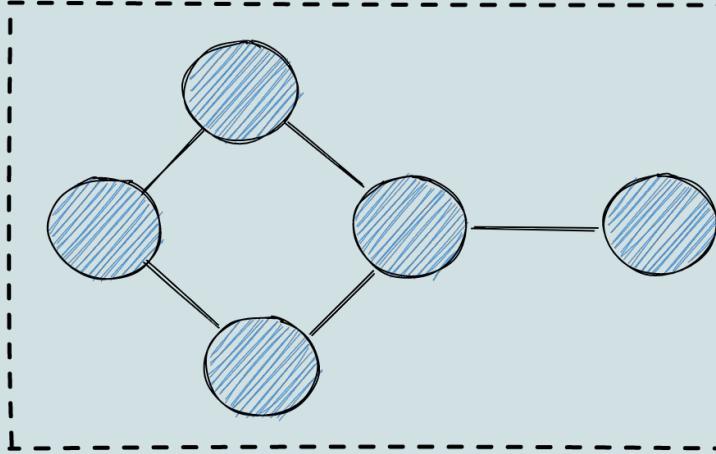
Basic Definitions

$$G = (V, E, W)$$

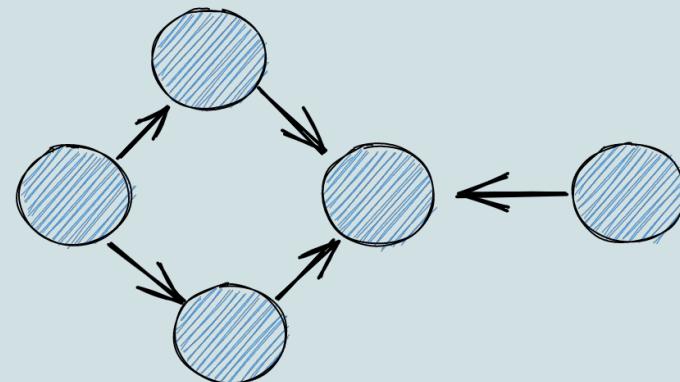
$$E \subseteq V \times V$$

$$W \subseteq R^+$$

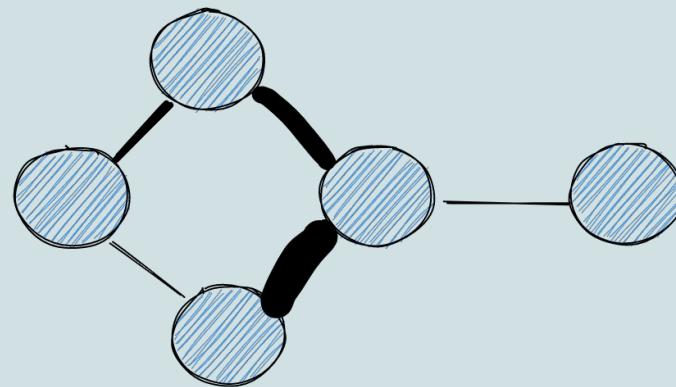
Undirected



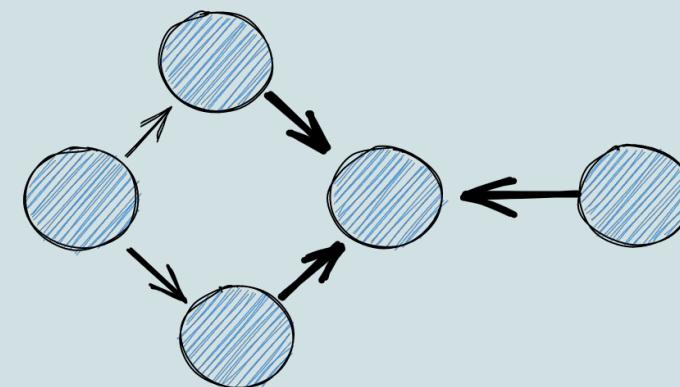
Directed



Unweighted



Weighted



Knowing

Information is directly acquired from reliable sources such as books, teachers, lectures, and courses

Focus on absorbing and retaining information.

Learning that takes place when information or experiences are exchanged between individuals or groups.

Teaching others reinforces one's own understanding.

Sharing

Learning

Discovering

Self-directed learning that happens when one ventures out to find new information

Driven by curiosity and inherently exploratory.

"Learning by doing", based on the premise that direct experience is one of the most potent forms of learning.

