MIT Computational Law

Smart law and Compliance Technologies in the Data Supply Chain

David Restrepo Amariles, Associate Professor of Data Law and AI, HEC Paris

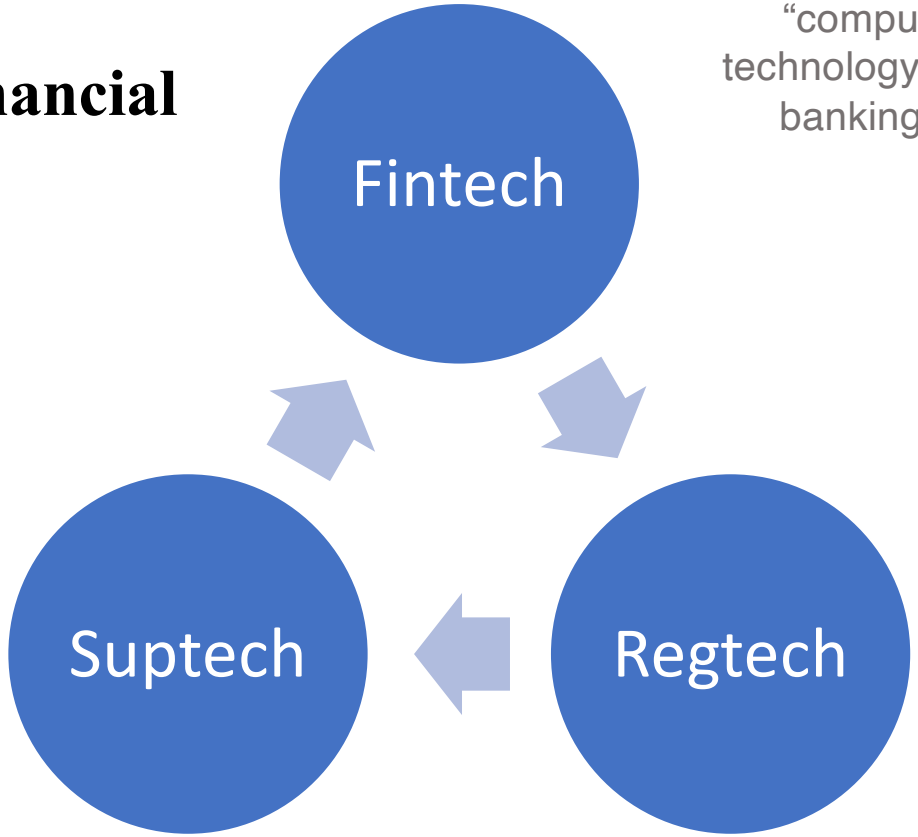
Friday, 8 January 2020

SMART LAW

SCIENTIFIC, MATHEMATICAL, RISK AND TECHNOLOGY-DRIVEN LAW

David Restrepo-Amariles and Gregory Lewkowicz, Unpacking Smart Law: How Mathematics and Algorithms are Reshaping the Legal Code in the Financial Sector, Lex Electronica, Vol. 25, n° 3 (2020), pp 171-185. Available in SSRN

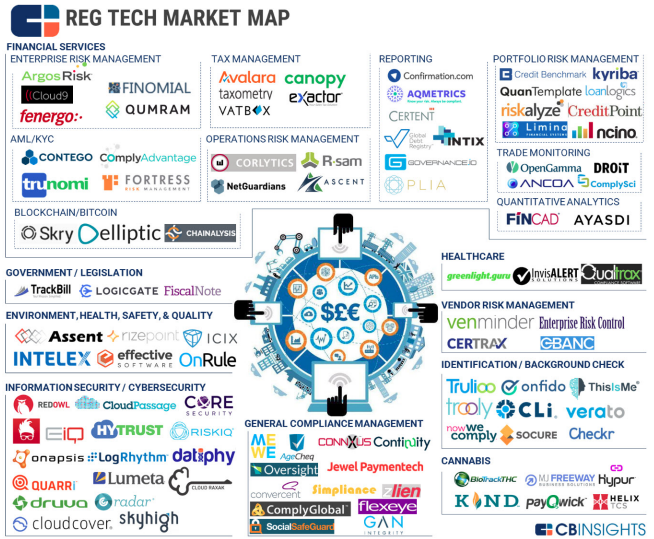
The Cycle of Financial Law



"computer programs and other technology used to support or enable banking and financial services"

"SupTech is essentially the other side of the same coin – applying technology to enhance the way MAS carries out its financial supervision functions."

-Monetary Authority of Singapore

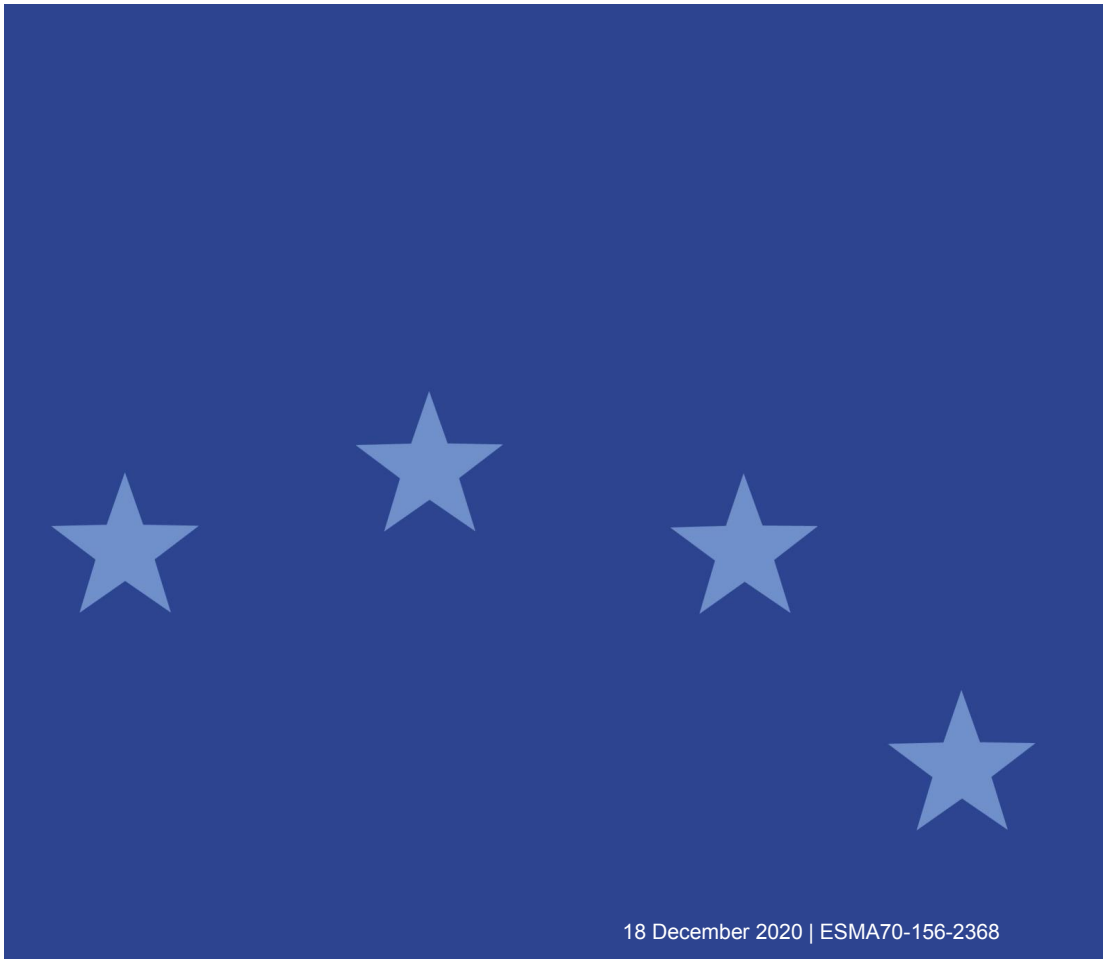


esma European Securities and Markets Authority

Consultation Paper

MiFID II/MiFIR review report on Algorithmic Trading

HEC PARIS



18 December 2020 | ESMA70-156-2368

Regulation on market abuse (*Article 16)*

1. Market operators and investment firms that operate a trading venue **shall establish and maintain effective arrangements, systems and procedures aimed at preventing and detecting insider dealing, market manipulation and attempted insider dealing and market manipulation**, in accordance with Articles 31 and 54 of Directive 2014/65/EU.

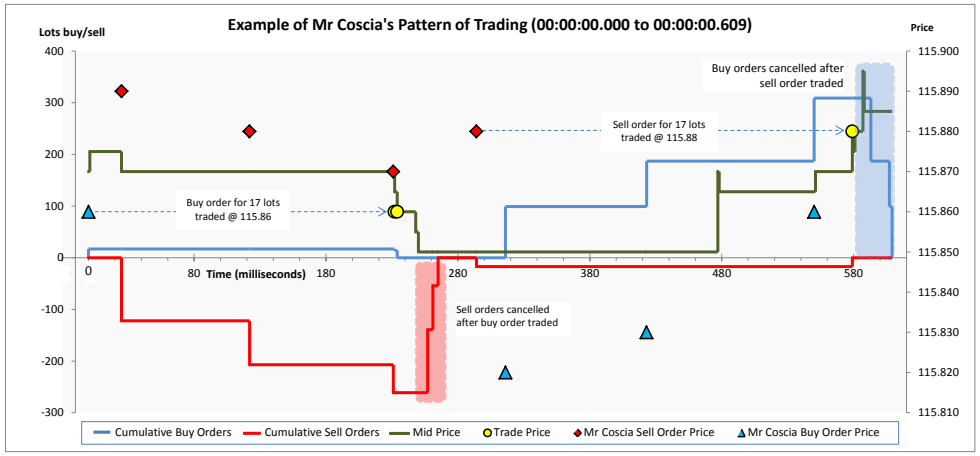
2. Any person professionally arranging or executing transactions **shall establish and maintain effective arrangements, systems and procedures to detect and report suspicious orders and transactions**.

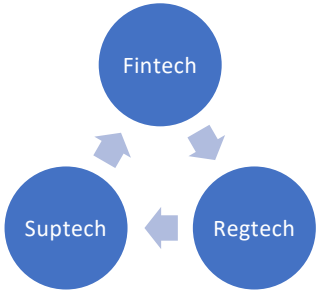
Article 10(1) of Regulatory Technical Standards (RTS 7)

Trading venues should require their members to certify that **the algorithms they deploy have been tested to avoid contributing to (or creating) disorderly trading conditions prior to the deployment** or substantial update of a trading algorithm or trading strategy and explain the means used for that testing.

