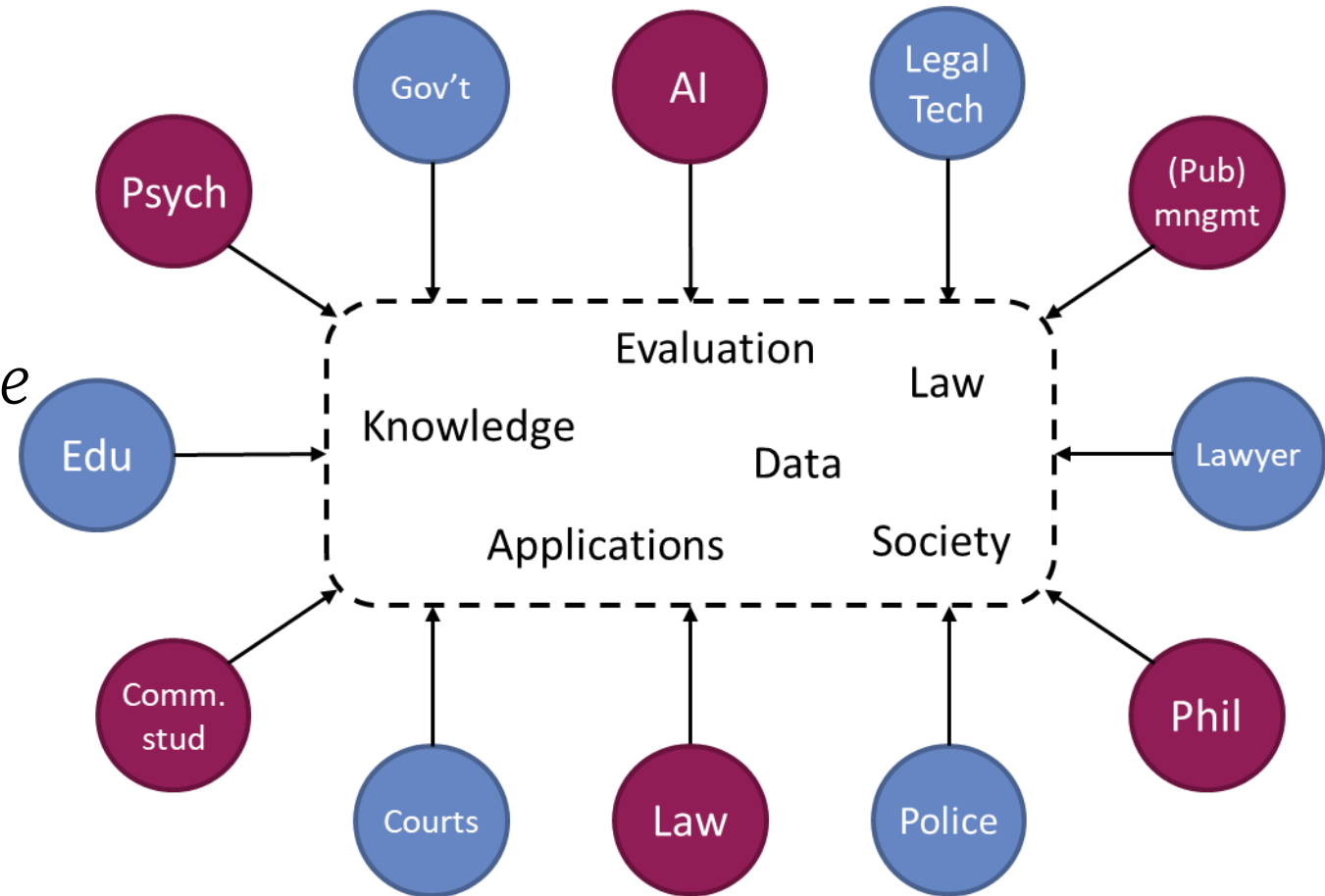# AI, Law and beyond
A transdisciplinary ecosystem for the future of AI & Law

Floris Bex

Scientific Director National Police Lab AI (Utrecht)
Associate Professor Artificial Intelligence (Utrecht University)
Full Professor Data Science and the Judiciary (Tilburg University)

35 years of AI and Law

The Future of AI & Law
L. Karl Branting

20 Years of ICAIL –
Reflections on the Field of AI and Law
Thomas F. Gordon

25 Years of AI & Law
ICAIL 1987 - 2013
Radboud Winkels

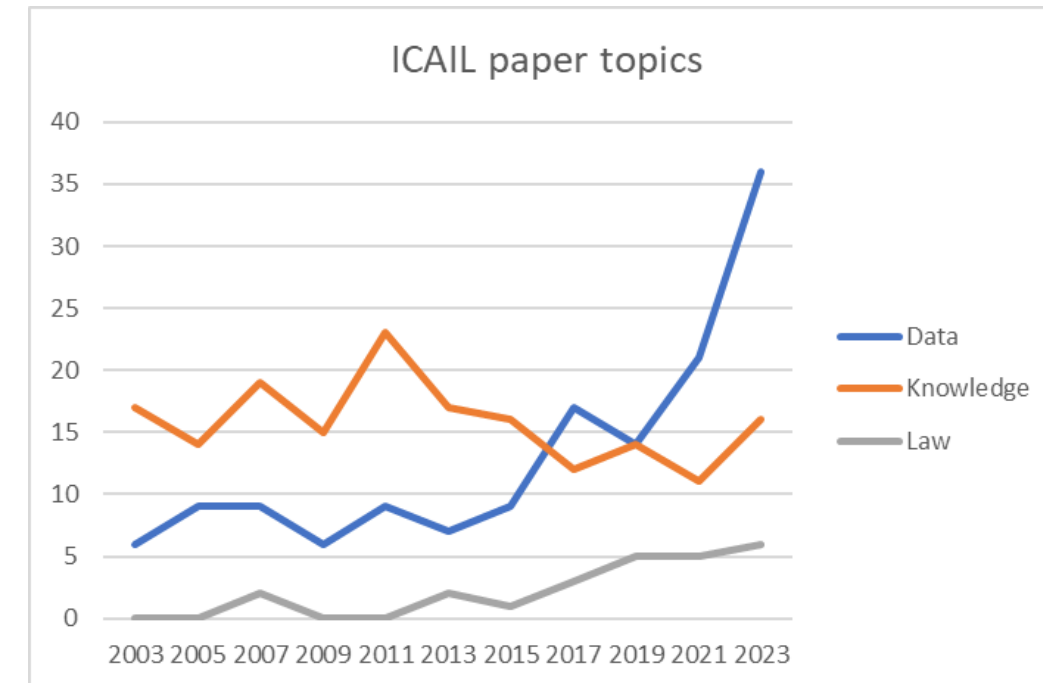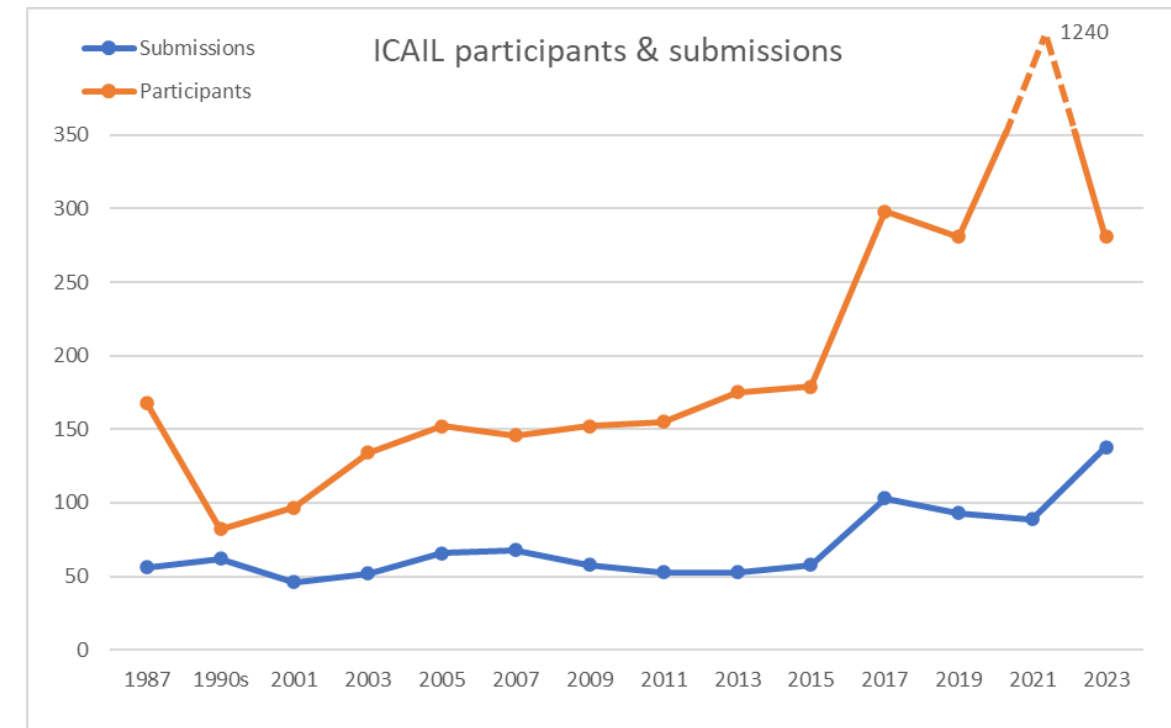AI and Law in 2017: Turning the hype into real world solutions
Katie Atkinson