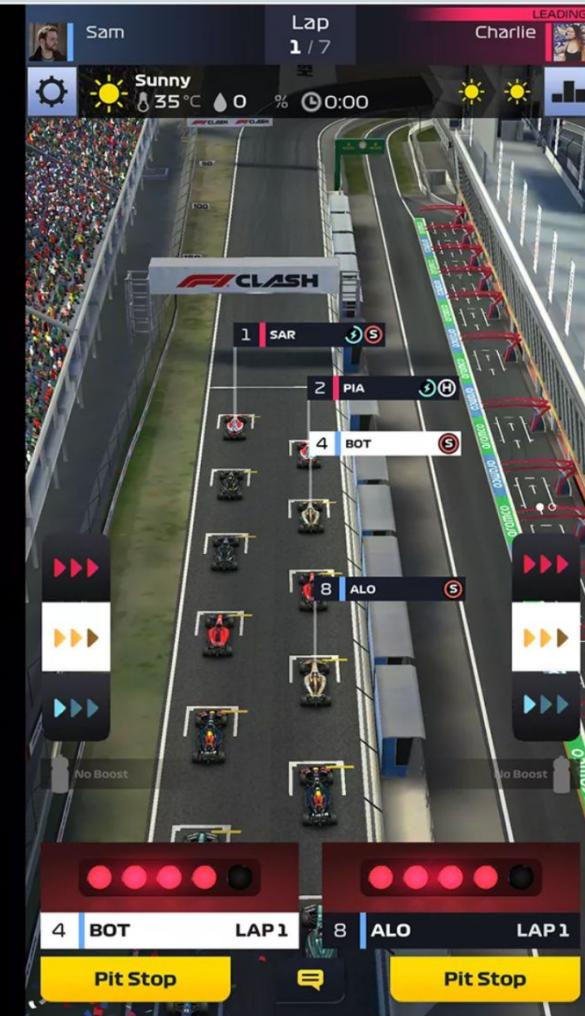
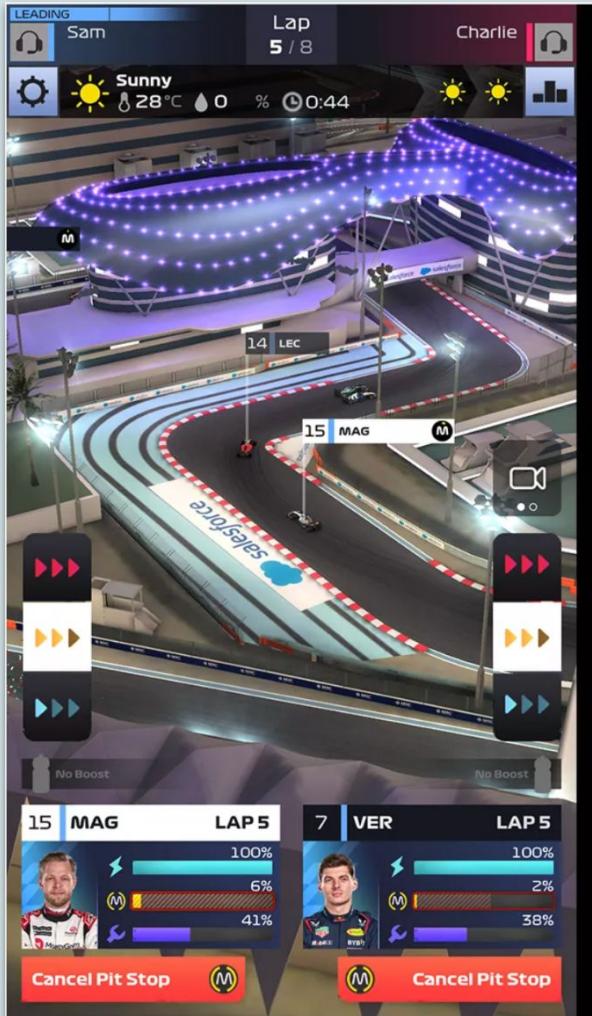
Involves real-life situations

Experiencing

 F1® CLASH**F1® CLASH** F1® CLASH

Compete in thrilling 1v1 races with the toughest rival race drivers from around the world.



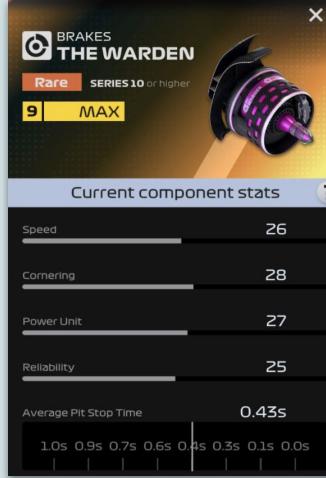




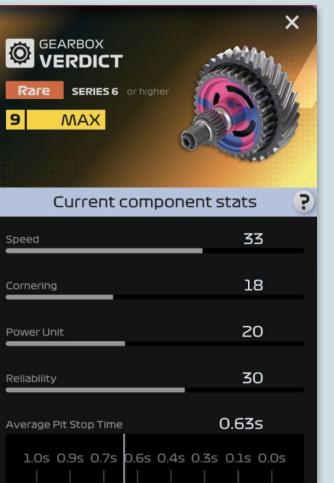
Configuring a setup

$\min(1,220)$

Breaks



GearBox



Rear wing



Current component stats	
Speed	50
Cornering	27
Power Unit	26
Reliability	23
Average Pit Stop Time	0.53s
1.0s 0.9s 0.7s 0.6s 0.4s 0.3s 0.1s 0.0s	