Regulation on Markets in Financial Instruments, Mifid II art 17

An investment firm that engages in algorithmic trading shall have in place **effective systems and risk controls** … **to ensure the trading systems cannot be used for any purpose that is contrary to Regulation (…) or to the rules of a trading venue to which it is connected**.



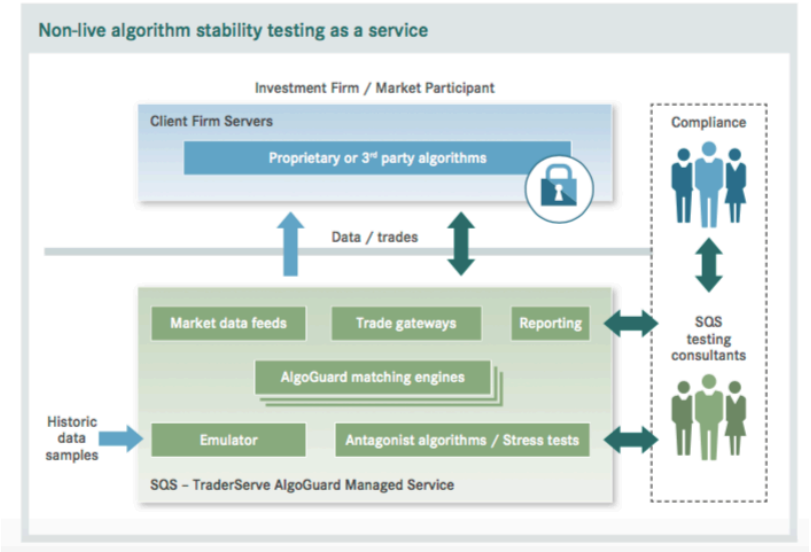


Technology for Regulators

The need to keep trading safe and maintain integrity throughout different jurisdictions is imperative. Nasdaq SMARTS Market Surveillance is the industry benchmark for real-time and T+1 solutions for market surveillance, supervision and compliance.

Powering Market Integrity on a Global Scale

In order to keep pace with sophisticated trading technology, and manipulation techniques being used to gain a trading advantage, regulatory authorities require the same level of sophisticated tools as trading professionals.



Lawyers - Theologians (16th C.)

Lawyers - Economists (models)

Lawyers - Engineers (Standards)

Lawyers - Managers (corporate rules)

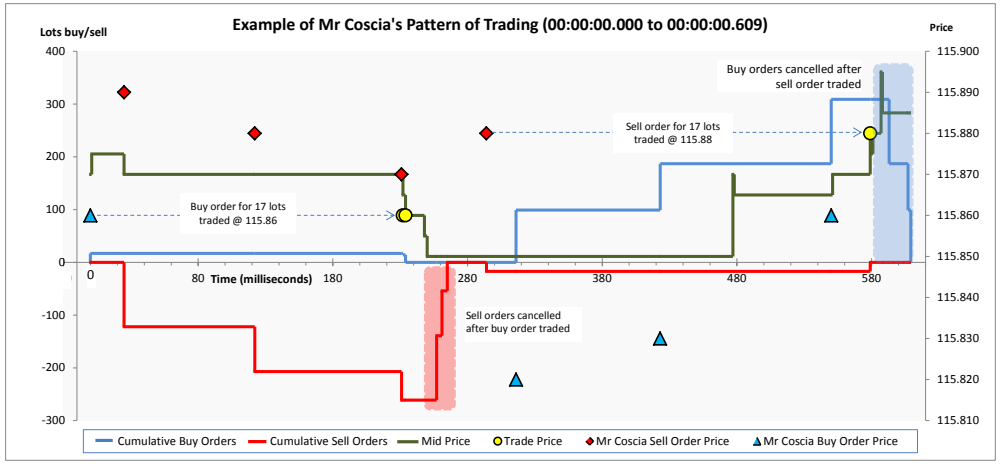
Lawyers - Computer Scientists (smart)

Implications

- The world (facts) is all that is recorded
- No always possible to define the Ought/Is distinction
- Sociological premise: The legal system must be effective in general vs. 100% compliance
- Law = what is enforced

"The life of the law is in its enforcement" R. Pound, The Limits of Effective Legal Action, International Journal of Ethics, Vol. 27, No. 2, 1917, p. 167.

- Legal Instrumentalism: Means to an End (social goals) v. Optimization



Field Science

LEGAL SCIENCE

Laboratory Science

Case Difficulty

- Compute a ‘’*Difficulty*” value which enables to provide a more loyal information about the quality/performance of the services of a lawyer in court
- Discover some cases type/communities and compute the win/lose among these communities
- Use the article cited to group the case together

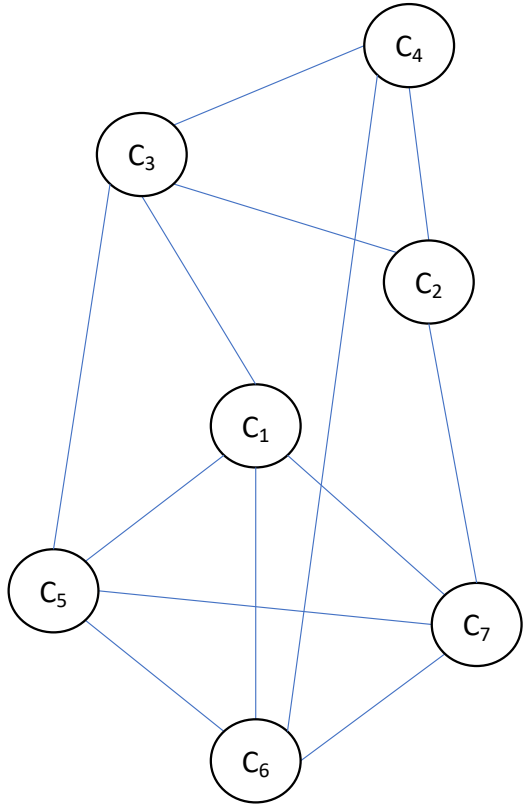
Case Graph

- Representing every cases in a graph where:
  - Case c_1 and case c_2 has an edge if they cite at least *k* same articles
  - Formally, $G_c(N,E,k)$ is graph where the Node set *N* and the edge set *E* are defined as follow:

Case Graph

- Representing every cases in a graph where:
  - Case c_1 and case c_2 has an edge if they cite at least *k* same articles
  - Formally, $G_c(N,E,k)$ is graph where the Node set *N* and the edge set *E* are defined as follow:

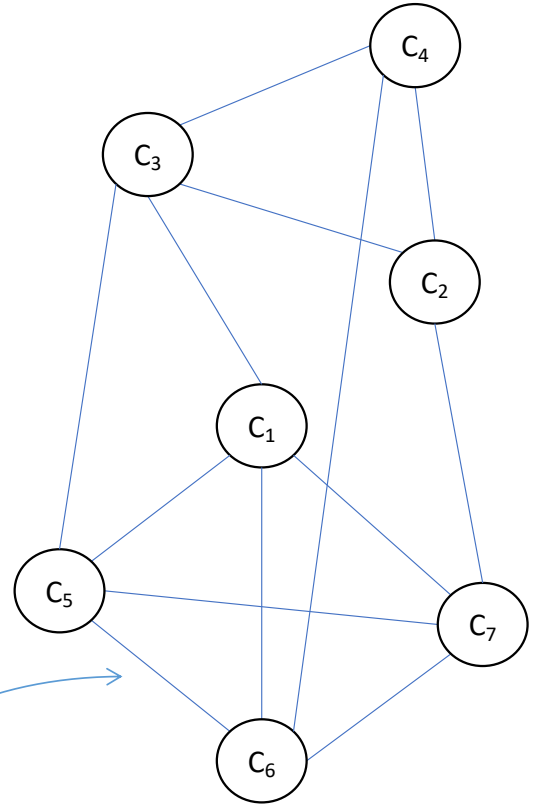
G_c for k = 3:



Case Graph

- Representing every cases in a graph where:
  - Case c_1 and case c_2 has an edge if they cite at least *k* same articles
  - Formally, $G_c(N,E,k)$ is graph where the Node set *N* and the edge set *E* are defined as follow:

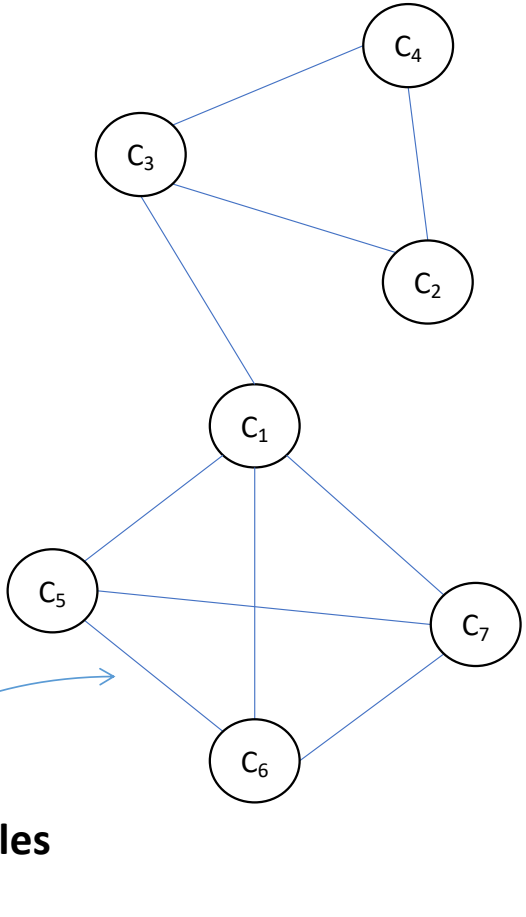
G_c for k = 3:



Case Graph

- Representing every cases in a graph where:
  - Case c_1 and case c_2 has an edge if they cite at least *k* same articles
  - Formally, $G_c(N,E,k)$ is graph where the Node set *N* and the edge set *E* are defined as follow:

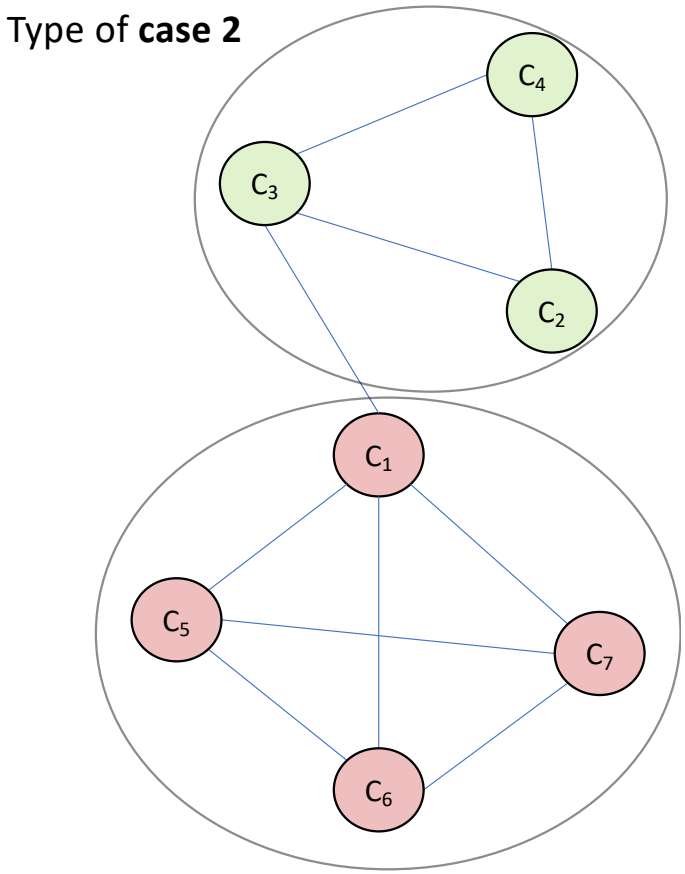
G_c for **k = 5**:



Case Graph

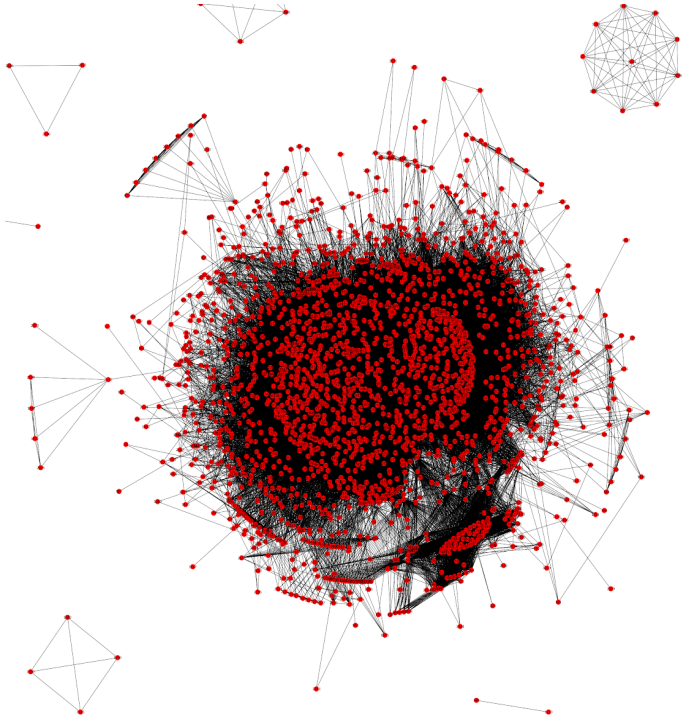
- Representing every cases in a graph where:
  - Case c_1 and case c_2 has an edge if they cite at least *k* same articles
  - Formally, $G_c(N,E,k)$ is graph where the Node set *N* and the edge set *E* are defined as follow:

G_c for **k = 5**:



Example on Cour d'Appel de Paris

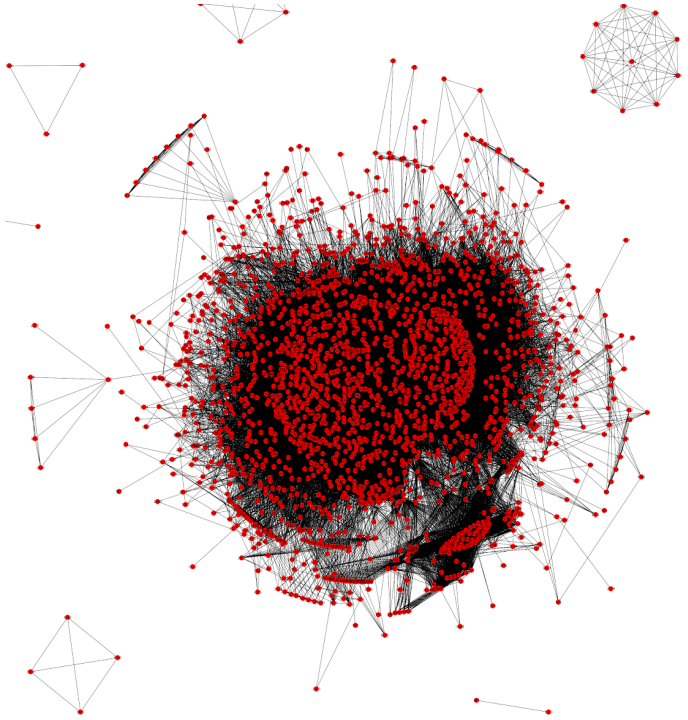
- For the 3 last months of 2018 (5500 cases):



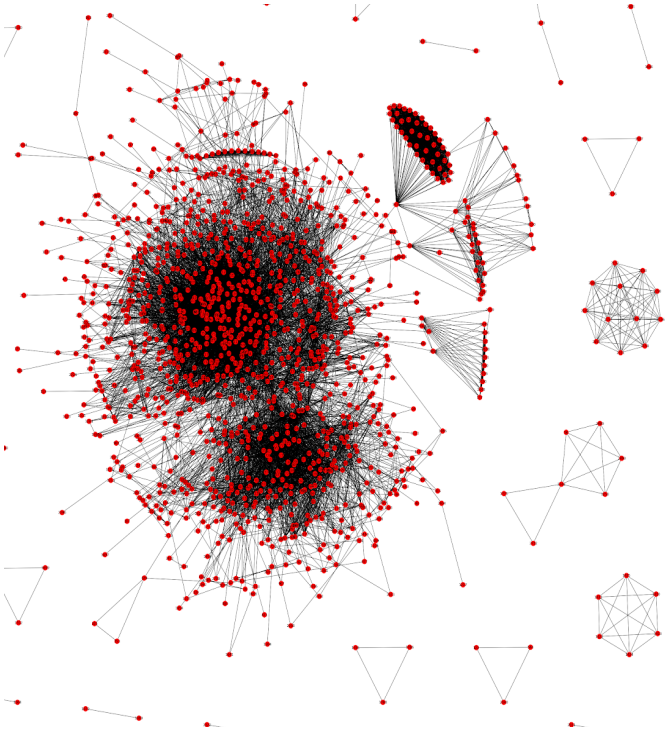
k=2 (80K edges, 1000 nodes)

Example on Cour d'Appel de Paris

- For the 3 last months of 2018 (1500 cases):



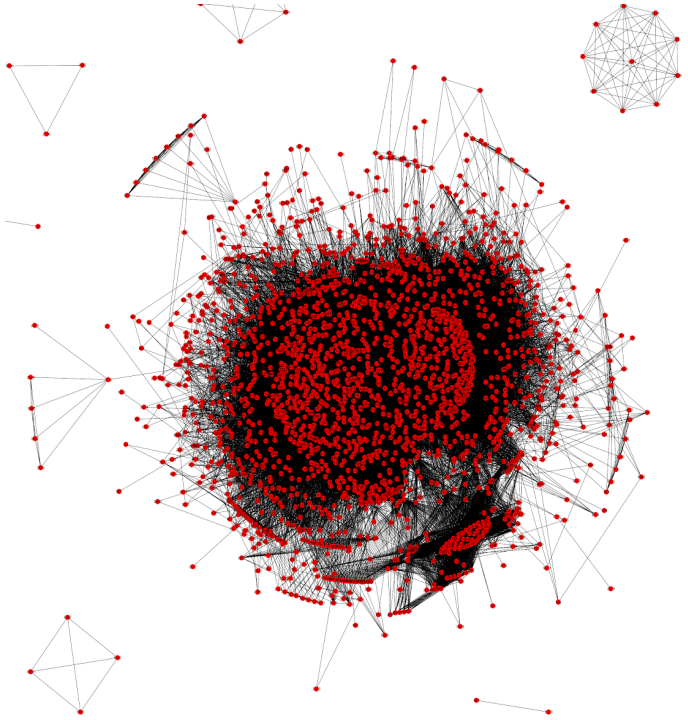
k=2 (80K edges, 1000 nodes)



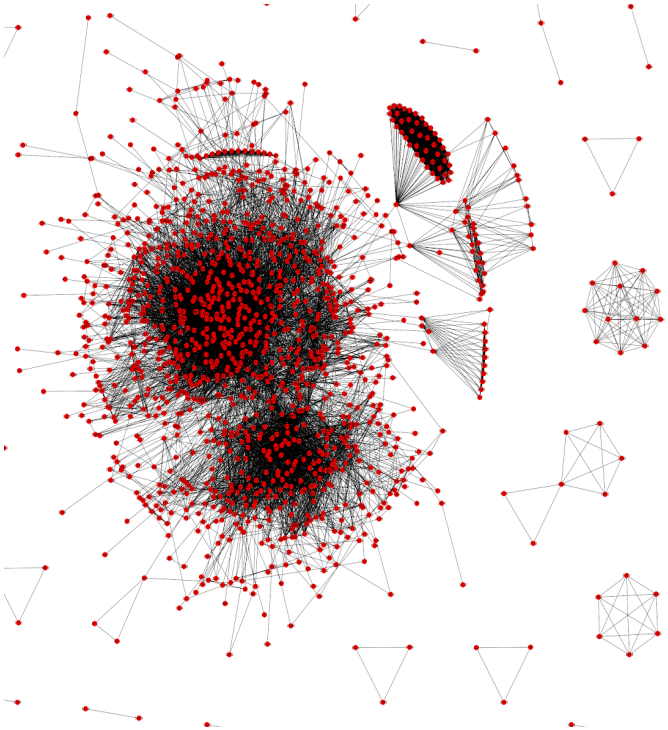
k=3 (20K edges, 600 nodes)

