



INSIGHT

Data Science Laboratory
Federal University of Ceará
Fortaleza - Brazil

<http://insightlab.ufc.br>
@_insightlab

ODIN: Data Science Applied to Police Intelligence

José Macedo



UNIVERSIDADE
FEDERAL DO CEARÁ

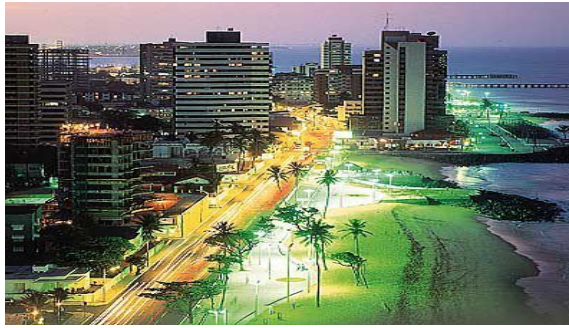


Jose Antonio Macedo

- Associate Professor at Federal University of Ceará
- Coordinator of Computer Science Doctoral School
- Ph.D. at PUC-Rio + ENST/France
- Post-Doc at EPFL/Switzerland
- CNPq Fellow

Fortaleza – Ceará - Brazil

- State capital of Ceará
- 2.55 million people
- The 5th largest city in Brazil



Federal University of Ceará

- 2 million m²
- 8 Campi
- 18 Academic Units
- 2 Hospitals
- 17 Libraries

12th of 178 public
universities of Brazil
20th in Latin America

3.890 Professors
3.100 Staff

- 27.000 Undergraduated students
- 5.700 Master/PhD students



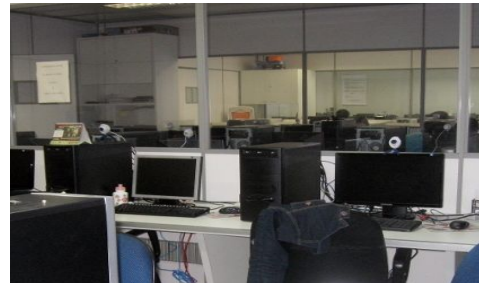
Computer Science Department

Numbers

- 28 Professors
- 211 Undergraduate students
- 123 Master and PhD Students
- 5 Research Groups:
 - ARIDA - Database
 - CRAb - Computer Graphics
 - GREaT – Network/Soft. Eng.
 - ParGO – Graphs/HPC
 - LOGIA – Logics and AI

Infrastructure

- 4 buildings
- 9 laboratories



Insight Data Science Laboratory Team

53
people

Prof. José Macedo
Coordinator

Profa. Ticiana Linhares
Postdoctoral Researcher

Prof. Regis Pires
Ph.D Candidate

Profa. Lívia Almada
Ph.D Candidate

Igo Brilhante
Postdoctoral Researcher

Francesco Lettich
Postdoctoral Researcher

Leopoldo Melo
Ph.D Candidate

Samara Martins
Ph.D. Candidate

Prof. Lívio Freire
Ph.D Candidate

David Araujo
Manager

Prof. Gustavo Coutinho
Master Student

Emanuel Oliveira
Master Student

Holanda Junior
Master Student

Guilherme Estevão
Master Student

Tércio Jorge
Master Student

Felipe Zschornack
Master Student

Kevin Barros
Master Student

Ricardo Ávila
Ph.D Candidate

Felipe Melo
Master Student

Lucas Peres
Undergraduate Student

Erick Lima
Undergraduate Student

Yuri Bittencourt
Undergraduate Student

Vitória Mendes
Undergraduate Student

Samara Lou
Undergraduate Student

Vitória Mendes
Undergraduate Student

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AGENDA

1. Ongoing Projects
2. Petrobras Project
3. Police Project

Ongoing Projects



**Ontologies-based Data
Access for Geological Data
Generated by E&P Wells**

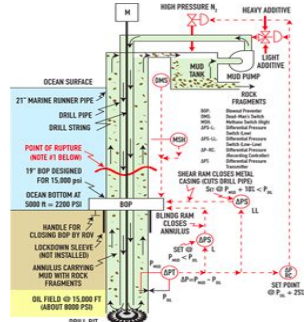
**Budget: 400K Euros
Duration: 18 months
People: 12**



**Scientific Intelligence for
Public Security**

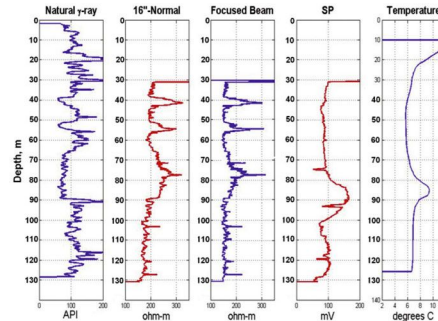
**Budget: 1.8M Euros
Duration: 36 months
People: 58**

Drilling Operation

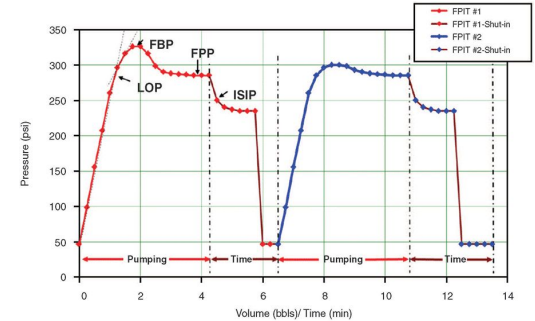


Note #1: The rupture occurred in this low design pressure section of the riser pipe. The "Log" with the new BOP¹ was installed on top of the old BOP. The oil flow was much more than suggested by BP and their claim that it could not be measured is now false. If the "Log" was implemented, we will never know how much it was.