Artificial Intelligence & Law:
Through the Lens of IAAIL – Past, Present and Future
Jack G. Conrad, IAAIL President

The Winter, the Summer and the Summer Dream of AI in Law
The journey of ICAIL conference series from my perspective
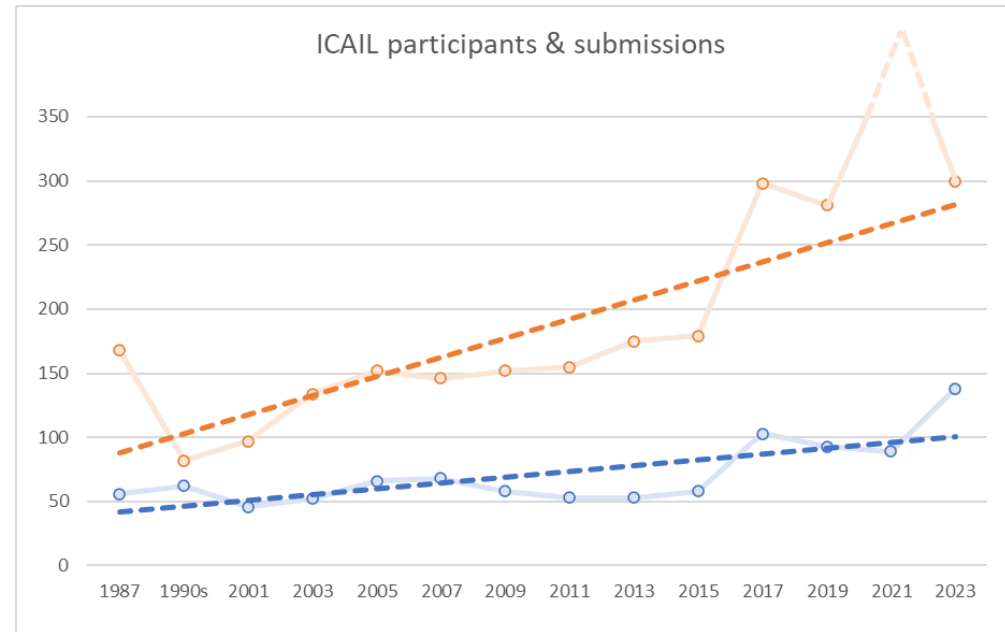Enrico Francesconi

ICAIL participants & submissions

ICAIL paper topics

AI & Law is doing great in 2023

ICAIL participants & submissions

Natural Legal Language Processing - NLLP
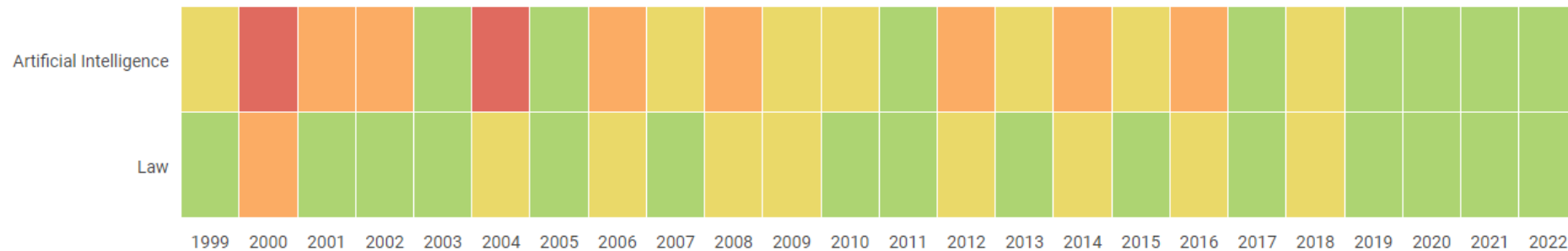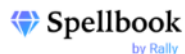
Scimago Journal Rank (Q1-Green,…, Q4-Red)

AI & Law is doing great in 2023

Pakistani judge uses ChatGPT to make court decision

Colombian judge says he used ChatGPT in ruling

The Guardian, February 2023

China's court AI reaches every corner of justice system, advising judges and streamlining punishment

South China Morning Post, July 2022

Spellbook
by Rally

Draft contracts 10x faster with AI

Sequoia and OpenAI Back Harvey to Redefine Professional Services, Starting with Legal

ICAIL participants & submissions

350
300
200
150
0

1987 1990s 2001 2003 2005 2007 2009 2011 2013 2015 2017 2019 2021 2023

Codex TechIndex 2017

Total number of companies
710

Marketplace companies
159

Document automation companies
183

Practice management companies
128

Legal research companies
53

Legal education companies
34

ODR companies
20

Analytics companies
38

Codex TechIndex 2023

Total number of companies
2072

Marketplace companies
196

Document automation companies
118

Practice management companies
442

Legal research companies
103

Legal education companies
140

ODR companies
572

Analytics companies
57

Developing AI for the legal sector: innovation and collaboration at the University of Liverpool