Example on Cour d'Appel de Paris

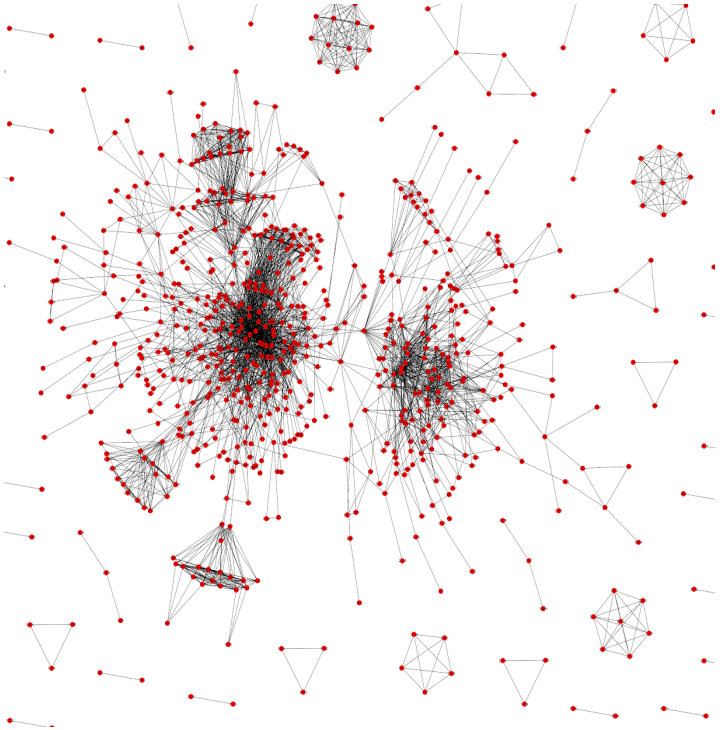
- For the 3 last months of 2018 (1500 cases):



k=2 (80K edges, 1000 nodes)



k=3 (20K edges, 600 nodes)

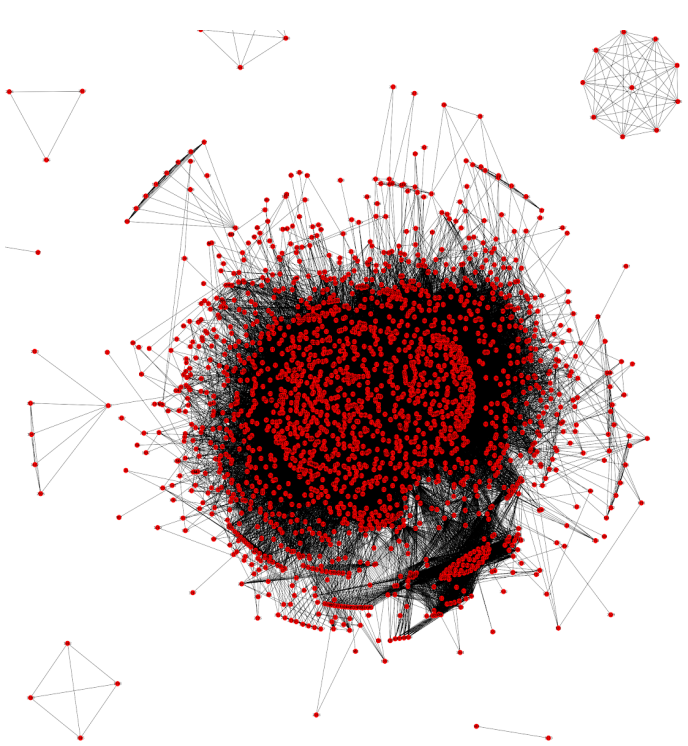


k=4 (5K edges, 400 nodes)

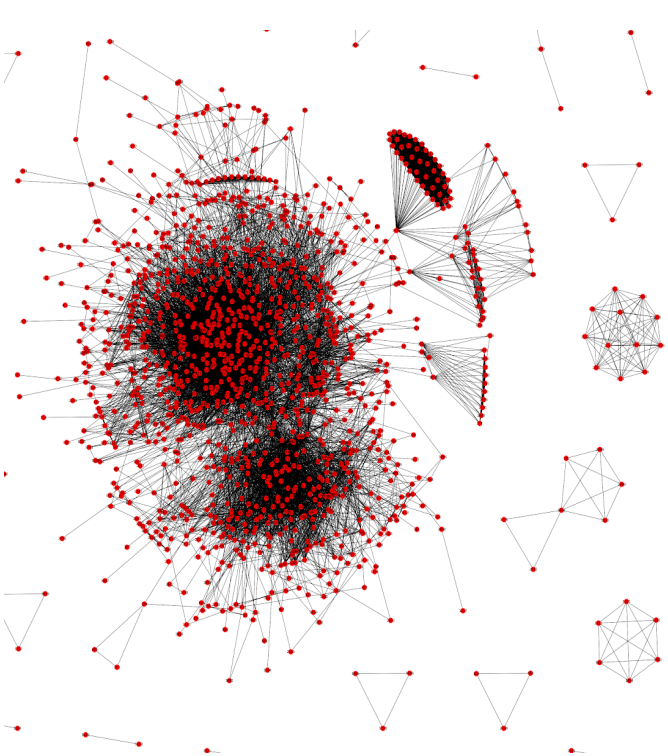
Example on Cour d'Appel de Paris

- For the 3 last months of 2018 (1500 cases):

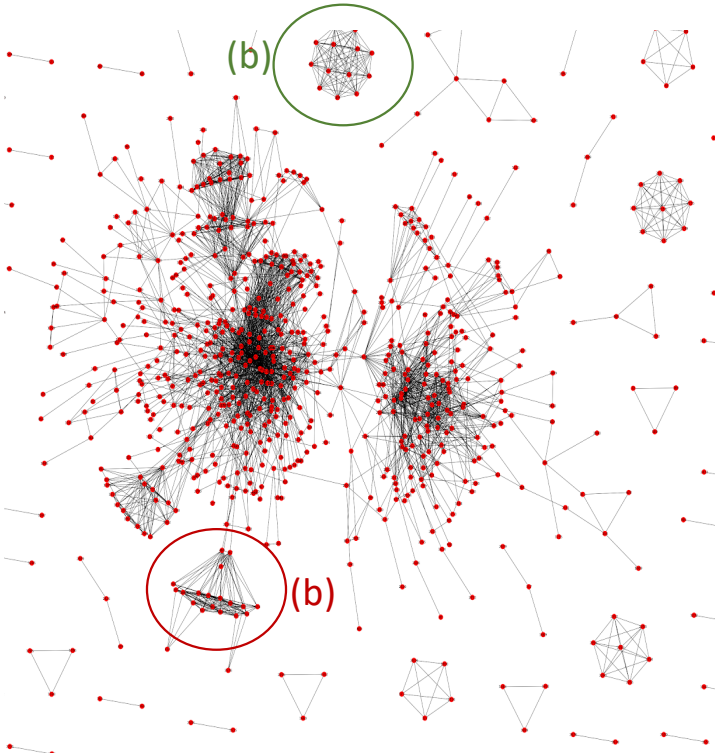
(a): Airbnb long term renting
(b): Holidays not given by SNCF



k=2 (80K edges, 1000 nodes)



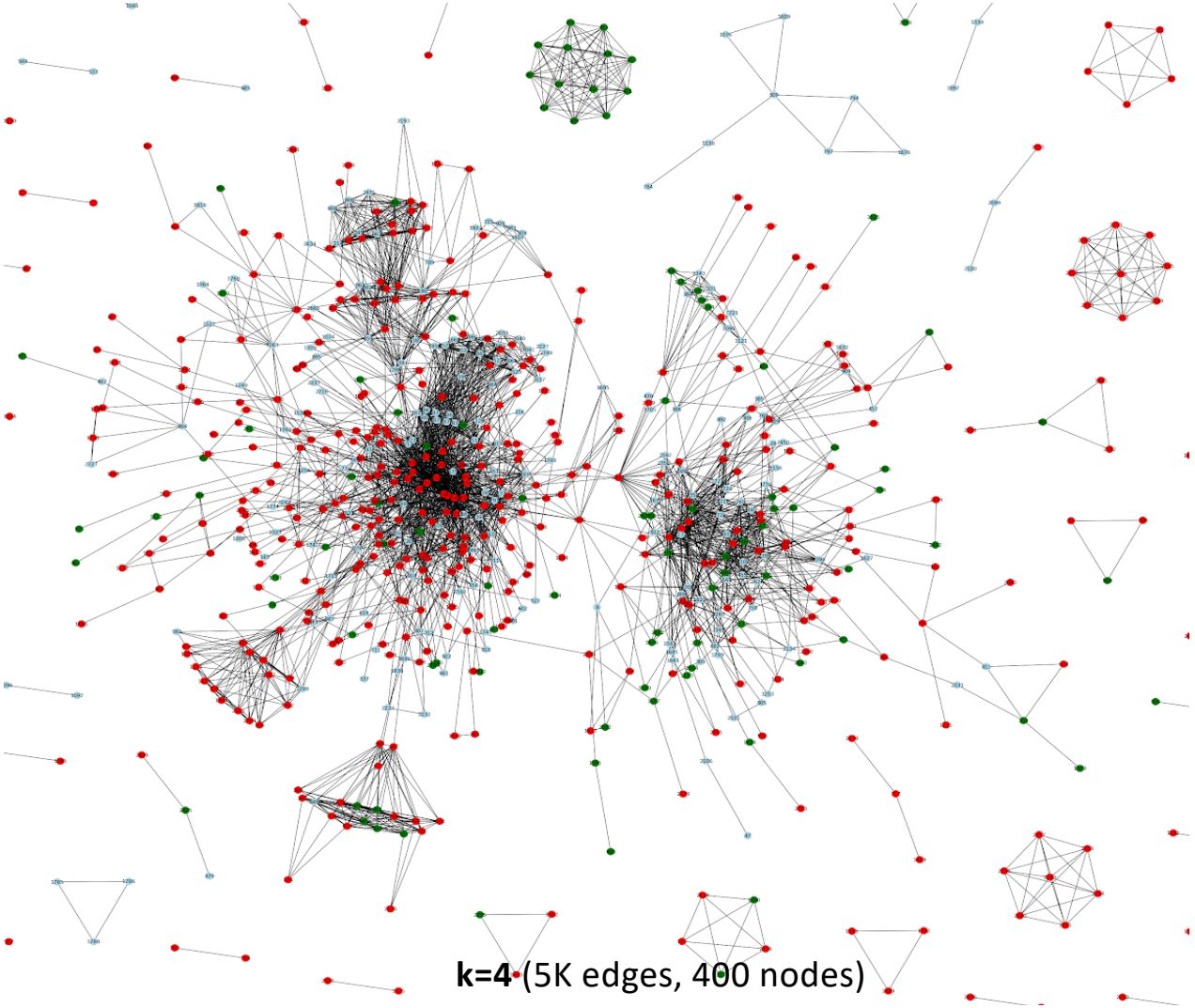
k=3 (20K edges, 600 nodes)



k=4 (5K edges, 400 nodes)