Current component stats	
Speed	24
Cornering	22
Power Unit	36
Reliability	37
Average Pit Stop Time	0.53s
1.0s 0.9s 0.7s 0.6s 0.4s 0.3s 0.1s 0.0s	



Current component stats	
Speed	21
Cornering	33
Power Unit	20
Reliability	22
Average Pit Stop Time	0.37s
1.0s 0.9s 0.7s 0.6s 0.4s 0.3s 0.1s 0.0s	



Current component stats	
Speed	23
Cornering	21
Power Unit	19
Reliability	37
Average Pit Stop Time	0.61s
1.0s 0.9s 0.7s 0.6s 0.4s 0.3s 0.1s 0.0s	



Current component stats	
Speed	16
Cornering	24
Power Unit	23
Reliability	14
Average Pit Stop Time	0.69s
1.0s 0.9s 0.7s 0.6s 0.4s 0.3s 0.1s 0.0s	



Current component stats	
Speed	19
Cornering	16
Power Unit	18
Reliability	17
Average Pit Stop Time	0.72s
1.0s 0.9s 0.7s 0.6s 0.4s 0.3s 0.1s 0.0s	

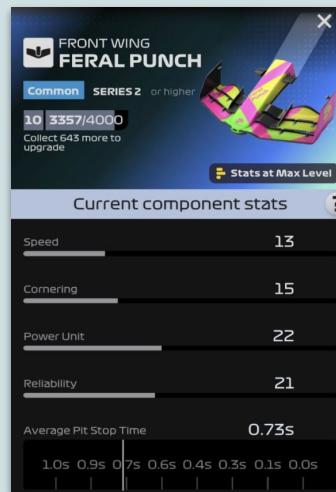


Current component stats	
Speed	26
Cornering	15
Power Unit	12
Reliability	11
Average Pit Stop Time	0.76s
1.0s 0.9s 0.7s 0.6s 0.4s 0.3s 0.1s 0.0s	

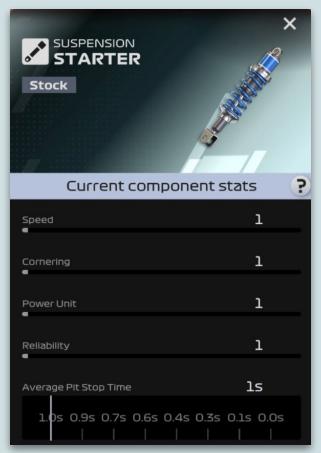
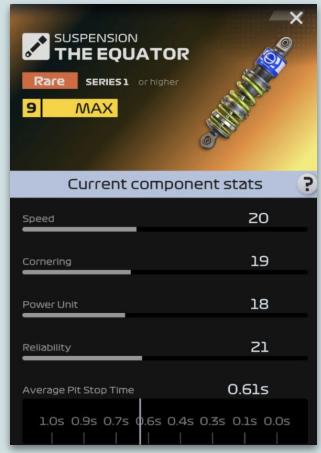
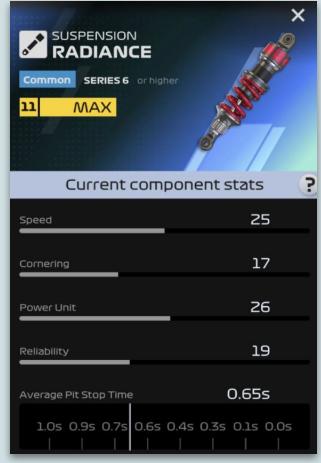
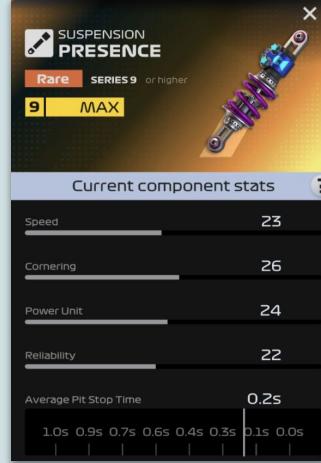
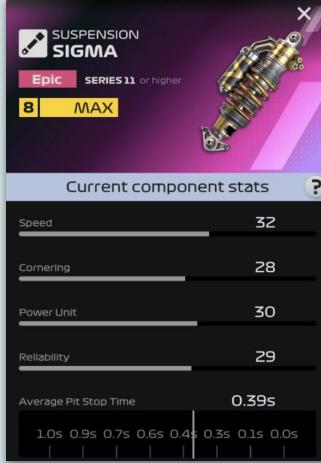