Utrecht University

National Policelab AI

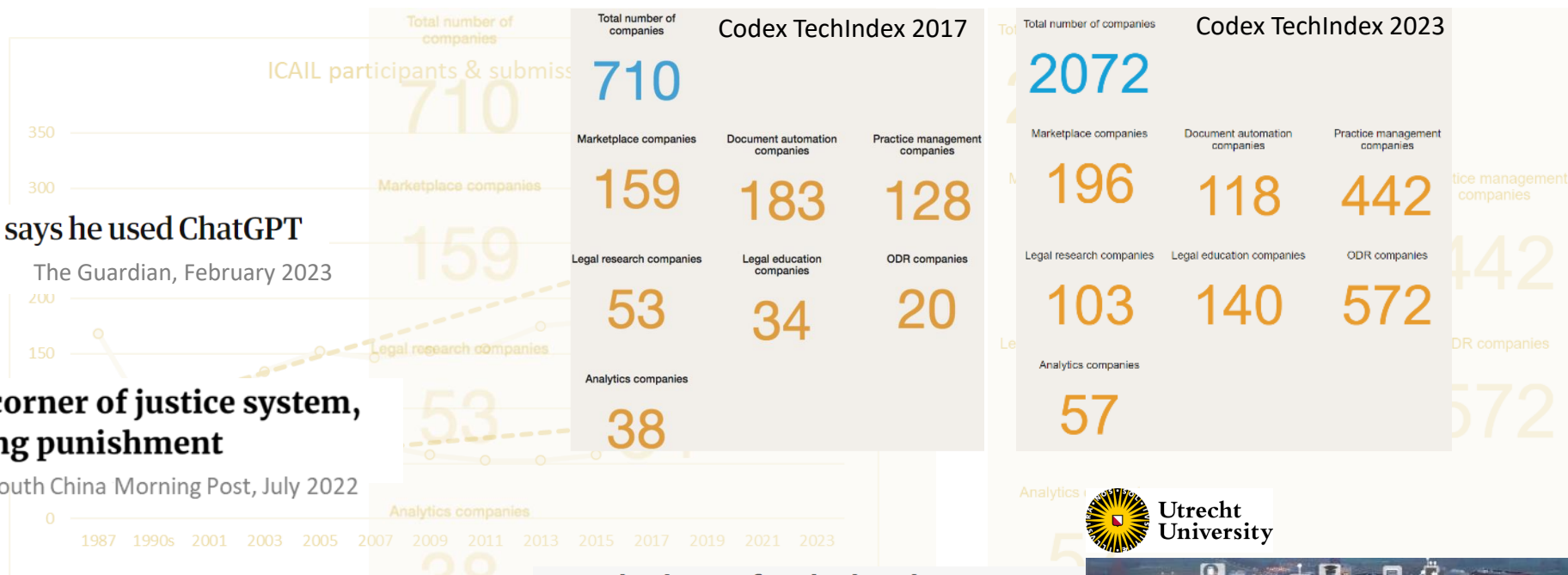**Artificial Intelligence for Law Enforcement and Community Safety (AiLECS) Lab**

MONASH University

AI & Law is doing great in 2023 (right??)

FEATURE-As Malaysia tests AI court sentencing, some lawyers fear for justice Reuters, April 2022

Automating Fairness?
Artificial Intelligence in the Chinese Courts

RACHEL E. STERN,* BENJAMIN L. LIEBMAN,**
MARGARET E. ROBERTS,*** AND ALICE Z. WANG****

Colombian ju
in ruling

Pakistani judge uses ChatGPT to
make court decision

A lawyer used ChatGPT to cite bogus cases. What are the ethics? Reuters, May 2023

WE SENSE TROUBLE

AUTOMATED DISCRIMINATION AND MASS SURVEILLANCE IN PREDICTIVE POLICING IN THE NETHERLANDS
Amnesty, September 2020

ChatGPT Lands OpenAI in Legal Trouble, Globally
AnalyticsIndia, 2023

OpenAI's GPT-4 Is Closed Source and Shrouded in Secrecy
Vice, 16-3-2023

'The Godfather of A.I.' Leaves Google and Warns of Danger Ahead
NY Times, May 2023
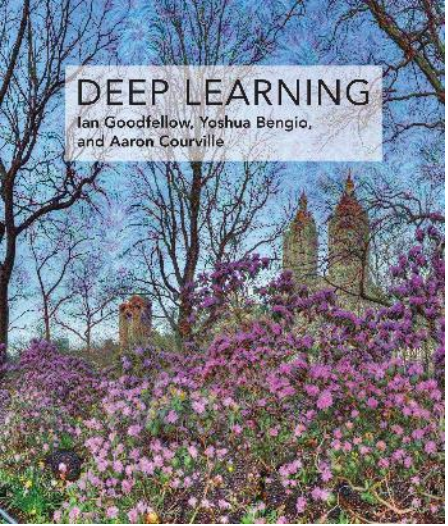
An "algorithmic drama"

Futurama - Fox

Robocop - MGM

people.dsv.su.se/~jpalme/reports/right-wrong.html

VS

Robocar Poli – Roi Visual

Ziewitz (2016). Governing algorithms: Myth, mess, and methods. *Science, Technology, & Human Values*
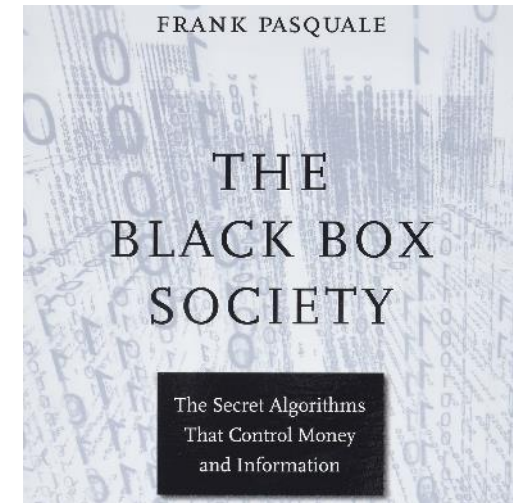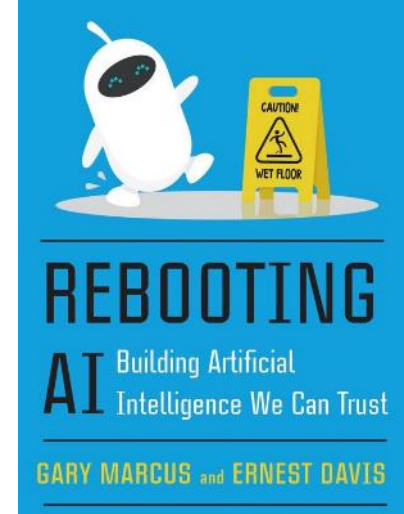
An "algorithmic drama" in AI (& Law)