Example on Cour d'Appel de Paris

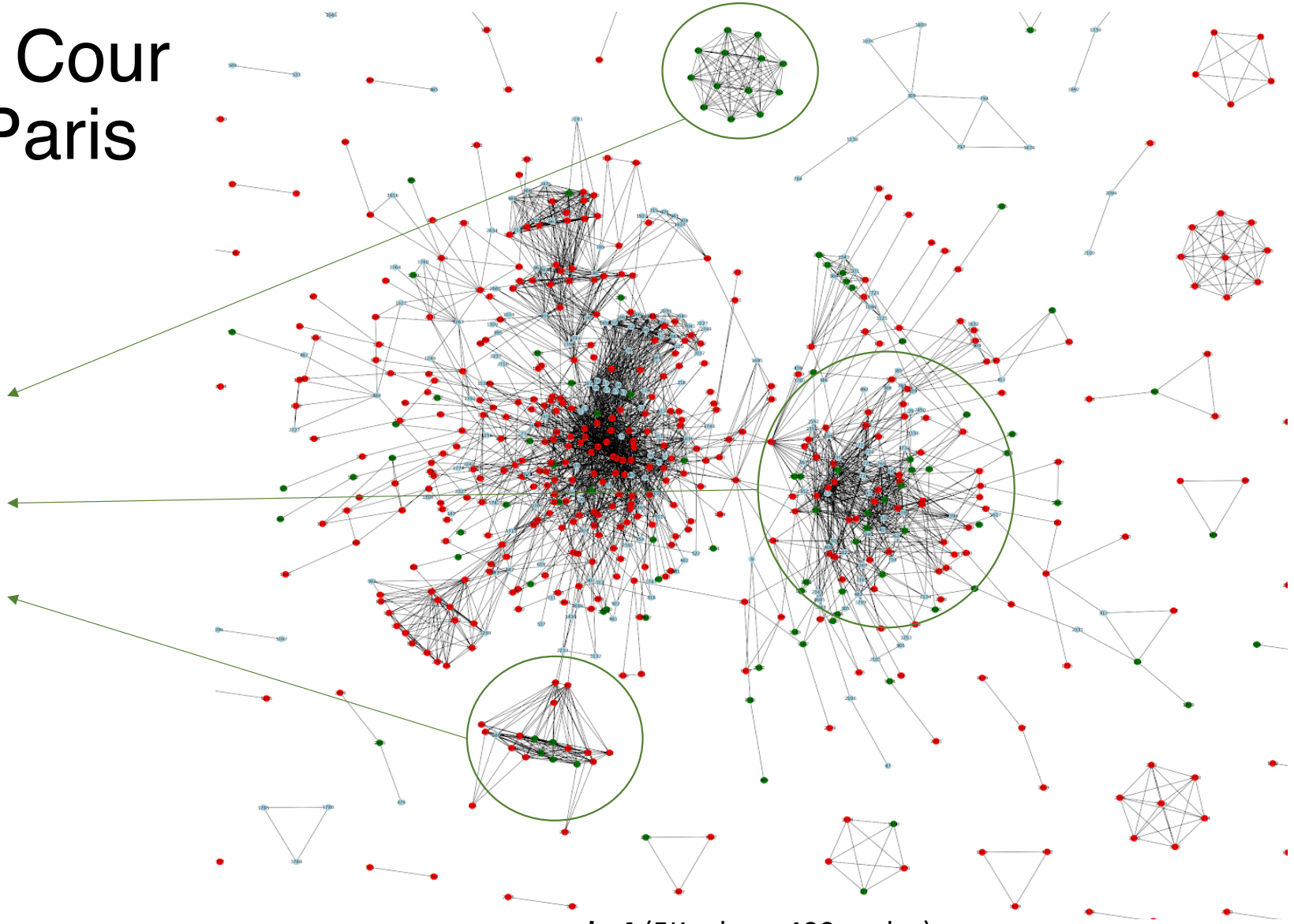
Green: Claimant wins
Red: Defendant wins
Blue: unknown



k=4 (5K edges, 400 nodes)

Example on Cour d'Appel de Paris

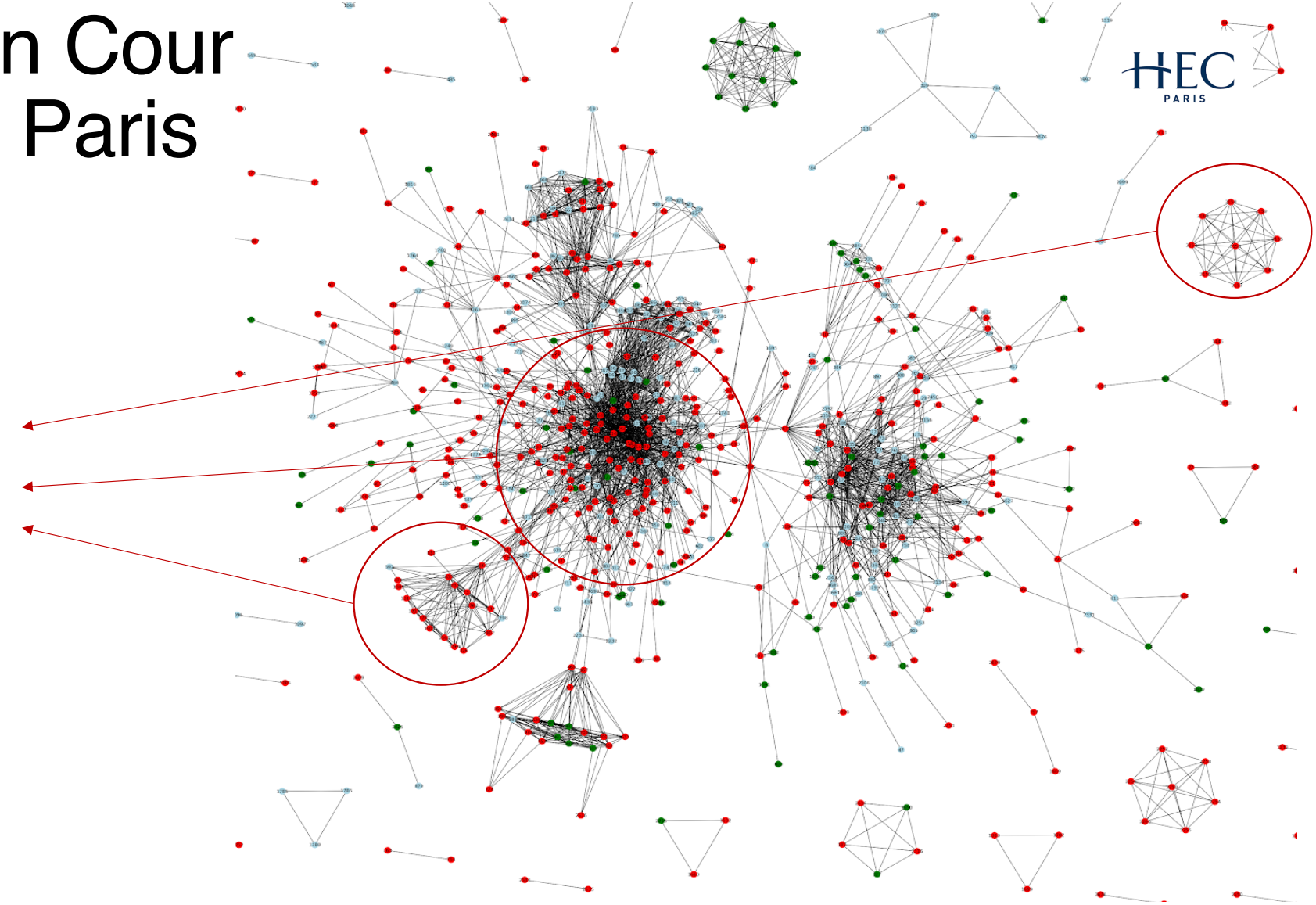
Communities with High/medium **winning** rate



k=4 (5K edges, 400 nodes)