Current component stats	
Speed	1
Cornering	1
Power Unit	1
Reliability	1
Average Pit Stop Time	1s
1.0s 0.9s 0.7s 0.6s 0.4s 0.3s 0.1s 0.0s	

Front wing

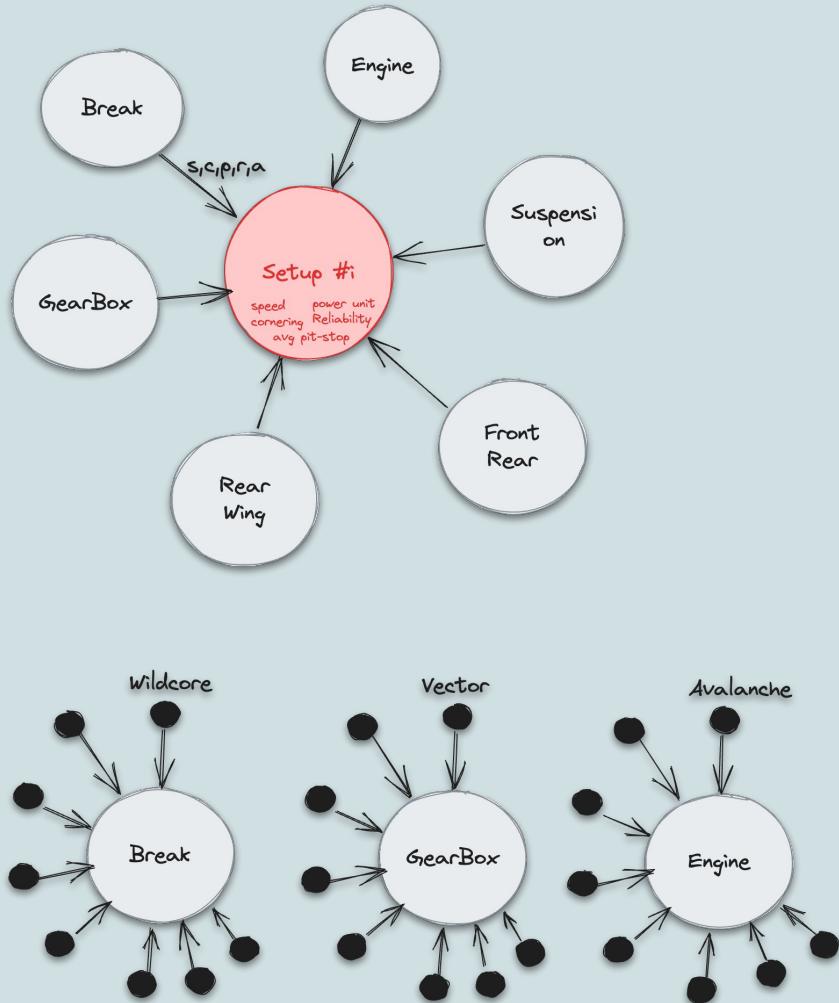


Suspension



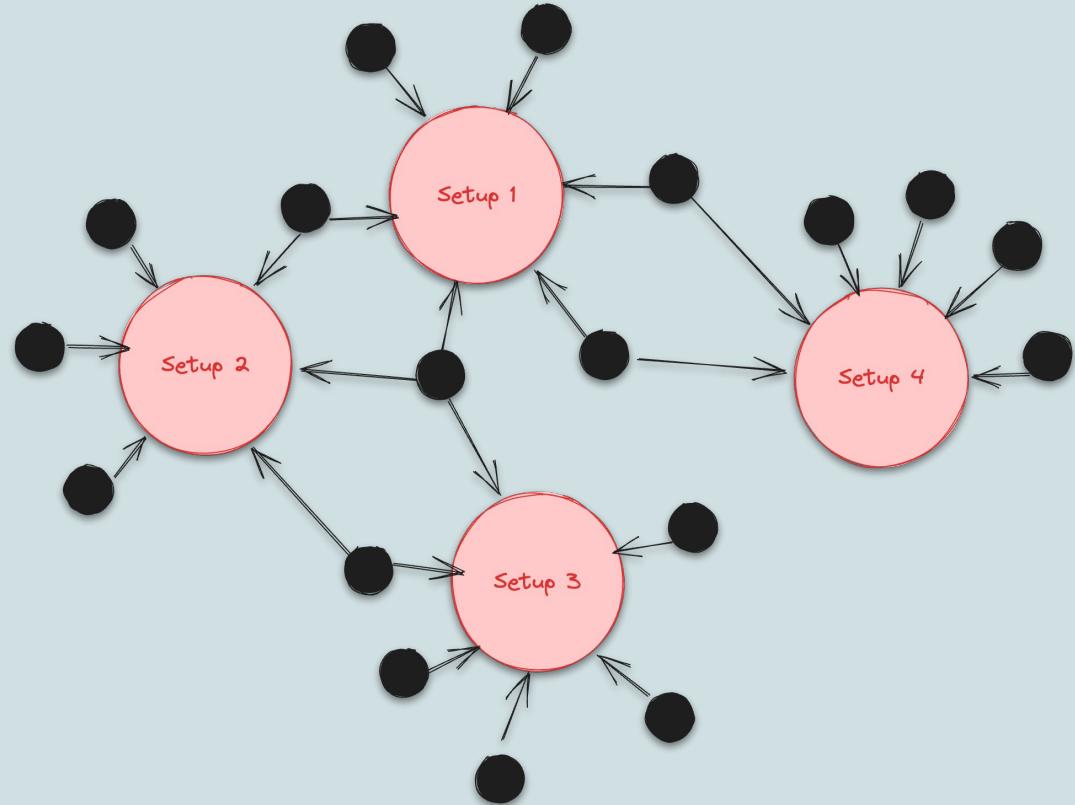
Engine



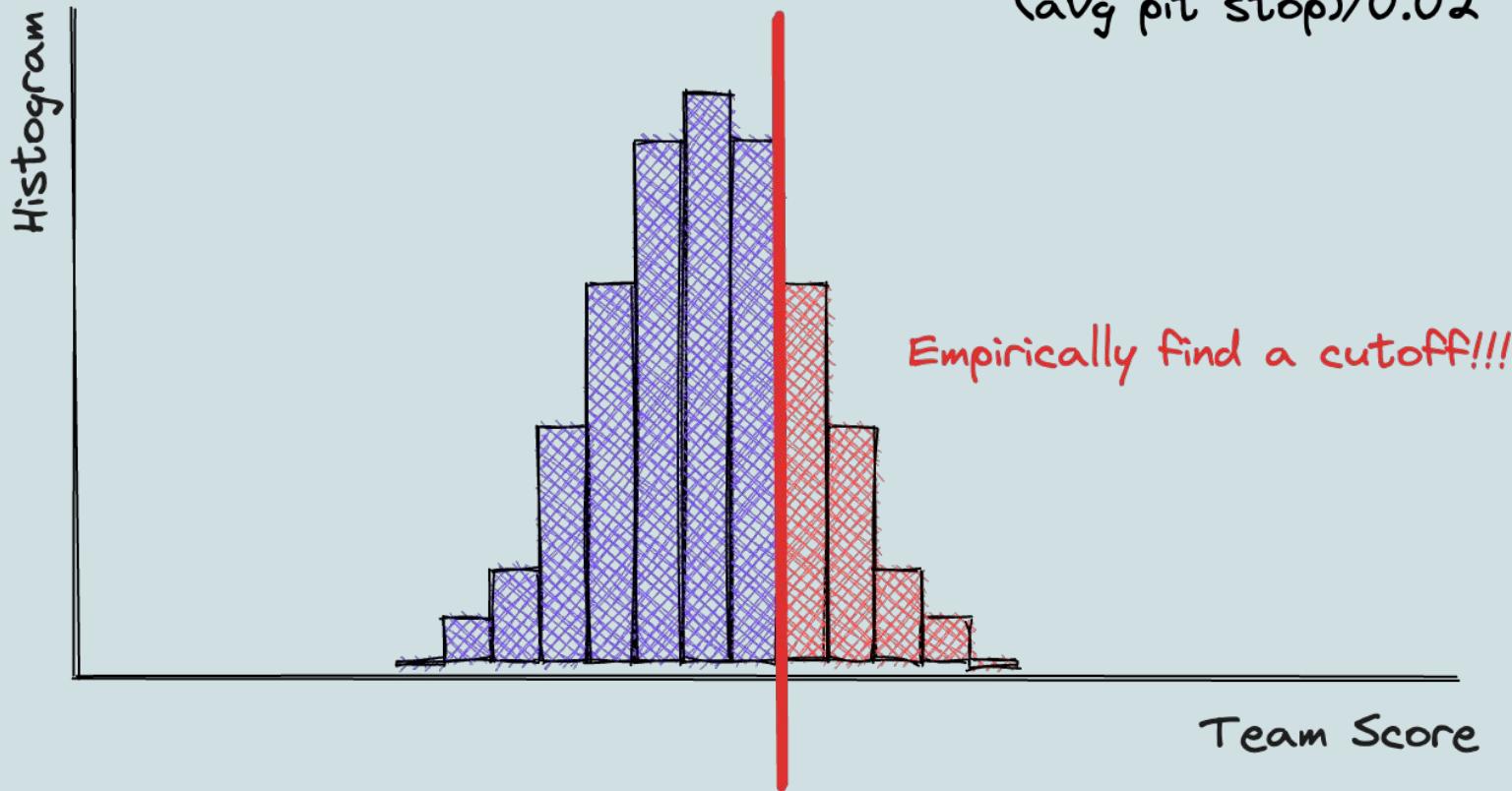




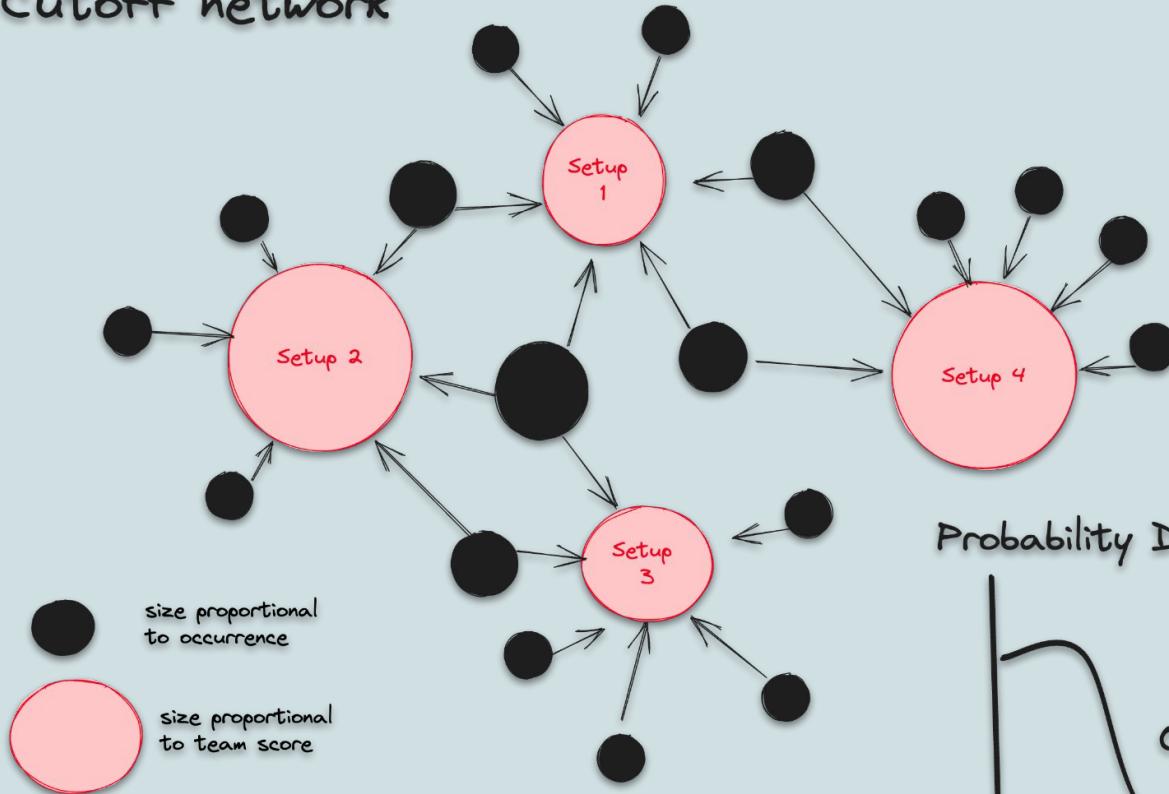
$8^6 = 262,144$
combinations



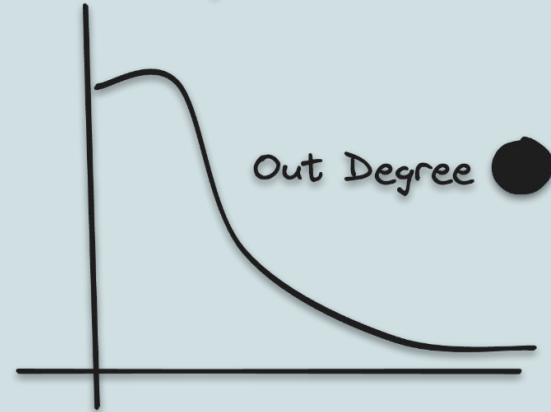
Team Score = speed + cornering + power unit + reliability +
(avg pit stop)/0.02