- Data-driven deep learning vs. knowledge-driven reasoning

- Techno-optimism vs. techno scepticism

- Building AI vs. Regulating AI

On Formal Models of Legal
Argument:
Modelling Everyday Legal
Argument

Henry Prakken

Try To See It My Way
Persuasion in Legal Discourse
Trevor J.M. Bench-Capon

Artificial Intelligence as Law

Bart Verheij

The law in AI & law

Giovanni Sartor

Stepping away from the drama – A way forward for AI & Law

1. Combine knowledge & data
   - Use new techniques without forgetting about the old ones

2. Evaluate how AI & Law is being used in practice
   - Develop and broadly evaluate AI & Law applications

3. Combine multiple disciplines
   - Law, AI, and beyond

National Policelab AI

- Collaboration between police and universities
  - Research, develop & evaluate AI for real police problems, in actual police context
- 20 PhDs
  - Majority also works at police
  - 2/3 CS/AI background, 1/3 other (information systems, public management, law, communication studies)

Example 1: AI for citizen complaint/report intake

- Trade fraud: false webshops, malicious traders on Ebay
  - 40,000+ reports of alleged online fraud per year
  - Not all fraud: wrong product, not paid

- Automatically recommend to file report or not
  - Citizen fills in a form w. details & free text story
  - Possible fraud or not?

AI for intake – data & knowledge

- Combine data- and knowledge-driven AI
  - Relevant legal rules are known, bounded domain
  - Free-text interpretation needs data-driven AI

Ashley & Walker (2013) Toward constructing evidence-based legal arguments using legal decision documents and machine learning. *ICAIL 2013*

Schraagen, Testerink, Odekerken, Bex (2018) Argumentation-driven information extraction for online crime reports. *LeDAM 2018*

Mumford, Atkinson, & Bench-Capon (2022). Reasoning with Legal Cases: A Hybrid ADF-ML Approach. *Jurix 2022*.

AI for intake – legal model

Legal model
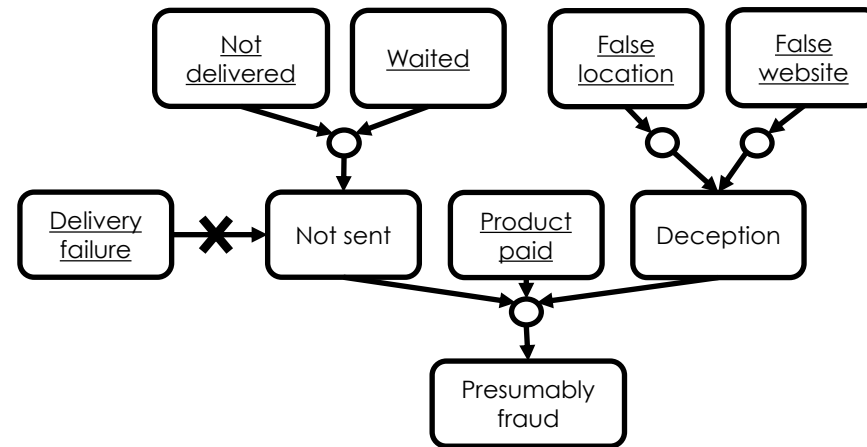
Computational argumentation
*Rules w. exceptions based on
DCC & police policy rules*

AI for intake – free text

Complaint form

Legal model

Fictitious example report 1
I would like to report fraud. I recently saw a bicycle for sale on eBay and contacted the advertiser. He said he lived far away, so he would send me the bike. I paid him in good faith, but have still not received anything. I saw on Facebook he lives nearby.
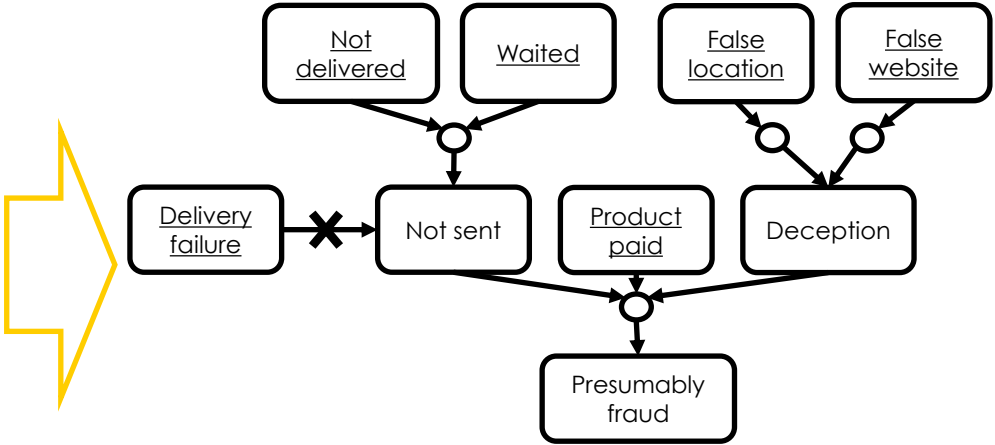
Computational argumentation
*Rules w. exceptions based on
DCC & police policy rules*

AI for intake – combining IR and argumentation

Extracting observations from complaint form

Paid

Fictitious example report 1
I would like to report fraud. I recently saw a bicycle for sale on eBay and contacted the advertiser. He said he lived far away, so he would send me the bike. I paid him in good faith, but have still not received anything. I saw on Facebook he lives nearby.

False location

Not delivered

Basic information extraction

Inferring possible fraud (or not)

Computational argumentation
Rules w. exceptions based on DCC & police policy rules

AI for intake – asking the right questions

Extracting observations from complaint form

Paid

Fictitious example report 1
I would like to report fraud. I recently saw a bicycle for sale on eBay and contacted the advertiser. He said he lived far away, so he would send me the bike. I paid him in good faith, but have still not received anything. I saw on Facebook he lives nearby.

False location   **Not delivered**

Basic information extraction

Inferring possible fraud (or not)

Not delivered | Waited
False location | False website
Delivery failure — Not sent — Product paid | Deception
Presumably fraud

Computational argumentation
Rules w. exceptions based on DCC & police policy rules

Asking for missing observations

Did you wait?

Was there a delivery failure?

Approximation algorithms
Can new info still change the conclusion (and if so which)?

AI for intake - explanations

Inferring possible fraud (or not)
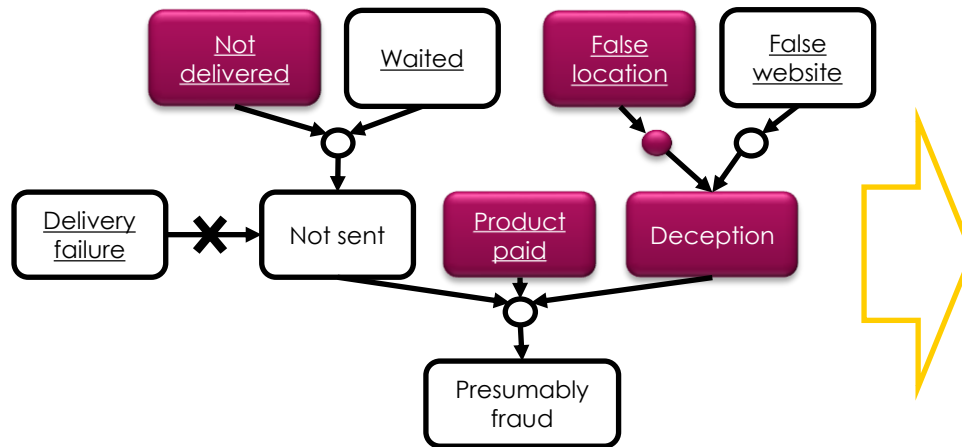
Computational argumentation
Rules w. exceptions based on DCC & police policy rules

Response
Thank you for your complaint. In your case, the system has concluded that it is not a case of fraud, since you did not wait for at least 5 days. We recommend you do not file an official report at this point.