Example on Cour d'Appel de Paris

Communities with High **losing** rate



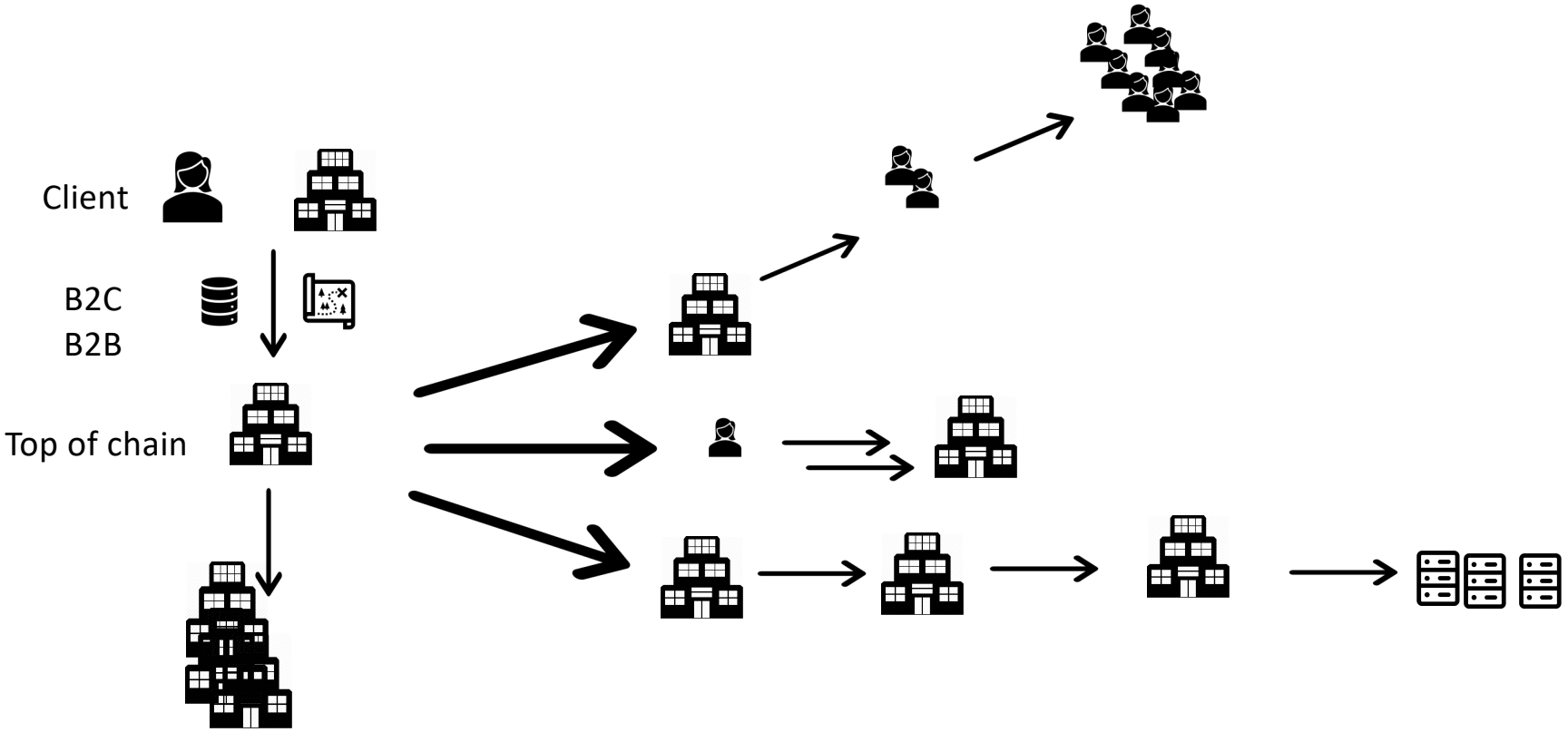
k=4 (5K edges, 400 nodes)

Data Supply chain - Problem Statement

Individuals' right to data protection may lack effectiveness if it is not possible to monitor and hold processors accountable for the data flows in the supply chain

Article 28 of the GDPR establishes that all processing conducted by processors or sub-processors shall be governed by a contract. Those processors and sub-processors shall process personal data only on documented instructions from the controller.
Therefore, it is mandatory for a data processor to properly collect the processing instructions from its Clients and cascade the obligations and those instructions to suppliers and partners participating in the chain of personal data processing. Instructions are documented using any written form, and a record of instructions should be saved.

Chains of contracts - Data Supply chain



General Challenges in Chains of Contracts

I) Heterogeneity of contractual artefacts

Contract cycle : information, negotiation, pre-contractual, agreement(deal), execution, dispute resolution

Types of documents

- Request Information
- Pre-contractual documents (NDA)
- Main contract/ contract amendments
- Data Protection documentation
- Privacy policies
- Due diligence
- Processing instructions
- Processing audits
- Data Protection Impact Assessment

Formats

- PDF, s
- Spreadsheets, emails
- Letters
- word docs
- scans,
- zip files
- audio
- etc.

Follow-up execution

- Receiving instructions
- Executing
- cascading auditing execution

General Challenges in Chains of Contracts

I) Movement towards societal to total compliance system

- e.g. Corporate social responsibility

II) Companies are increasingly liable for violations in supply chains

- Accountability – incl. judicial e.g– CSR Kasky case/ but also contractual
- Increasing number of monitoring tools (e.g. labels, CSR Hub)
- Compliance in supply chain became priority (non-financial reporting)

III) Complexity of supply chain

- Transnational
- Compliance in supply chain became priority

Challenges: Data Protection in Supply Chains

I. Compliance aspects

- Large amounts of data flow through contractual supply chains
- Data protection regulations in supply chains,_ data controller/processor

See Art. 28 GDPR – Initial processor is liable for ensuring the compliance of all subcontractors in a supply chain with data protection rules

- However, in supply chains, it is difficult to detect and manage risk of non-compliance

II. Contract management aspects

- Database issues (centralization of data).
- Silos: Procurement, data protection teams, operational, etc.
- Multiple contract management software + general software

3 pillars of Privacy Compliance in Chains of Contracts

1. Coherence through chain of contracts
2. Compliance assessment with regulations
3. Auditing and verification of effective compliance

Compliance with GDPR: A review of current methods and technologies

Assessment of clarity and transparency

- Readability measures
- Automatic vagueness detection
- Automatic detection of missing information

Empowerment of data subjects

- Analysis of Opt-Out choices
- Automatic summarization
- Modeling GDPR rules

Approaches

Linear regression Naïve Bayes Classifier Support Vector Machines Decision Trees Random Forests Rule Based Methods Combination of Machine Learning and Rule Based approaches

CLAUDETTE

SPECIAL

Data Privacy Advisor
the answer company
THOMSON REUTERS

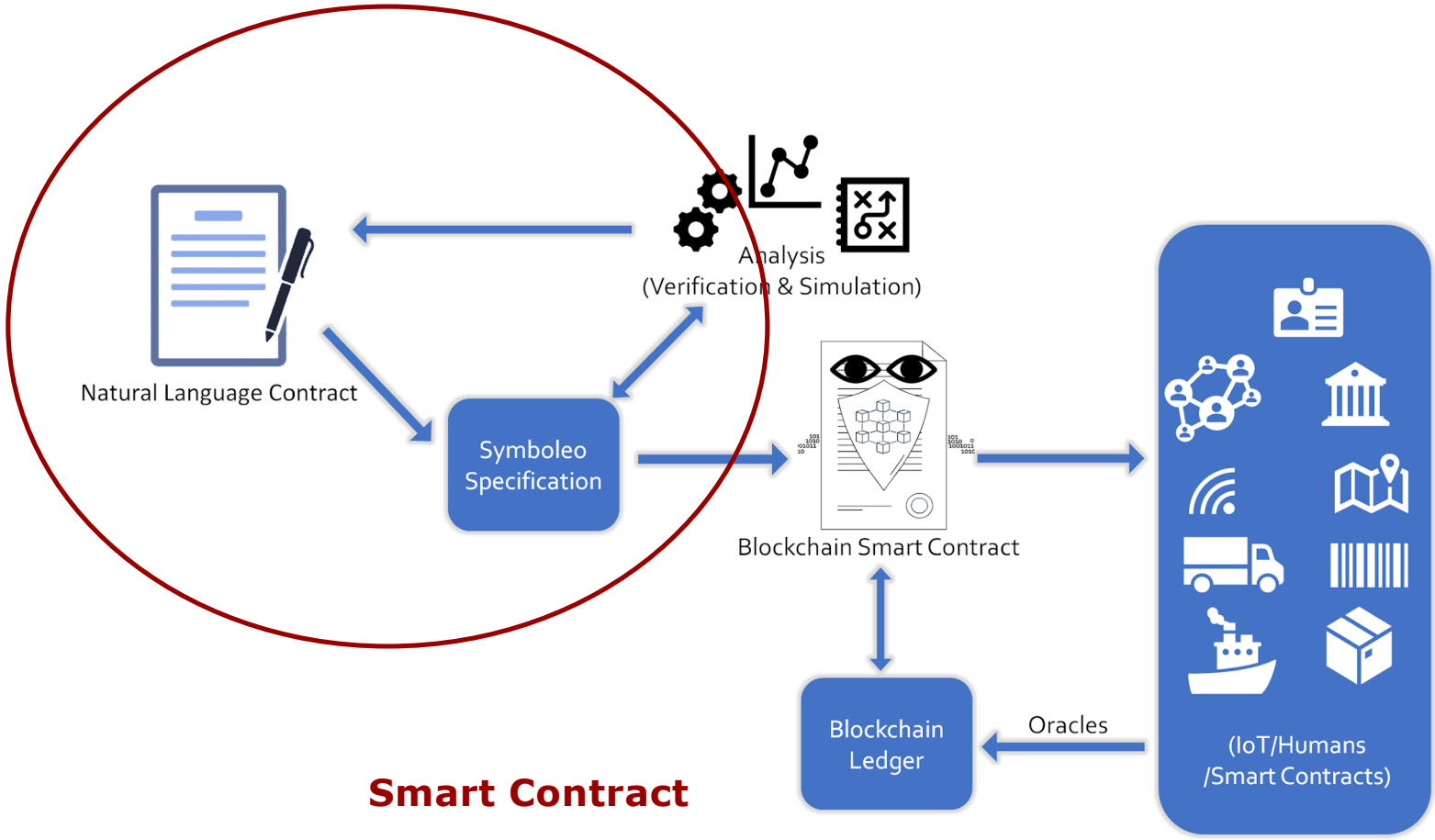
USABLE PRIVACY.ORG
the usable privacy policy project

David Restrepo Amariles, Aurore Clément Troussel, Rajaa El Hamdani, Compliance Generation for Privacy Documents under GDPR: A Roadmap for Implementing Automation and Machine Learning, arXiv:2012.12718