Drill Logging



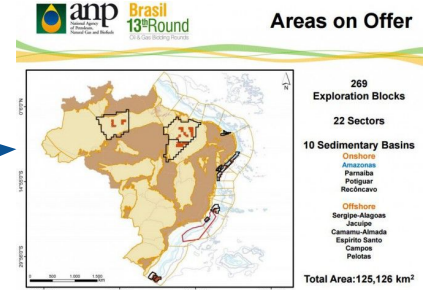
Rock Formation Tests



Rock Samples

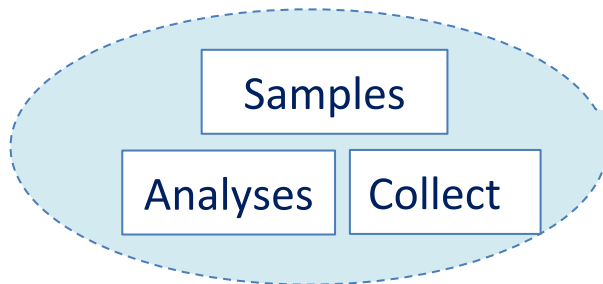
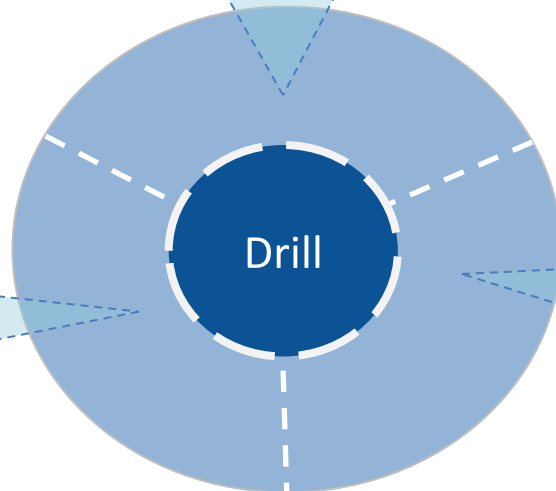
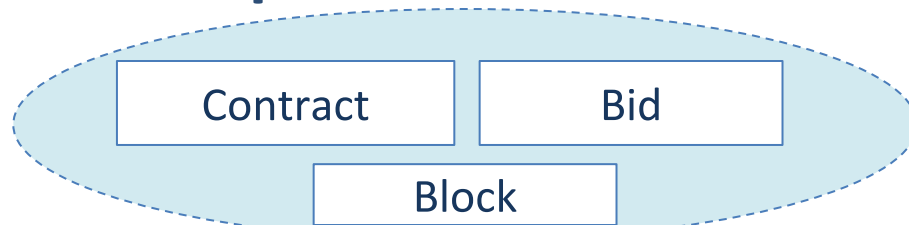