Explanations
Explaining (non-)acceptance in terms of arguments and counterarguments

AI for intake - evaluation

- Evaluate accuracy, user satisfaction

- Investigate citizen trust in automatic recommendations
  - How do users perceive recommendations by the system?
  - Do explanations matter?

AI for intake – citizen trust & explanations

- Do citizens trust the system with and without an explanation?
  - Controlled experiments 1700+ participants

- Not fraud – still file an official report? (trusting behaviour)?
  - No explanation (control): 40-60% still filed report
  - With explanation: only 20-35% still filed report

AI, transparency and citizen trust

- Transparency
  - About the system/decision: XAI
  - About the use of systems in the organisation
  - About AI and regulation

- How do citizens react when AI is more contentious?
  - Predictive policing
- What's the influence of basic trust in police?
  - US vs. Netherlands

Example 2: AI for (explainable) text classification

- Police generate, use and analyse lots of text data
  - Citizen reports, Incident reports, Lab reports, Social Media, Seized Data Carriers
- Text classification for search, for use in AI systems

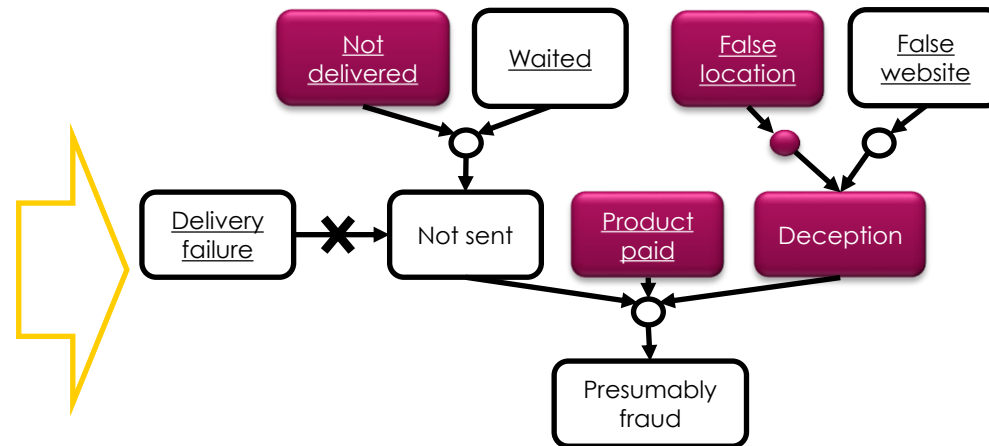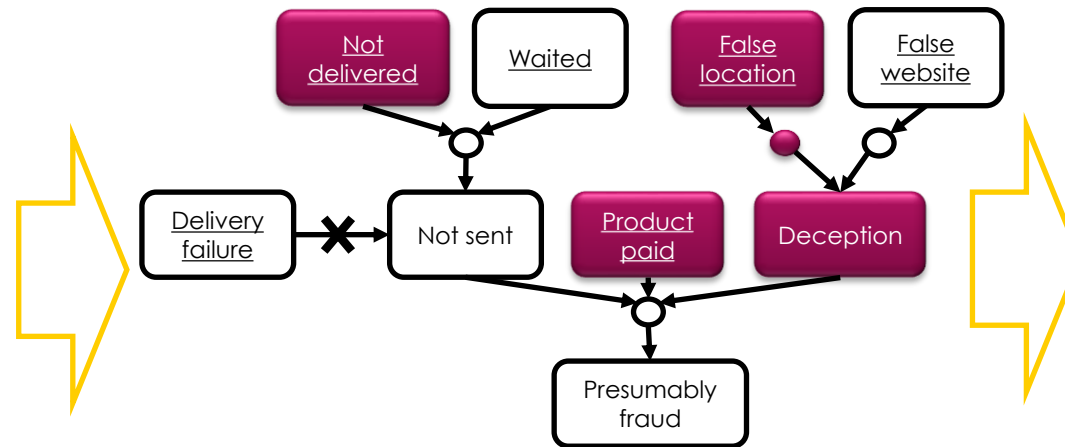*Fictitious example report 1*
I recently saw a bicycle for sale online and contacted the advertiser. He said he lived far away, so he would send me the bike. I paid him in good faith, but have still not received anything. I saw on Facebook he lives nearby.

Fictitious example report 2
I wanted to buy champagne from John Doe via Ebay. Up to now, I have not received anything, and he does not respond to my e-mails, so I haven't transferred the money yet.

Paid

Not paid

Threat

No Threat

Zortic
@kingZortic
@SouthwestAir As part of a nationwide State agreement. A bomb was placed on SWA2492. It will be detonated at a random time of my choosing...
RETWEETS 27   FAVORITE 1
9:57 AM - 24 Jan 2015

BBC World Service
@bbcworldservice
75 years ago this week, atomic bombs were dropped on Hiroshima and Nagasaki, Japan, killing countless civilians.

Ribeiro, Singh & Guestrin (2016). "Why should i trust you?" Explaining the predictions of any classifier. In *ACM SIGKDD*.

Branting et al. (2019) Semi-supervised methods for explainable legal prediction. *ICAIL 2019*.

Tan, Zhang, Zhang, & Li (2020).The sentencing-element-aware model for explainable term-of-penalty prediction. *NLPCC 2020*.

AI for explainable text classification

- Being able to explain why something was classified
  - Model testing and improvement
  - Transparency and accountability
  - Use in legal (criminal) cases

Fictitious example report 1
I recently saw a bicycle for sale online and contacted the advertiser. He said he lived far away, so he would send me the bike. I paid him in good faith, but have still not received anything. I saw on Facebook he lives nearby.

Fictitious example report 2
I wanted to buy champagne from John Doe via Ebay. Up to now, I have not received anything, and he does not respond to my e-mails, so I haven't transferred the money yet.

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Not paid

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RETWEETS 27   FAVORITE 1

9:57 AM - 24 Jan 2015

BBC World Service
@bbcworldservice

75 years ago this week, atomic bombs were dropped on Hiroshima and Nagasaki, Japan, killing countless civilians.

Explainable text classification - Rationales

- Explaining text classification
  - Using *machine generated rationales* (highlighted sentences)

Fictitious example report 1
I recently saw a bicycle for sale online and contacted the advertiser. He said he lived far away, so he would send me the bike. I paid him in good faith, but have still not received anything. I saw on Facebook he lives nearby.

Paid

Fictitious example report 2
I wanted to buy champagne from John Doe via Ebay. Up to now, I have not received anything, and he does not respond to my e-mails, so I haven't transferred the money yet.