I. Coherence through chain of contracts

Use Smart contracts

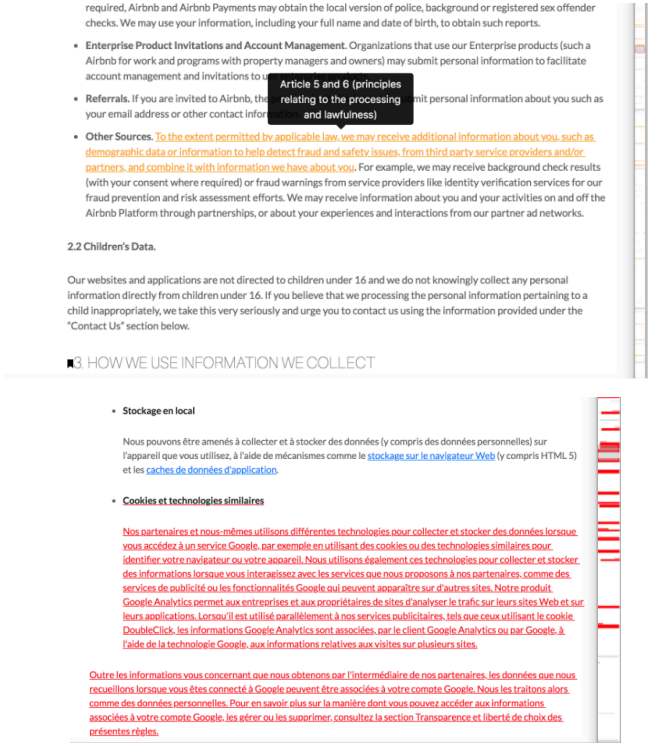
- Feasibility analysis (convert/not convert)
- Mixed solution
- Select a specification language
- Cross-match of documents: review individual use of documents
- Annotation based on domain ontology for contracts (graphs)
- Formalization of selected clauses with formalization language (Symboleo)
- Software development
- Implementation in company
- Auditing tools



Sepehr SHARIFI, Alireza PARVIZIMOSAED, Daniel AMYOT, Luigi LOGRIPPO et John MYLOPOULOS, "Symboleo: Towards a Specification Language for Smart Contracts" , (2020) *28th IEEE Int. Requirements Engineering Conf.*

Natural Language Processing for retrieval and populate smart contracts

Information retrieval to populate entities of smart contracts



Formalization of natural language contracts into smart contracts

Meat Purchase and Sale Agreement

Between Seller and Buyer

This agreement is entered into as of the date <*effDate*>, between <*party1*> as Seller with the address <*retAdd*>, and <*party2*> as Buyer with the address <*delAdd*>.

Terms and Conditions

1) **Payment & Delivery**
   - 1.1 Seller shall sell an amount of <*qnt*> meat with <*qlt*> quality ("goods") to the Buyer.
   - 1.2 Title in the Goods shall not pass on to the Buyer until payment of the amount owed has been made in full.
   - 1.3 The Seller shall deliver the Order in one delivery within <*delDueDateDays*> days to the Buyer at its warehouse.
   - 1.4 The Buyer shall pay <*amt*> ("amount") in <*curr*> ("currency") to the Seller before <*payDueDate*>.
   - 1.5 In the event of late payment of the amount owed due, the Buyer shall pay interests equal to <*intRate*>% of the amount owed, and the Seller may suspend performance of all of its obligations under the agreement until payment of amounts due has been received in full.
2) **Assignment**
   - 2.1 The rights and obligations are not assignable by Buyer.
3) **Termination**
   - 3.1 Any delay in delivery of the goods will not entitle the Buyer to terminate the Contract unless such delay exceeds 10 Days.
4) **Confidentiality**
   - 4.1 Both Seller and Buyer must keep the contents of this contract confidential during the execution of the contract and six months after the termination of the contract.

Example of formalization

Without prejudice to the Client's own obligation under Article 2.1(x) above, ***(affects interpretation, not the specification)***

X shall maintain a record of categories of processing activities carried out on behalf of Client regarding the Services provided under this Agreement.

Precondition	***Obligation***	***Creditor***	***Debtor***	***Asset***
-	Shall maintain a record	Client	X	Record of categories of processing activities

Such record shall contain, for the Client:

The categories of data processed, and processing activities carried out on behalf of Client

Where applicable, any international transfers of Personal Data;

Where possible, a general description of the technical and organizational security measures implemented.

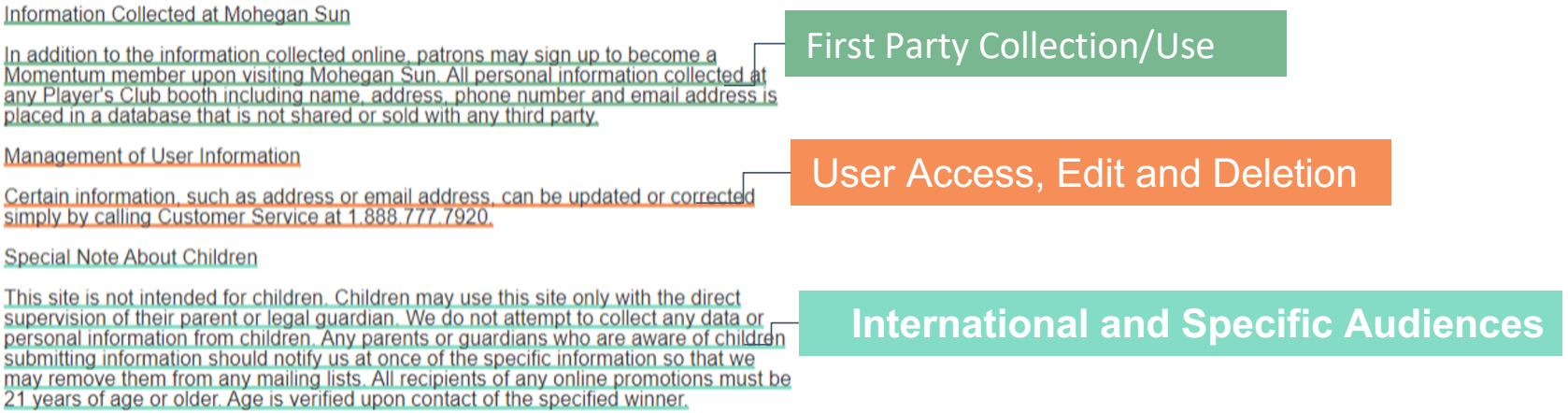
Asset	***Features***			
Record of categories of processing activities	Categories of data processed	Processing activities carried out on behalf of Client	any international transfers of Personal Data (if applicable)	a general description of the technical and and organizational security measures implemented (where possible)

2. Compliance assessment with regulations

NLP: Detection of high-risk data processing activities

Extraction of Data Processing Activities with Machine Learning

01



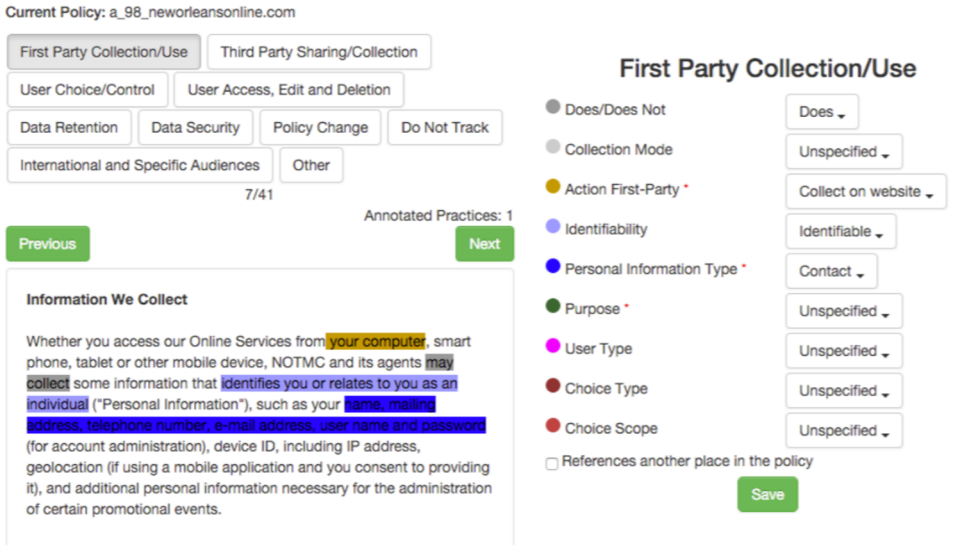
Compliance Assessment with regards to GDPR with a Rule Based System

02

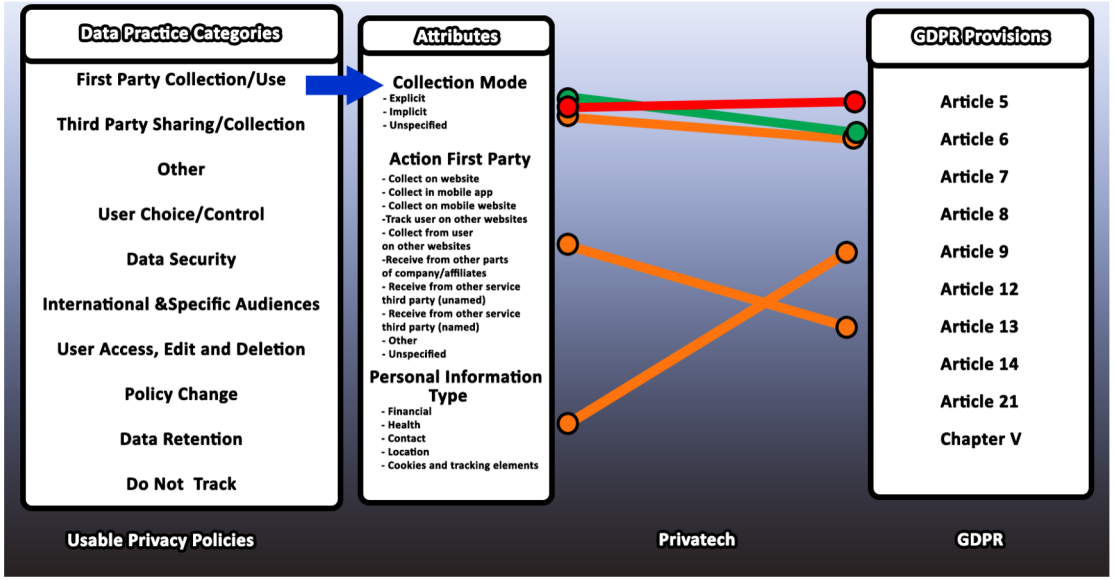
```
if (data_practice == "First Party Collection/Use" && personal_type_information == "Cookies and tracking elements" && purpose == "Advertising or marketing" && choice_type == "Unspecified") {
  gdpr_breach = true
}
```

Privatech prototype based on machine learning

01 Creation of an annotated corpus of privacy policies to train machine learning algorithms.



02 Legal interpretation of the categories and attributes with respect to GDPR in order to define rules which detect potential breaches