Drilling

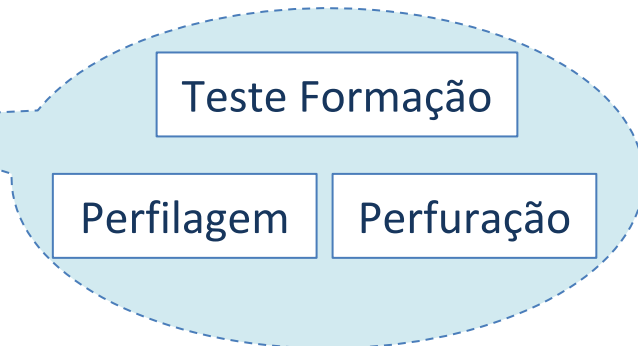


Property

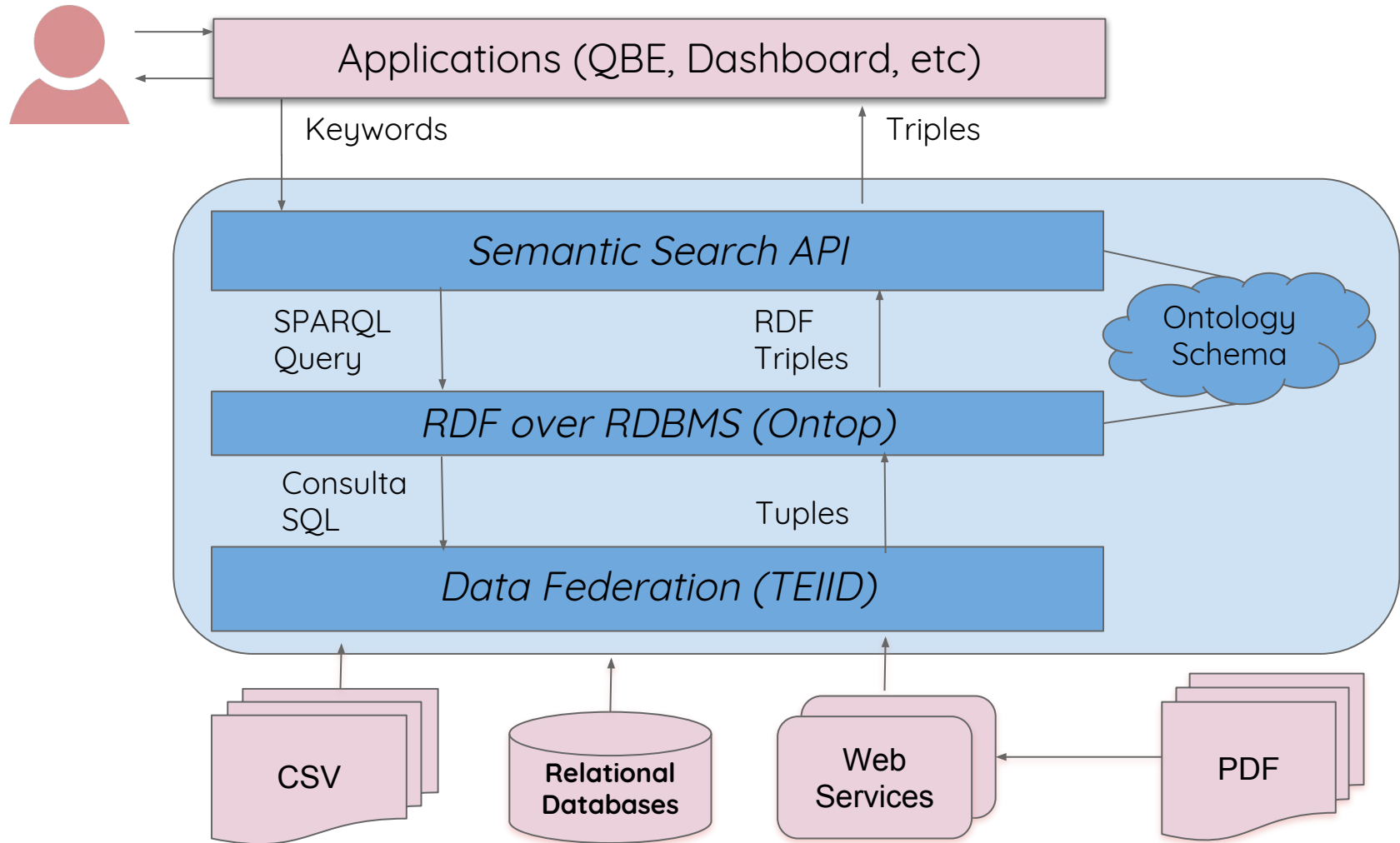
Exploration Process



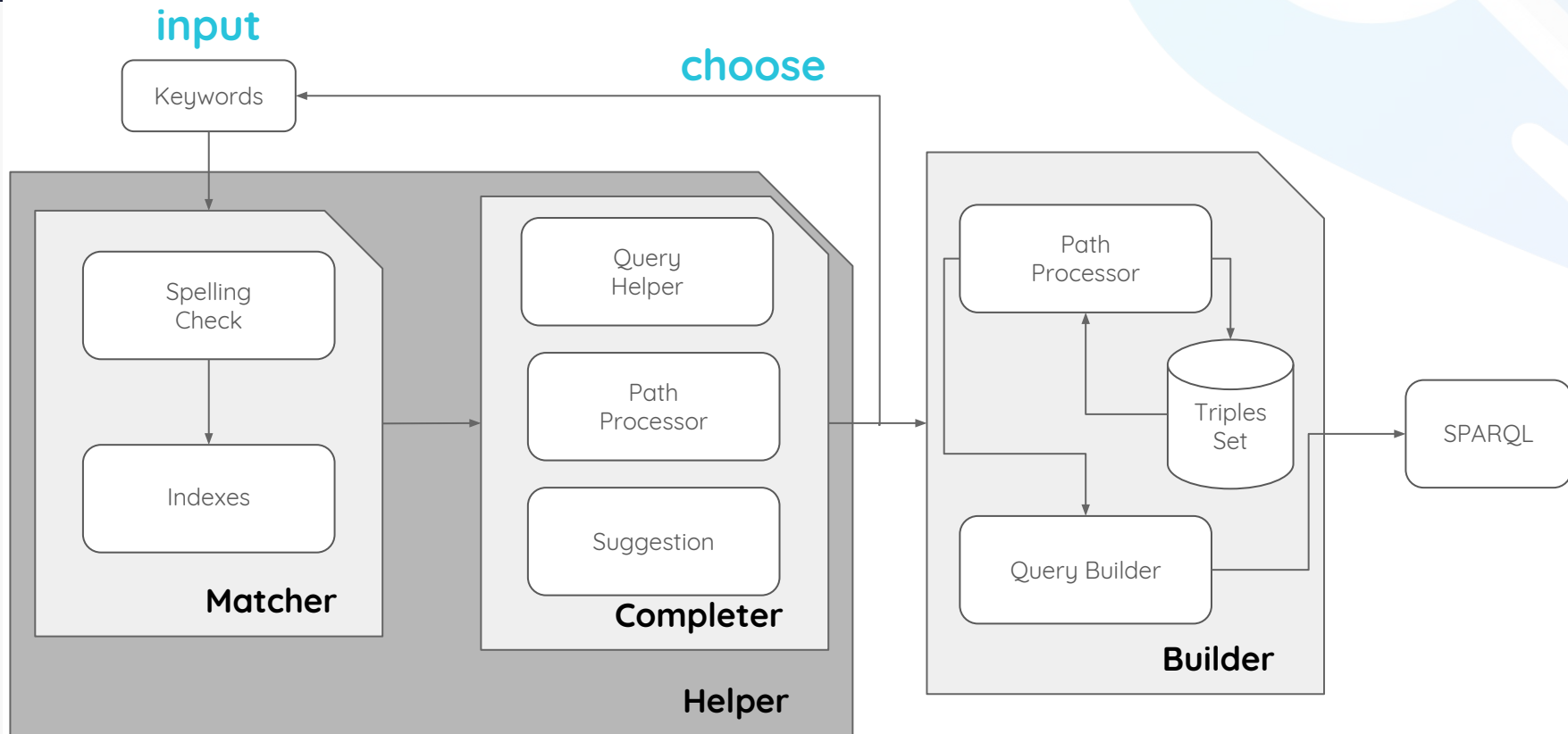
Rock and Fluid

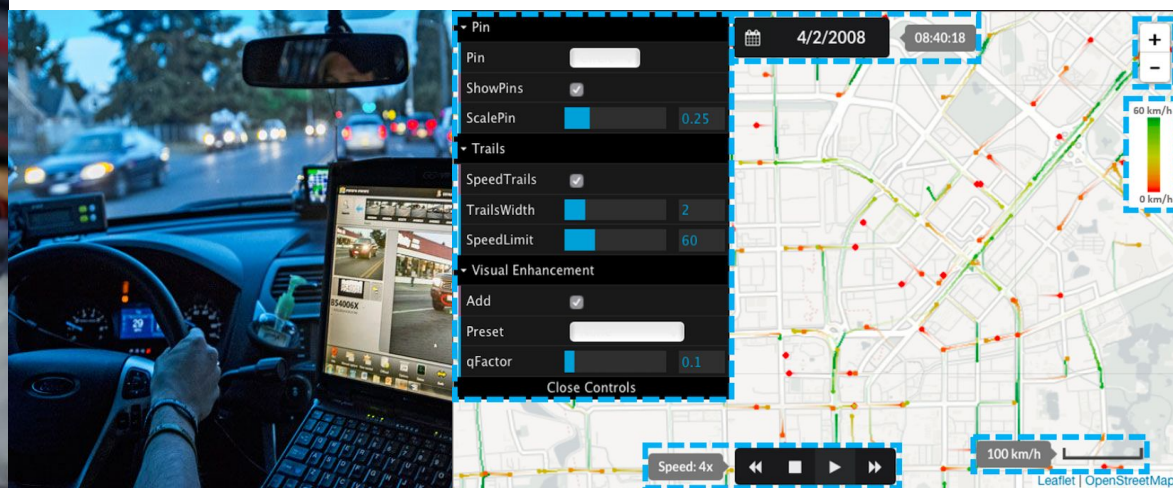