Not paid

Fictitious example report 1
I recently saw a bicycle for sale online and contacted the advertiser. He said he lived far away, so he would send me the bike. ==I paid him in good faith==, but have still not received anything. I saw on Facebook he lives nearby.

Fictitious example report 2
I wanted to buy champagne from John Doe via Ebay. Up to now, I have not received anything, and he does not respond to my e-mails, ==so I haven't transferred the money yet==.

Explainable text classification - Counterfactuals

- Explaining text classification
  - By generating *counterfactual example text*

Fictitious example report 1
I recently saw a bicycle for sale online and contacted the advertiser. He said he lived far away, so he would send me the bike. **I paid him** in good faith, but have still not received anything. I saw on Facebook he lives nearby.

Paid   (not paid)

Fictitious example report 2
I wanted to buy champagne from John Doe via Ebay. Up to now, I have not received anything, and he does not respond to my e-mails, **so I haven't transferred the money yet**.

Not paid   (paid)

Fictitious example report 1
I recently saw a bicycle for sale online and contacted the advertiser. He said he lived far away, so he would send me the bike. **I did not pay him** in good faith, but have still not received anything. I saw on Facebook he lives nearby.

Fictitious example report 2
I wanted to buy champagne from John Doe via Ebay. Up to now, I have not received anything, and he does not respond to my e-mails, **so I already transferred the money**.

M. Robeer et al. (2023) The Explabox: Responsible
AI Development & Usage. *Under review.*

https://explabox.readthedocs.io/

Explainable AI for legal decisions
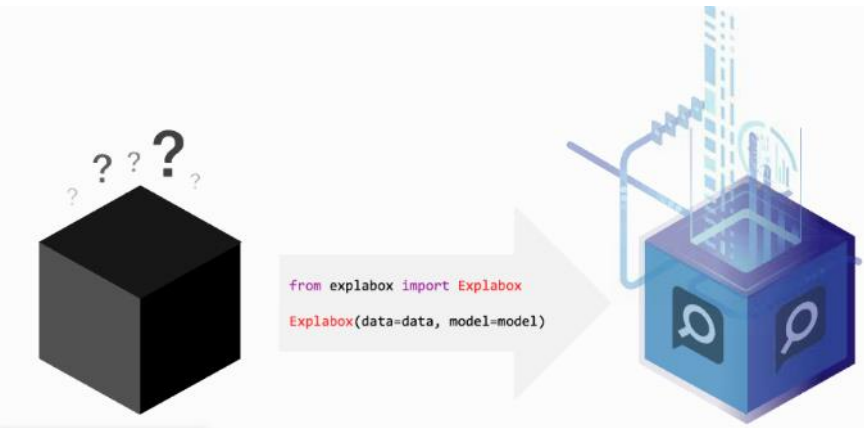
- Open-source libraries & toolkit for AI model inspection
  - Data statistics
  - XAI: rationales, counterfactuals, LIME/SHAP
  - Robustness: spelling mistakes, typo's
  - Biases: names, gender, etc.

- A holistic view on the AI system
  - What kind of data? How (good) does the system perform? Why does the system do what it does?

Tolan, Miron, Gómez & Castillo (2019) Why Machine Learning May Lead to Unfairness: Evidence from Risk Assessment for Juvenile Justice in Catalonia. *ICAIL 2019*

Alikhademi et al. (2022) A review of predictive policing from the perspective of fairness. *AI & Law Journal*

Sevim, Şahinuç & Koç (2023) Gender bias in legal corpora and debiasing it. *Natural Language Engineering*

Rules, tools, and metrics

EUROPEAN COMMISSION

Brussels, 21.4.2021
COM(2021) 206 final

2021/0106 (COD)

Proposal for a

REGULATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL

LAYING DOWN HARMONISED RULES ON ARTIFICIAL INTELLIGENCE (ARTIFICIAL INTELLIGENCE ACT) AND AMENDING CERTAIN UNION LEGISLATIVE ACTS

ACM Conference on Fairness, Accountability, and Transparency (ACM FAccT)

A computer science conference with a cross-disciplinary focus that brings together researchers and practitioners interested in fairness, accountability, and transparency in socio-technical systems.

Ministry of the Interior and Kingdom Relations

Impact Assessment
Fundamental rights and algorithms

1 Why?

Intended effects (objective)

Reason
Objectives, values, ...

→ See Chapter 1

2 What?

A) Data (input)

Preconditions
Data quality, storage, archiving...

B) Algorithm (throughput)

Preconditions
Accuracy, transparency, explainability

→ See Chapter 2

3 How?

Implementation and use of algorithm (output)

Preconditions
Impact, evaluation, communication ...

→ See Chapter 3

4 Fundamental rights

Infringed fundamental rights
Specific legislation
Seriousness of interference
Justification

→ See Chapter 4

Explabox as assessment aid

- Use information from Explabox for assessment
  - What kind of data? How (good) does the system perform? Why does the system do what it does?

Part 2A: What?
Data – input

This section covers the following topics:

- 2A.1 Assessment: Algorithm type
- 2A.2 Data sources and quality
- 2A.3 Bias/assumptions in the data
- 2A.4 Security and archiving

Impact Assessment | Fundamental rights and algorithms

- 2B.1 Algorithm type
- 2B.2 Ownership and control
- 2B.3 Algorithm accuracy
- 2B.4 Transparency and explainability
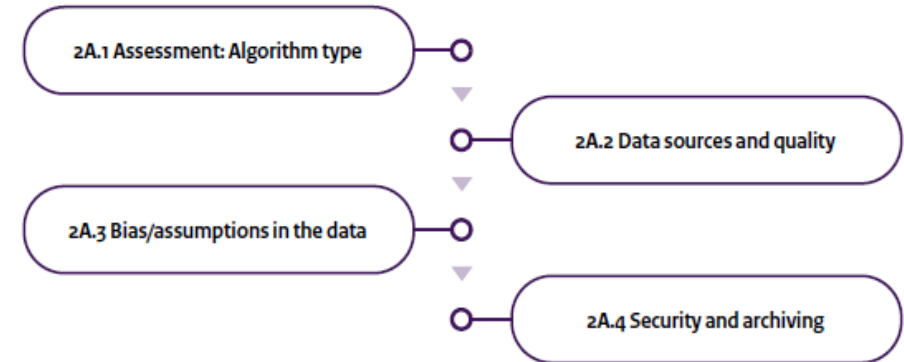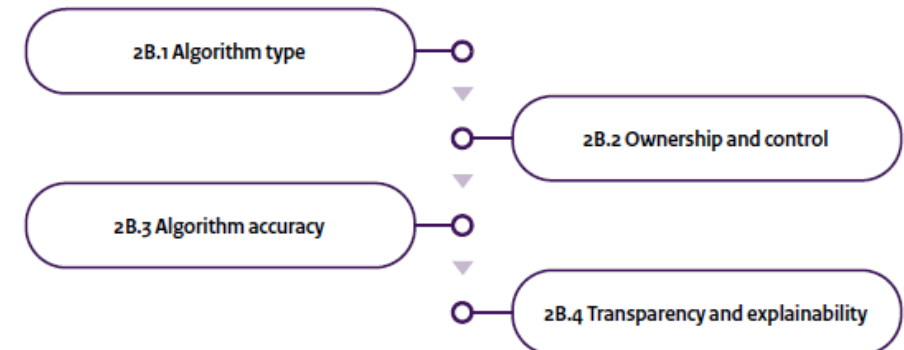
Rules, tools, and metrics

- Tools & metrics
  - What use are they? Intended and actual effects?