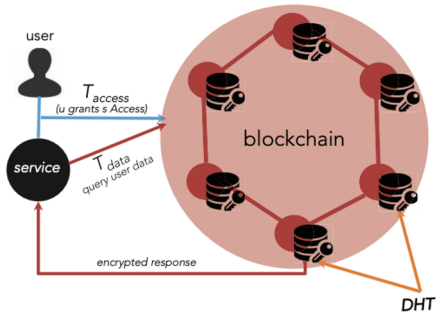


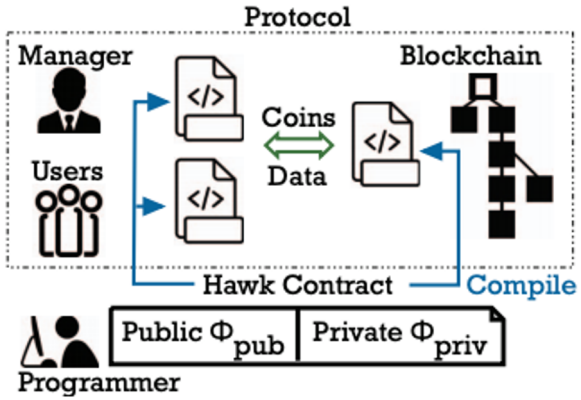
USABLE PRIVACY.ORG
the usable privacy policy project

3. Auditing and verification of effective compliance

In progress…

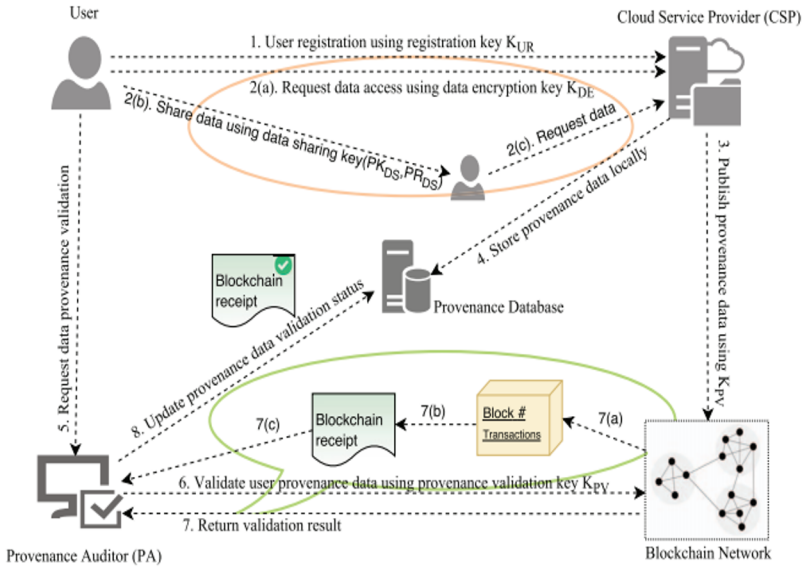
Decentralized Platform
Zyskind and Nathan (2015)



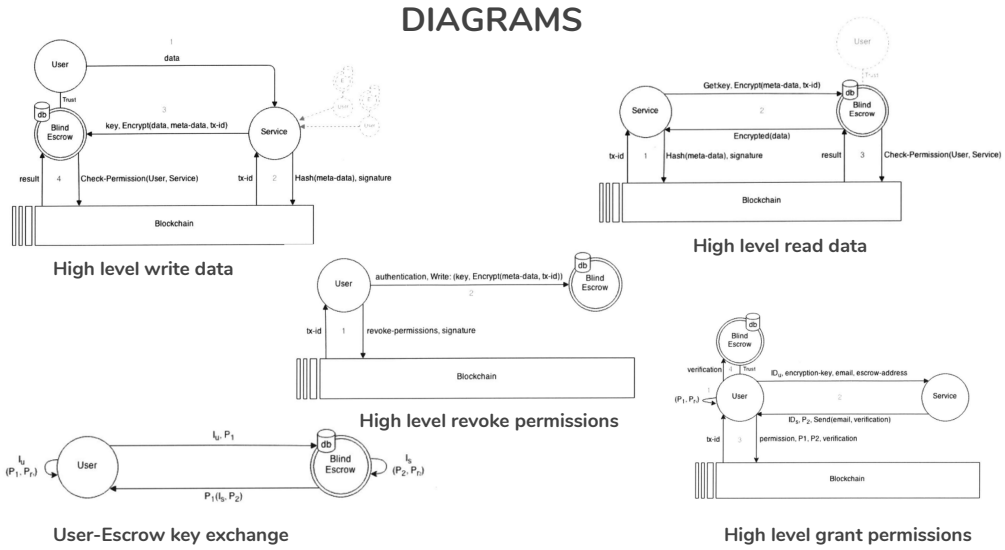


Hawk Model
Kosba et al. (2016)

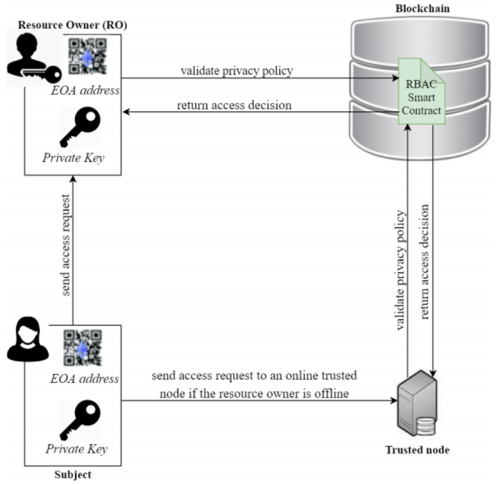
ProvChain Model
Ali et al. (2017)

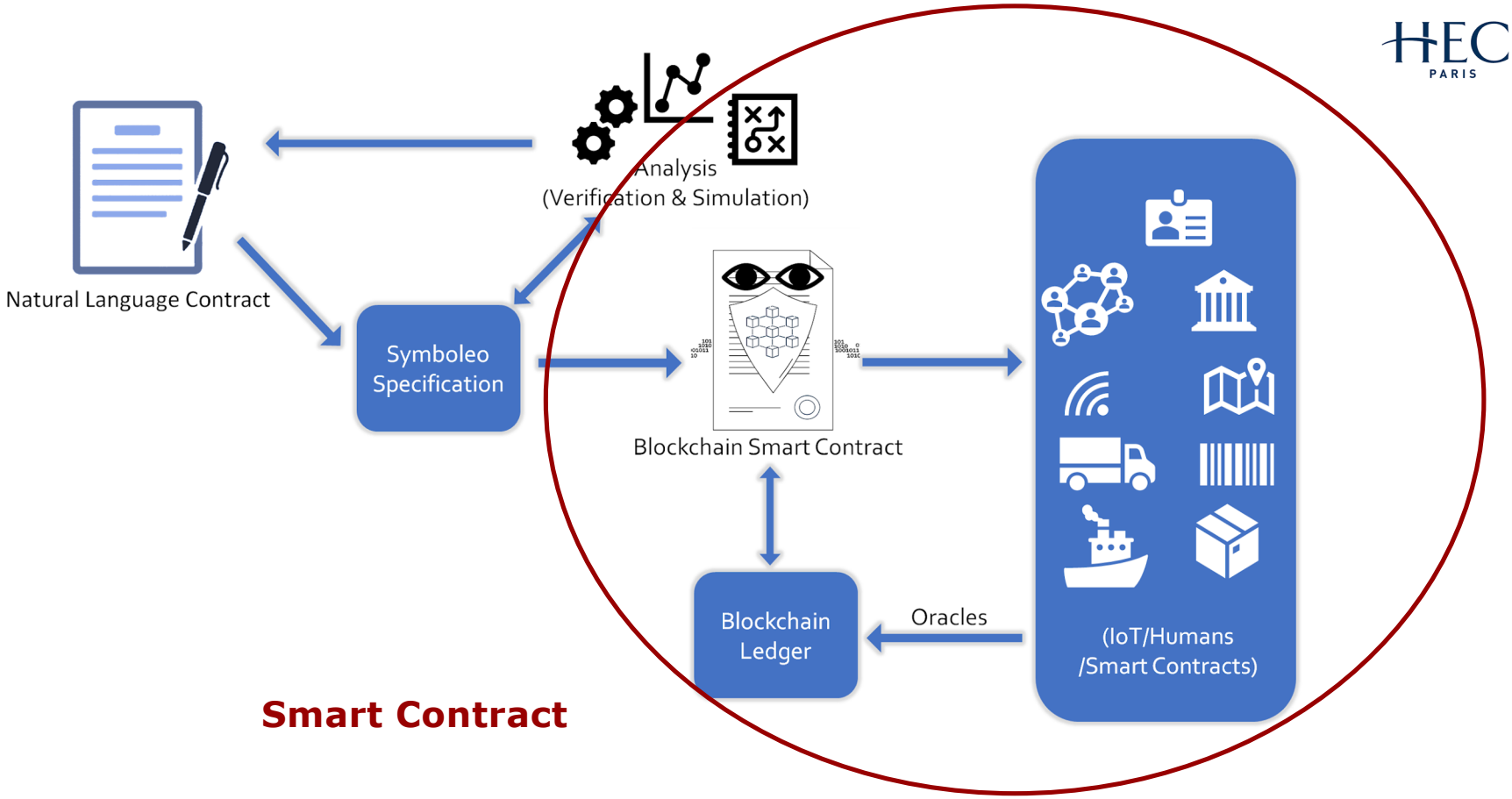


Invisible Ink System
Zyskind and Nathan (2015)



Decentralised Online Social Network (DOSN)
Rahman et al. (2019)





Sepehr SHARIFI, Alireza PARVIZIMOSAED, Daniel AMYOT, Luigi LOGRIPPO et John MYLOPOULOS, "Symboleo: Towards a Specification Language for Smart Contracts" , (2020) *28th IEEE Int. Requirements Engineering Conf.*

Thank you

Smart Law – HEC Paris

Privacy Compliance in Chains of Contracts

David Restrepo Amariles, Associate Professor, restrepo-amariles@hec.fr
Pablo Marcello Baquero, Post-doctoral Fellow,
Rajaa El Hamdani, Data Scientist,
Aurore Troussel, LLM HEC Paris
Sebastien Meeès, RA HEC Paris

Smart Law Hub Polytechnique
Michalis Vazirgiannis & Team, Prof. Data Science, Ecole Polytechnique

External collaborations
Daniel Amyot & Team , Prof. Software Engineering, University of Ottawa
Ken Satoh & Team, Prof. Principles of Informatics, NII Japan