Operations

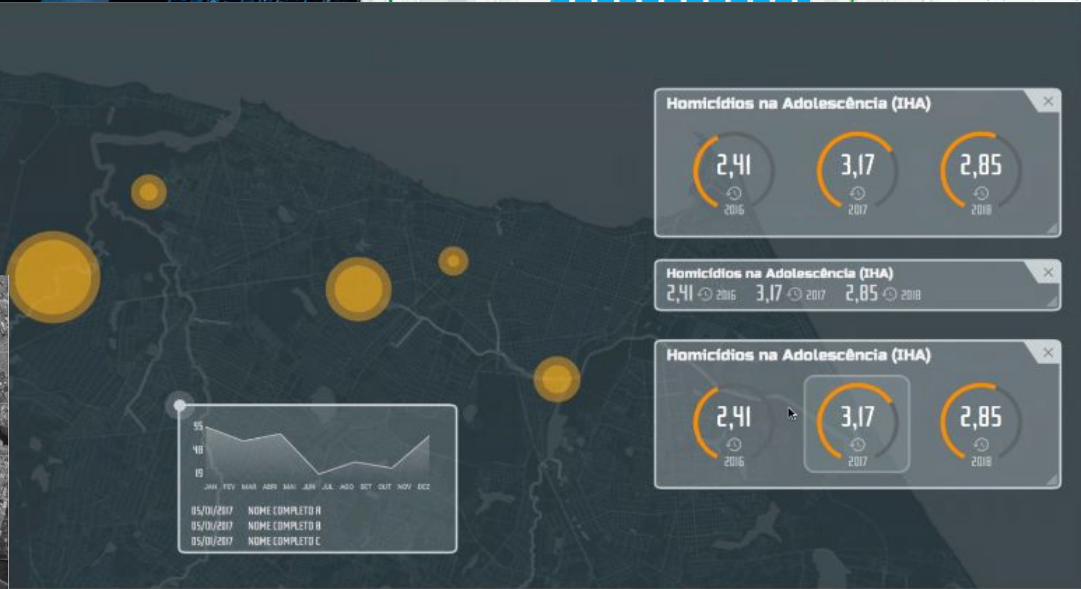
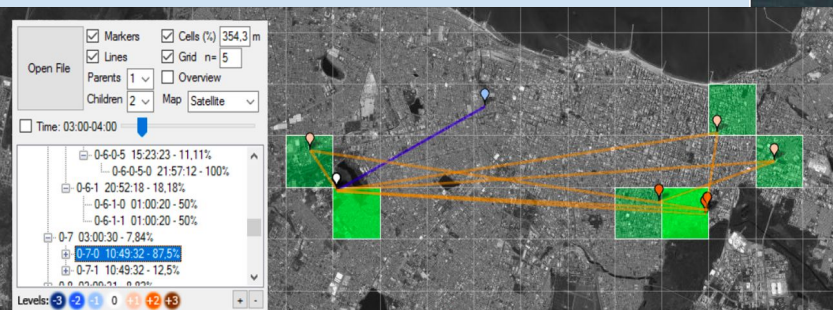


SEMANTIC SEARCH API





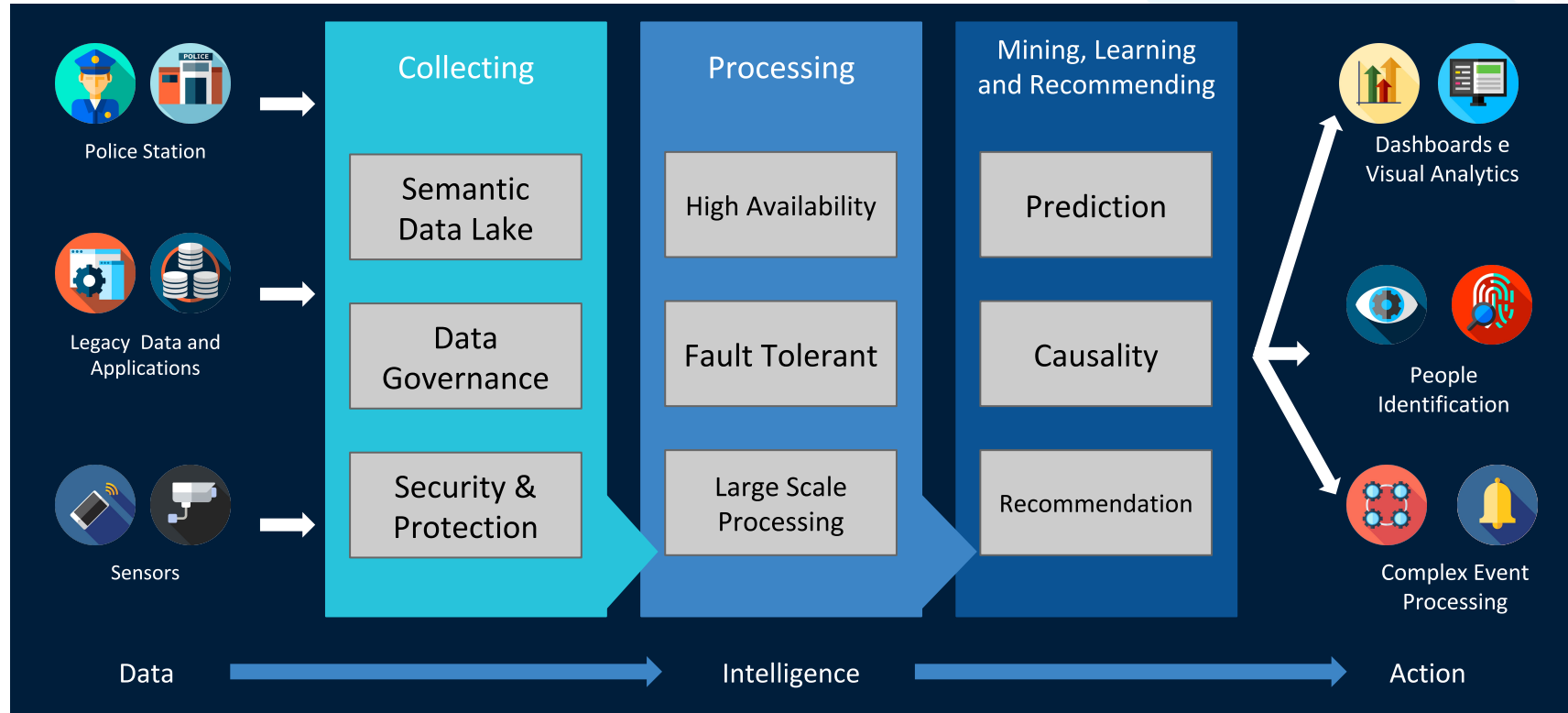
Scientific Intelligence for Public Security