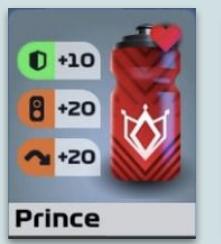
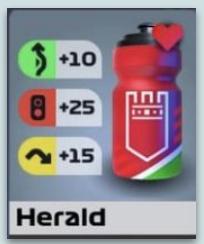
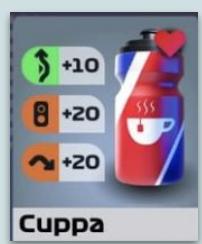
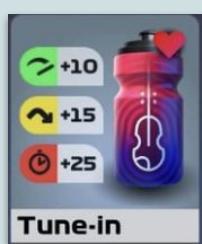


Cutoff network



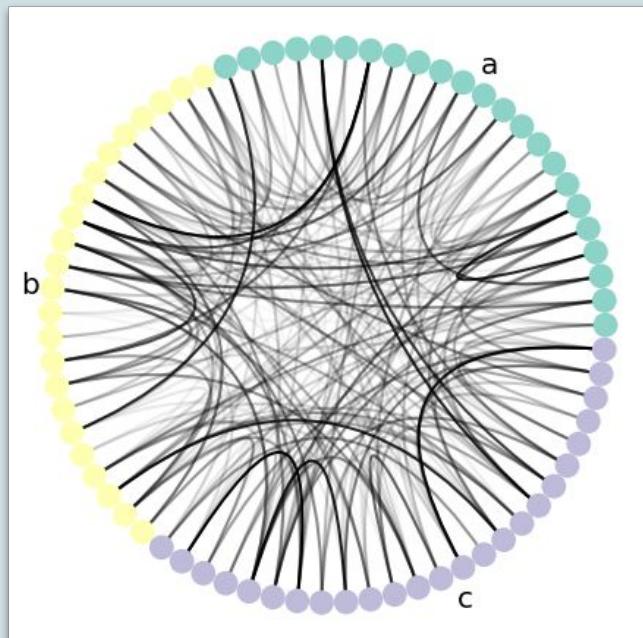
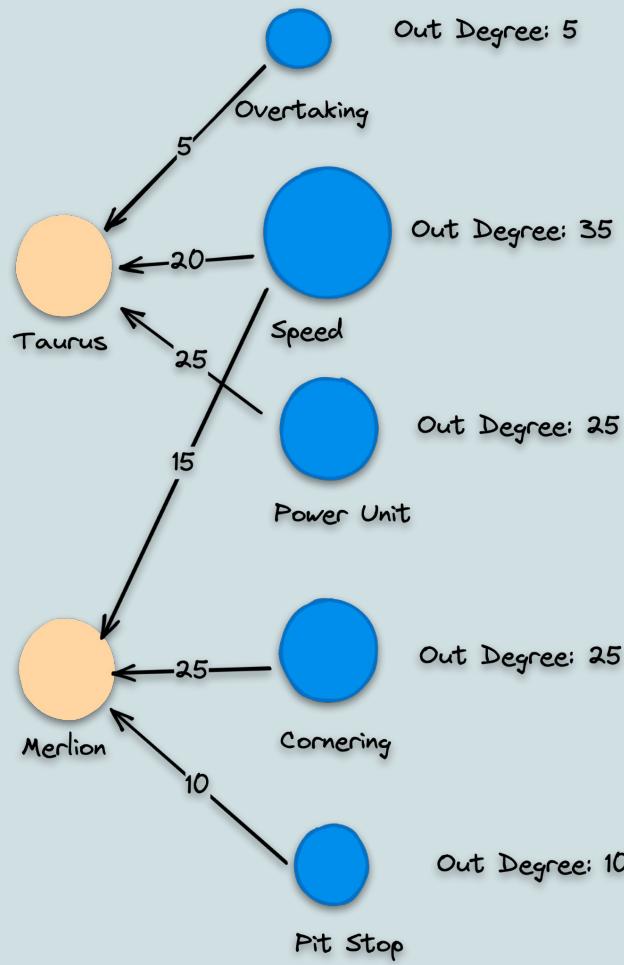
Probability Distribution Function (PDF)