- New roles and responsibilities in organisations
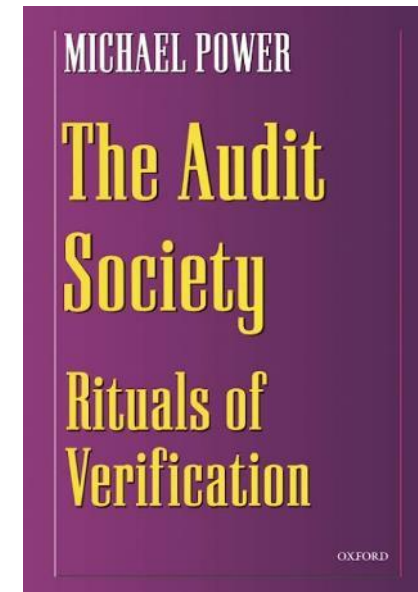
MICHAEL POWER

The Audit
Society

Rituals of
Verification

OXFORD

Wieringa (2020) What to account for when accounting for algorithms: a systematic literature review on algorithmic accountability. *FAT* 2020*.

algosoc Justice

Explainable AI for legal decisions

- Rules: Operationalising transparency and contestability in the law
  - Equality of arms

EUROPEAN COMMISSION
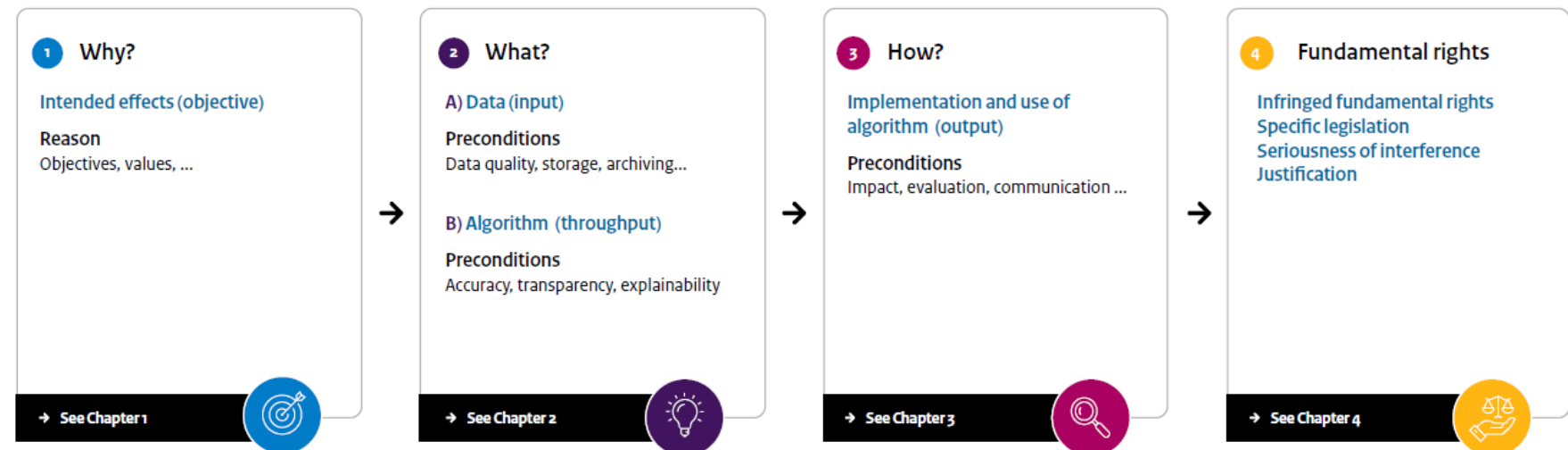
Brussels, 21.4.2021
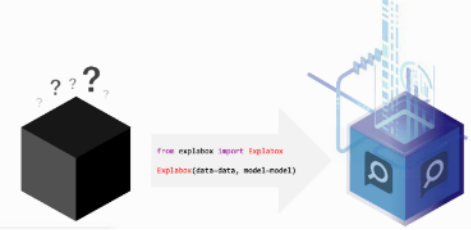COM(2021) 206 final

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LEGISLATIVE ACTS

From Multimodal Data to Trustworthy Evidence in Court

AI4Intelligence

Explainable AI for legal decisions

- Rules: Operationalising transparency and contestability in the law
  - Equality of arms
  - Evaluating evidence and motivating decisions

Bibal et al. (2021) Legal requirements on explainability in machine learning. *AI & Law Journal*

Almada (2019) Human intervention in automated decision-making: Toward the construction of contestable systems. *ICAIL 2019*.

Atkinson, Bench-Capon & Bollegala (2020) Explanation in AI and law: Past, present and future. *AI Journal*.

F.J. Bex (2011) *Arguments, Stories and Criminal Evidence: A Formal Hybrid Theory*.

Evaluating AI in practice

- AI & Law Tech development & evaluation
  - Argumentation
  - Natural Language Processing

- How to evaluate?
  - Real systems in real user context

JAIL Empirical Papers (2005-2014)
Evaluation Types (A2-A3-A4)

3 (7%)   2 (5%)
4 (10%)
9 (22%)   19 (46%)
4 (10%)

- Gold Data
- Statistical Analysis
- Manual Assessment
- Algorithmic Analysis
- Operational-Usability
- Other
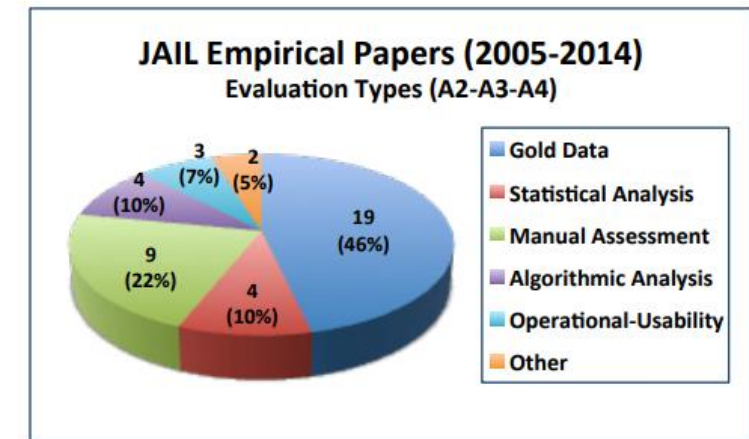
Atkinson, Collenette, Bench-Capon, Dzehtsiarou (2021) Practical tools from formal models: the ECHR as a case study. *ICAIL 2021*.

Odekerken & Bex (2020) Towards transparent human-in-the-loop classification of fraudulent web shops. *JURIX 2020*

Van Binsbergen, Liu, Van Doesburg & Van Engers (2020) eFLINT: a domain-specific language for executable norm specifications. *ACM SIGPLAN Conference on Generative Programming*.