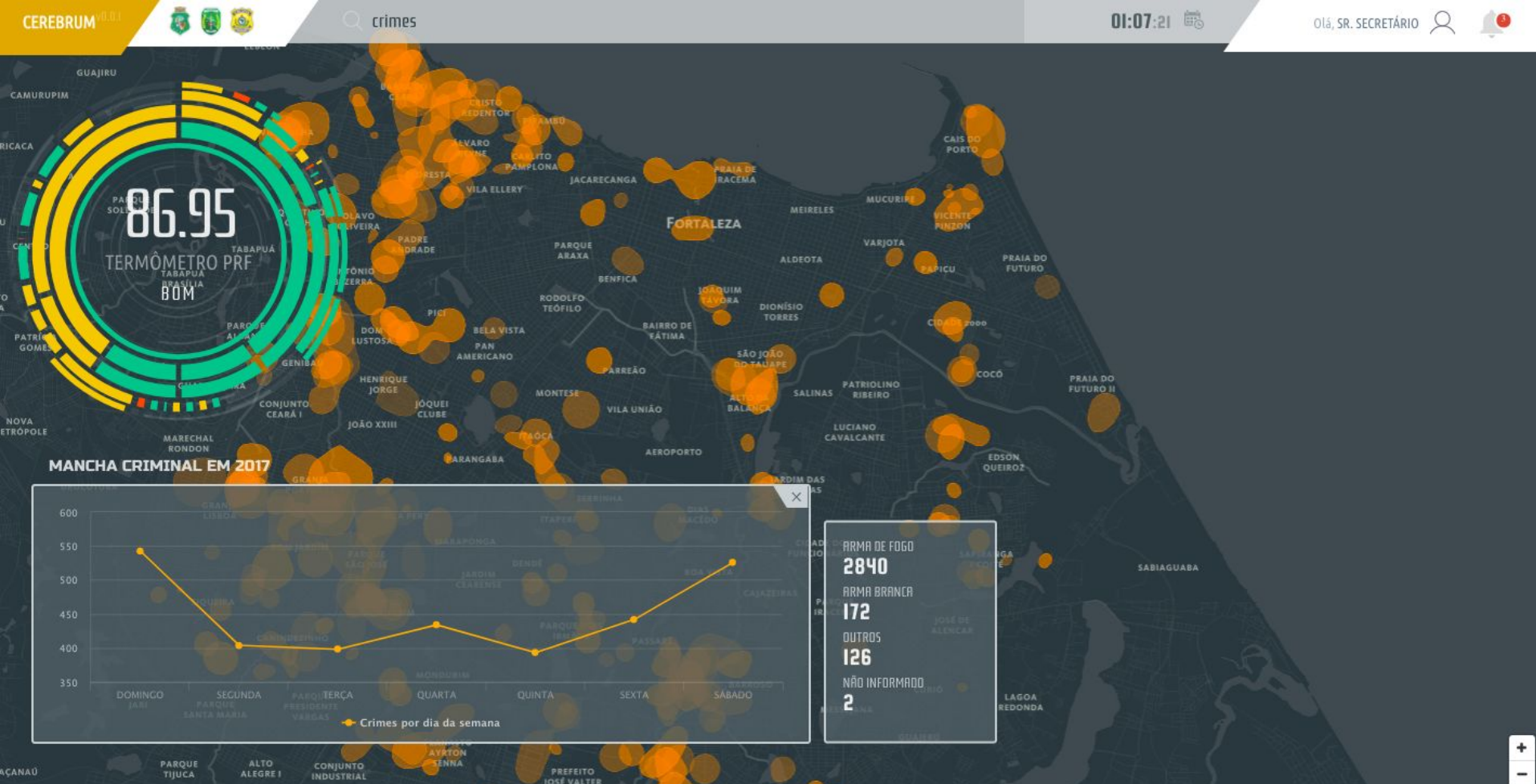


Challenges

- Big Data Platform for Public Security
- Moving Objects Real Time Monitoring
- Moving Objects Identification
- Criminal Network Discovery
- Visual Analytics supporting Security Strategy