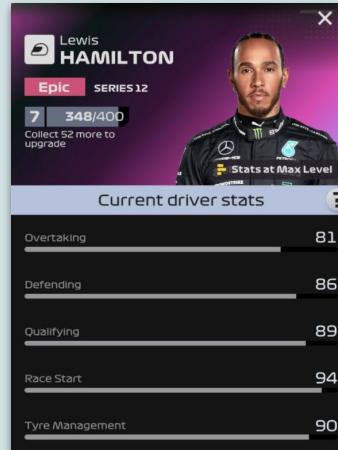






Speed, Cornering, Power_Unit, Reliability, Pit_Stop,
Overtaking, Defending, Race_Start, Tyre_Management





$$\min(\lceil \times 1, 99 \rceil)$$

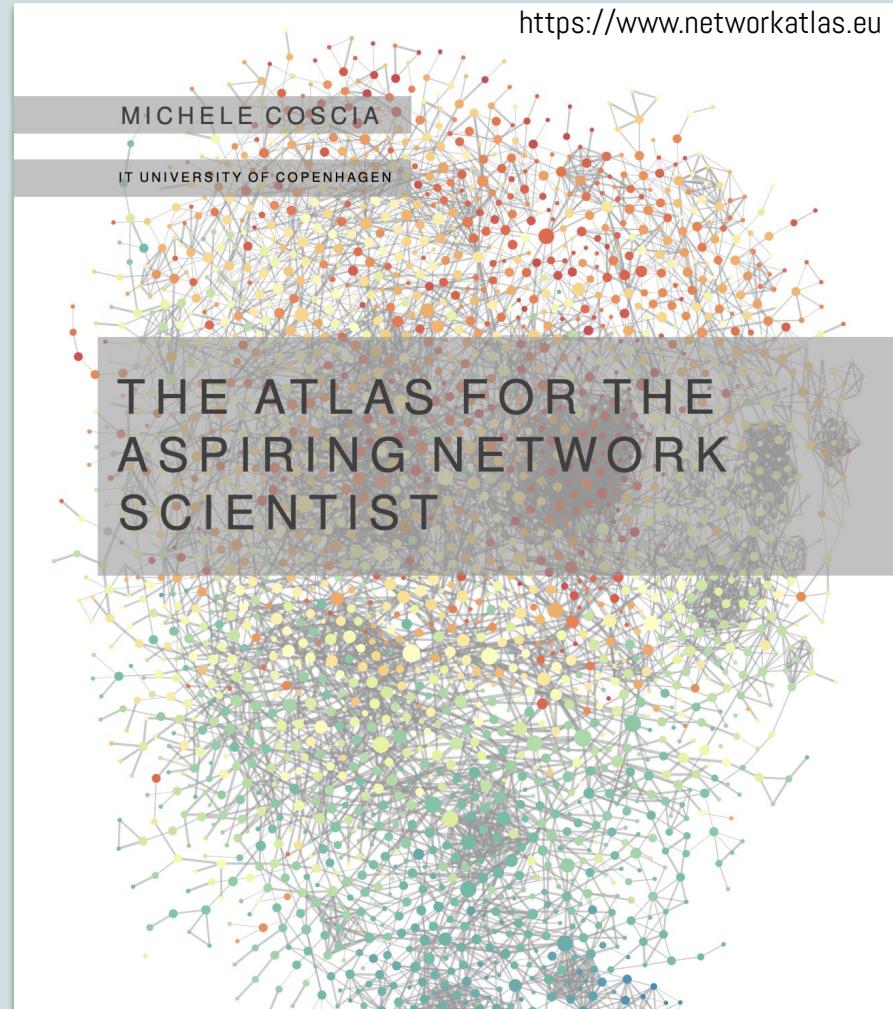
Further Reading & Practice



Contents

-  optional
-  must-read

1 Introduction	7
I Background Knowledge	
2 Probability Theory	21
3 Statistics	22
4 Machine Learning	39
5 Linear Algebra	55
II Graph Representations	
6 Basic Graphs	70
7 Extended Graphs	90
8 Matrices	91
	103
	119



Contact

[Mailing list](#)

[Issue tracker](#)

[Source](#)

Releases

[Stable \(notes\)](#)

[3.5 — May 2025](#)

[Documentation](#)

[Latest \(notes\)](#)

[3.6 development](#)

[Documentation](#)

[Archive](#)



NetworkX

Network Analysis in Python

NetworkX is a Python package for the creation, manipulation, and study of the structure, dynamics, and functions of complex networks.

Software for complex networks

- Data structures for graphs, digraphs, and multigraphs
- Many standard graph algorithms
- Network structure and analysis measures
- Generators for classic graphs, random graphs, and synthetic networks
- Nodes can be "anything" (e.g., text, images, XML records)
- Edges can hold arbitrary data (e.g., weights, time-series)
- Open source [3-clause BSD license](#)
- Well tested with over 90% code coverage
- Additional benefits from Python include fast prototyping, easy to teach, and multi-platform



[Resources](#)[Creators](#)[Explore](#) Search Substack...[Start publishing](#)[Sign in](#)

Substack is the home for great culture

Substack is a new media app that connects you with the creators, ideas, and communities you care about most. Here, you can discover world-class video, podcasts, and writing from a diverse set of creators who cover politics, pop culture, food, philosophy, tech, travel, and so much more.

[Get the Substack App](#)[Start a Substack](#)

10% grade bonus