Conrad & Zeleznikow (2015) The role of evaluation in AI and law: an examination of its different forms in the AI and law journal. *ICAIL 2015*.

AI for detecting mobile phone usage while driving

- AI does initial filtering for pictures of cars/drivers who seem to be holding a phone, officer then checks the picture.

AI for detecting mobile phone usage while driving

- Best-practice in value-sensitive design
  - Data protection and anonimization
  - Training models with representative datasets
  - Develop and retain control in-house

- In practice:
  - New windscreen foil on cars
  - Officers share photographs with other officers to get second opinion

- Continuous training of both AI and human!

AI for police interception
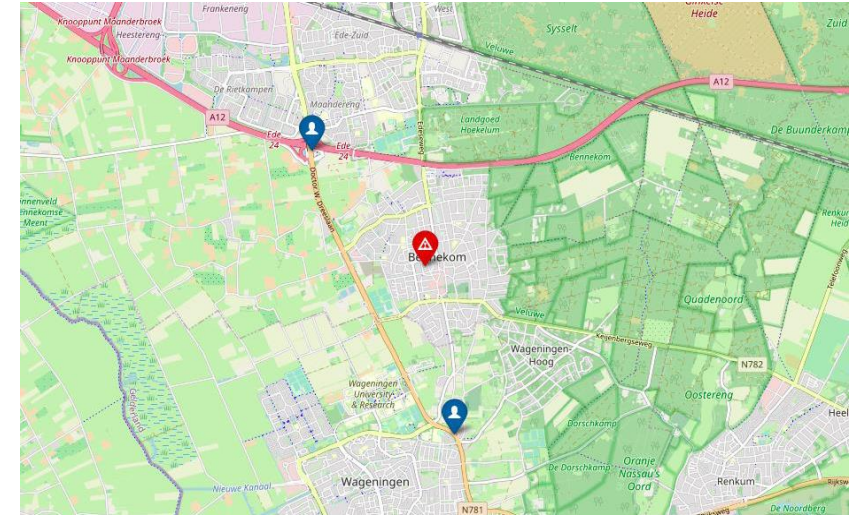
- Notification of crime (e.g. robbery, smash & grab) and fleeing suspects
- Using knowledge about suspect behaviour, roads, etc., predict the suspect's route

- "Just like I thought"
  - Expert dispatchers only followed the recommendations of the system if they coincided with their own intuitions
  - Explanations hardly influence whether they trust/follow the recommendation

Van Droffelaar, I.S., Kwakkel, J.H., Mense, J.P., Verbraeck, A. (2022) Simulation-optimization configurations for fugitive interception. *Proceedings of the 2022 Winter Simulation Conference*.

F. Selten, M. Robeer, S. Grimmelikhuijsen (2022) 'Just like I thought'. Street-level bureaucrats trust AI recommendations if they confirm their professional judgement. *Public Administration Review*.

AI, Law and beyond

1. Combine knowledge & data
   - Trade fraud complaint intake

2. Evaluate how AI & Law is being used in practice
   - Citizen interaction & trust
   - XAI techniques in practice
   - Police officers using systems

3. Combine multiple disciplines
   - Public management: empirically investigating AI audits
   - Law: XAI, decision motivation and equality of arms

Combining knowledge and data

- Legal information extraction
- Non-statistical models to reason with data

- Combining machine learning and knowledge representation approaches
  - ML to extract information, KR to reason
  - Both ML and KR for one (complex) task
  - Solving KR problems with ML models
  - Constraining ML models using KR models

Craandijk & Bex (2020) Deep Learning for Abstract Argumentation Semantics. *IJCAI 2020*.

Li, Liu, Chen and Rudin (2018) Deep Learning for Case-Based Reasoning Through Prototypes, *AAAI 2018*

Li & Srikumar (2019) Augmenting Neural Networks with First-order Logic. *ACL 2019*.

Gan et al. (2021) Judgment Prediction via Injecting Legal Knowledge into Neural Networks AAAI 2021

Argumentation Structure Prediction in CJEU Decisions on Fiscal State Aid - Santin et al.

Automatic Identification and Empirical Analysis of Legally Relevant Factors – Gray et al.

Argument Mining with Graph Representation Learning – Zhang et al.

Improving Translation of Case Descriptions into Logical Fact Formulas using LegalCaseNER – Zin et al.

Computable Contracts by Extracting Obligation Logic Graphs – Servantez et al.

Justification, stability and relevance for case-based reasoning with incomplete focus cases – Odekerken et al.

Model- and data-agnostic justifications with a fortiori case-based argumentation - Peters et al.

Analogical Reasoning, Generalization, and Rule Learning for Common Law Reasoning – Blass & Forbus

Combining a Legal Knowledge Model with Machine Learning for Reasoning with Legal Cases – Mumford et al.

Beyond Readability with RateMyPDF: A Combined Rule-based and Machine Learning Approach to Improving Court Forms – Steenhuis et al.

Evaluate AI & Law in practice

- Innovative applications
  - Evaluate operational-usability by "disinterested domain experts"

- Work together with stakeholders from practice
- Evaluate with proxy users
- Work with easily accessible user groups

  - Legal education
  - Academics

sustain.AI: a Recommender System to analyze Sustainability Reports – Hillebrand et al.

Image Analysis Approach to Trademark Congestion and Depletion – Haim & Kesari

"What's wrong with this product?" - Detection of product safety issues based on information consumers share online – Fuchs et al.

A Methodology for Building Augmented Intelligence Tools for Laypeople to Increase Access to Justice – Westermann & Benyekhlef

Beyond Readability with RateMyPDF: A Combined Rule-based and Machine Learning Approach to Improving Court Forms – Steenhuis et al.

Conrad & Zeleznikow (2015) The role of evaluation in AI and law: an examination of its different forms in the AI and law journal. *ICAIL 2015*.

Combine multiple disciplines

- ## AI for Law
  - ### Apply AI for law, studying law with AI
- ## Law for AI
  - ### Legal-by-design
  - ### Legal aspects of AI for Law

- ## Include other disciplines
  - ### Broaden the AI & Law ecosystem

Using Agent-Based Simulations to Evaluate Bayesian Networks for Criminal Scenarios - van Leeuwen et al.

Do agents dream of abiding by the rules? Learning norms via behavioral exploration and sparse human supervision – Fratrič et al.

Uncovering Trauma in Genocide Tribunals: An NLP Approach Using the Genocide Transcript Corpus – Schirmer et al.

On predicting and explaining asylum adjudication – Katsikouli et al.

Gender Disparities in Child Custody Sentencing in Spain: a Data Driven Analysis – Riera et al.

The Perfect Victim: Computational Analysis of Judicial Attitudes towards Victims of Sexual Violence – Habba et al.

Computational Accountability - Hulstijn

Effects of XAI on Legal Process – Nielsen et al.

Rebuilding 'ethics' to govern 'AI': How to re-set the boundaries for the legal sector? - Unver

Araujo et al. (2020) In AI we trust? Perceptions about automated decision-making by artificial intelligence. *AI & Society*

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AI, law and beyond: building a transdisciplinary ecosystem