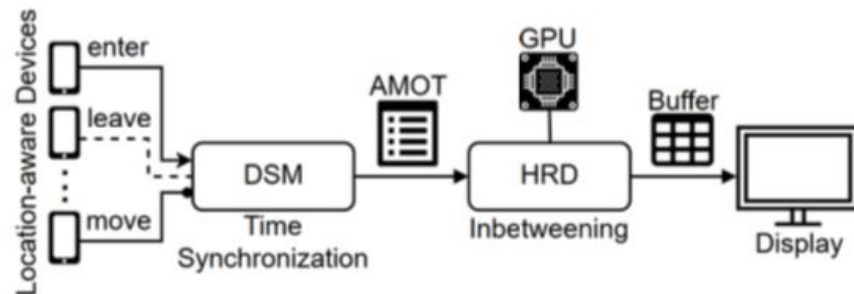
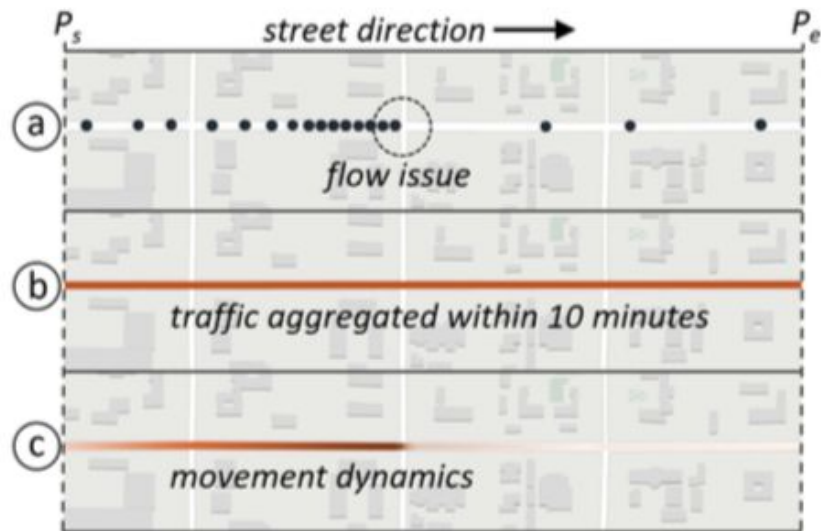
Big Data Platform for Public Security



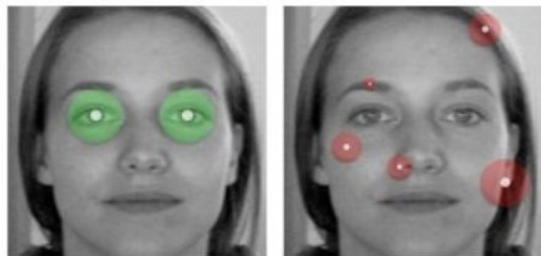
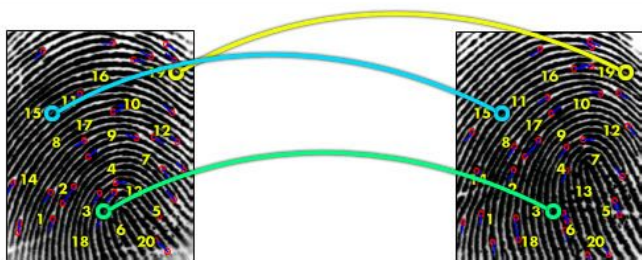


VISUAL ANALYTICS FOR PUBLIC SECURITY

Moving Objects Real Time Monitoring



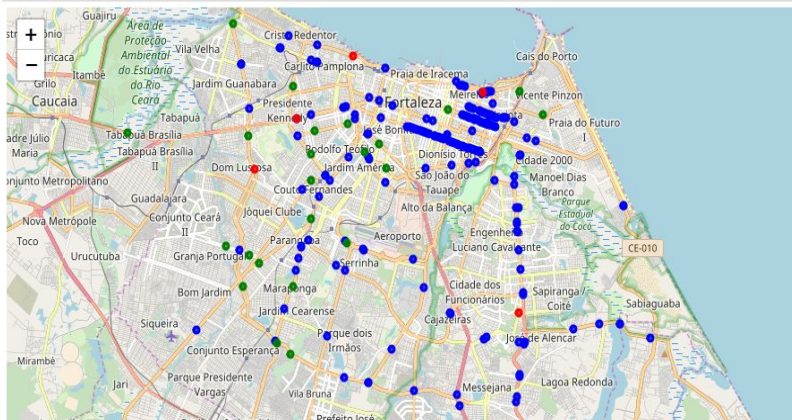
Real-time discovery of hot routes on trajectory data streams using interactive visualization based on GPU - Computers & Graphics 2018



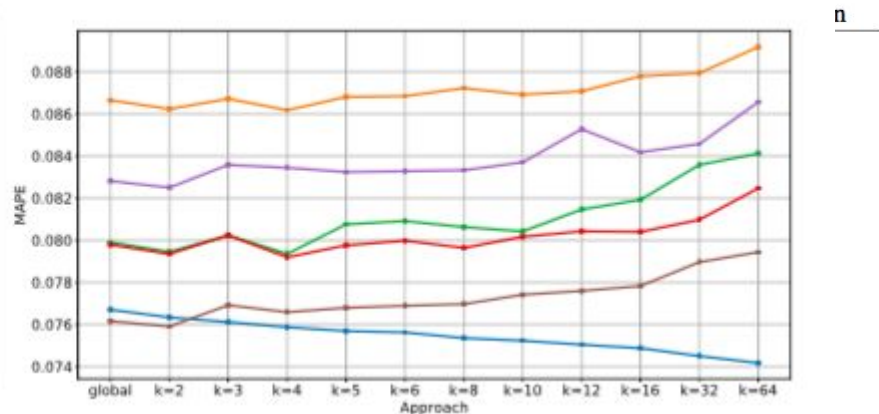
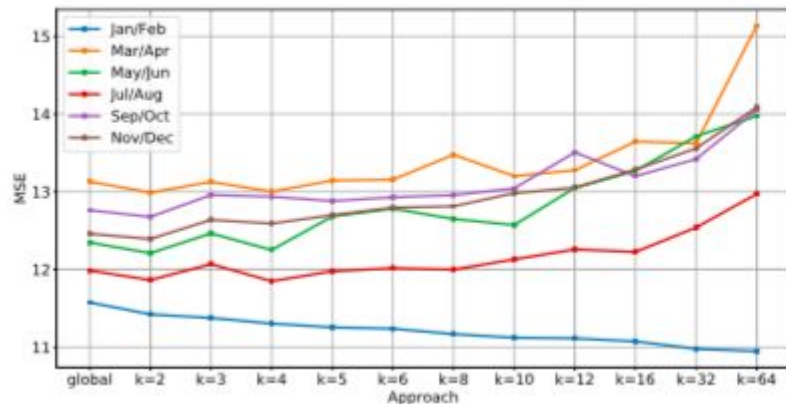
MOVING OBJECTS IDENTIFICATION

In [20]: `compane_dates(sensors, '12/17', '01/18')`

Out[20]:

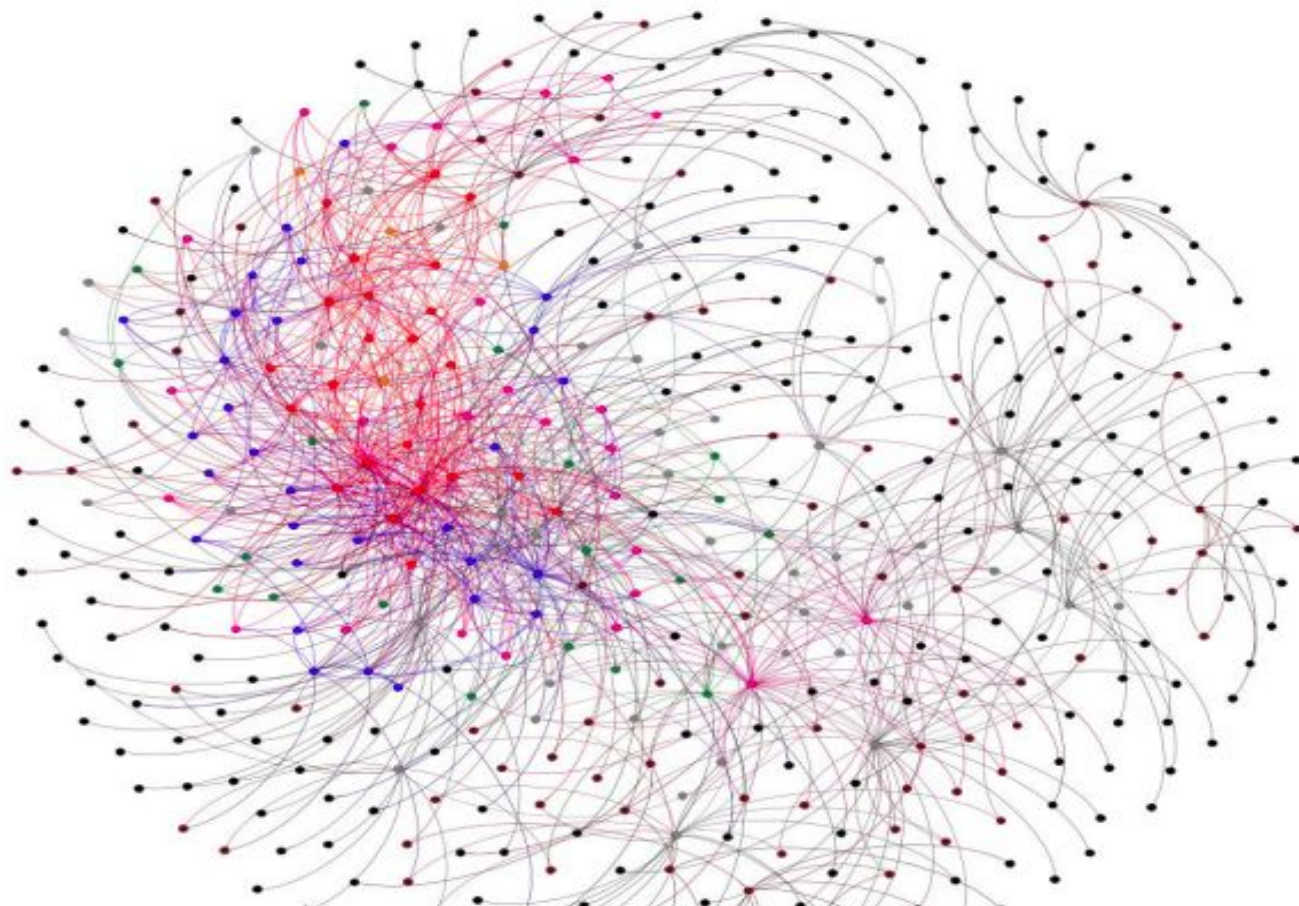


Group of Features	Acronym	Feature Name
(i) Sensor	n_lanes	Sensor number of lanes
	speed_limit	Speed limit
(ii) Time reference	day_of_week	Day of week
	slot_of_day	Slot of day
	working_day	Working day
(iii) 5 min last time slot (ts_{ref})	v_count5	Number of vehicles
	min5	Minimum speed
	max5	Maximum speed
	avg5	Average speed
	std5	Standard Deviation
(iv) 30 min last time slot (ts_{30})	v_count30	Number of vehicles
	min30	Minimum speed
	max30	Maximum speed

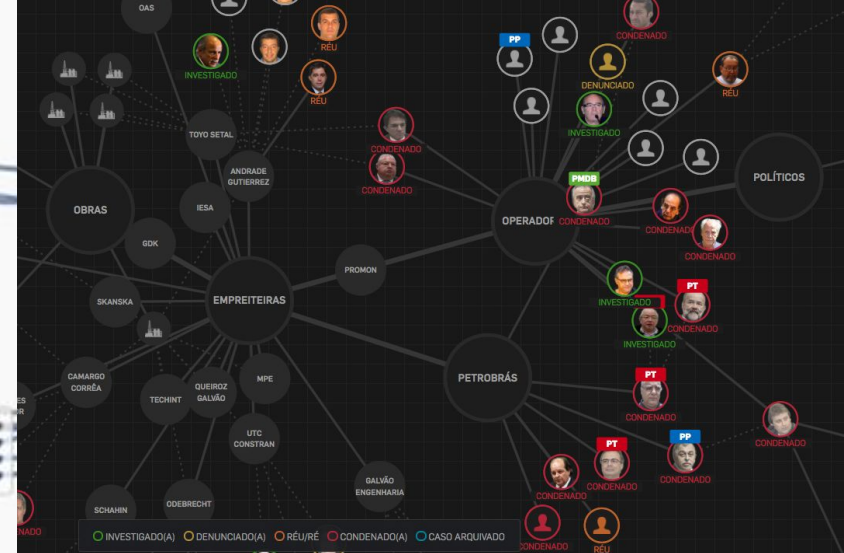
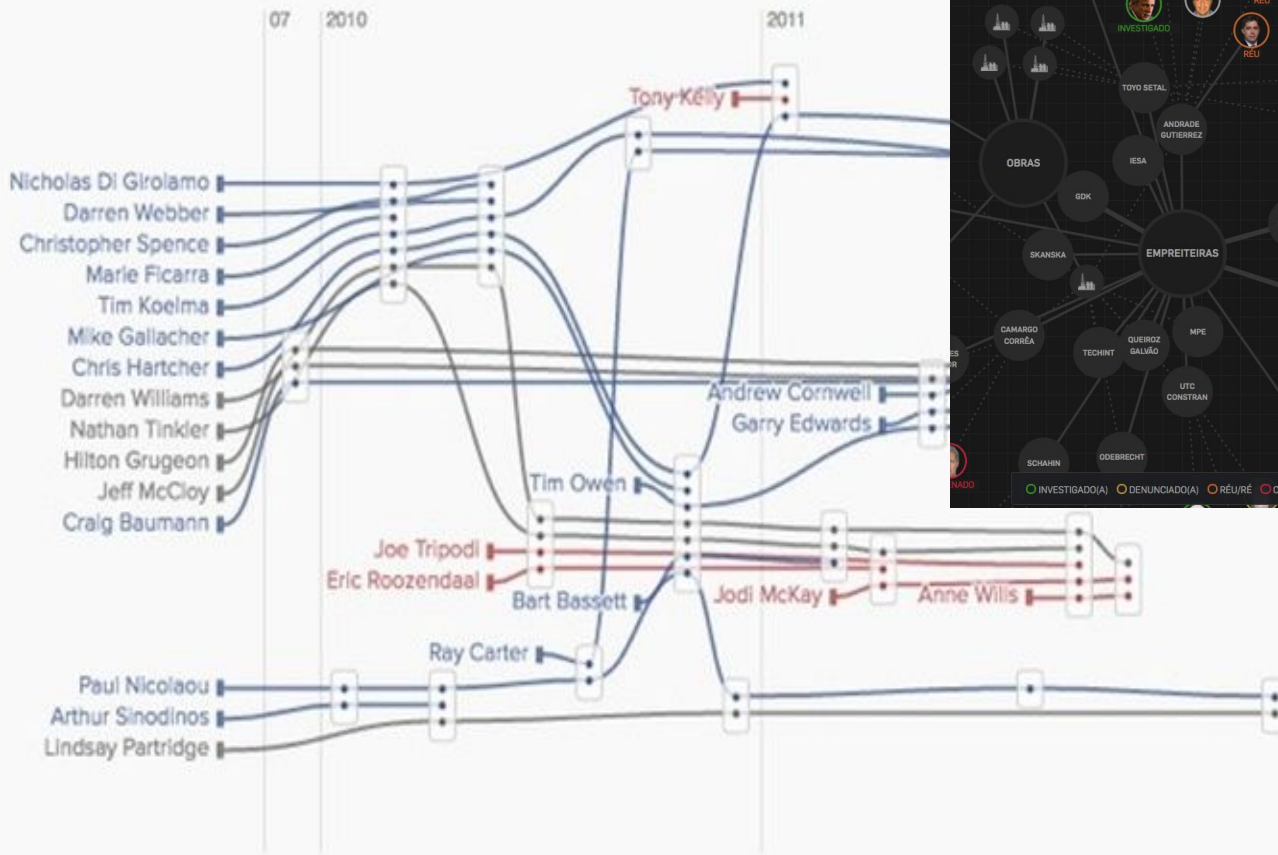


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Predicting Average Speed in the next 30 minutes

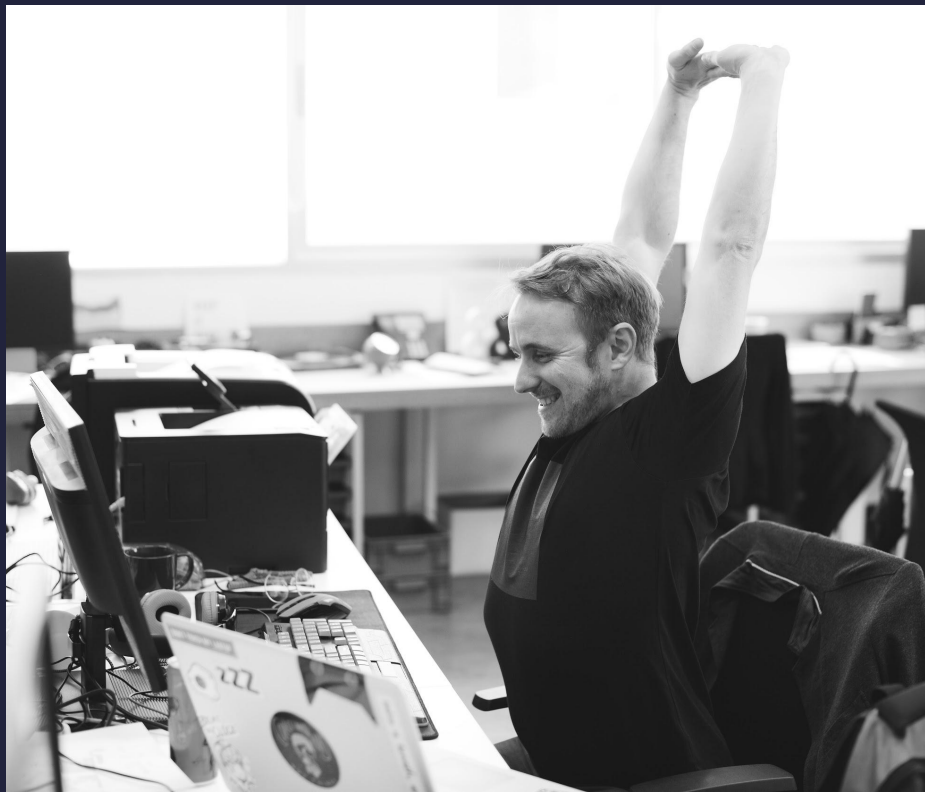


CRIMINAL NETWORK DISCOVERY



NEXT
JUNCTION

NARRATIVE NETWORKS



Many Thanks!

jose.macedo@dc.ufc.br