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# Multiagent systems for deciding about the relevance and admissibility of evidence

*AI for Judges and Arbitrators  
Module C*

*Lisbon*

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## Summary

1. (continues) Which effective remedy?
2. The problems of dealing with digital evidence: overview
3. Comparative solutions at the national level
4. Which role for AI systems?
5. Multi Agent Systems
6. Some applications
7. Which Way Forward?



## *(continues) Which effective remedy?*

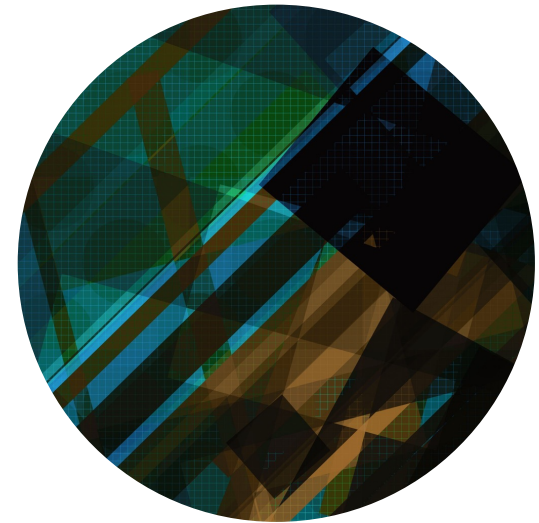
*...an approach alternative to “simple human control”*

- Certification
- Explicable AI

R. Guidotti, A. Monreale, S. Ruggieri, F. Turini, F. Giannotti, D. Pedreschi, “A Survey of Methods for Explaining Black Box Models,” 51 *acm Comput. Surv.*, 5 (2018), 93:1–93:42

- Redundancy approach: Right to a second automated decision

G. Contissa, G. Lasagni, *When it is (also) algorithms and AI that decide on criminal matters: In search for an effective remedy*, in *European Journal of Crime, Criminal Law and Criminal Justice*, 28, 3, 2020, pp. 280-304

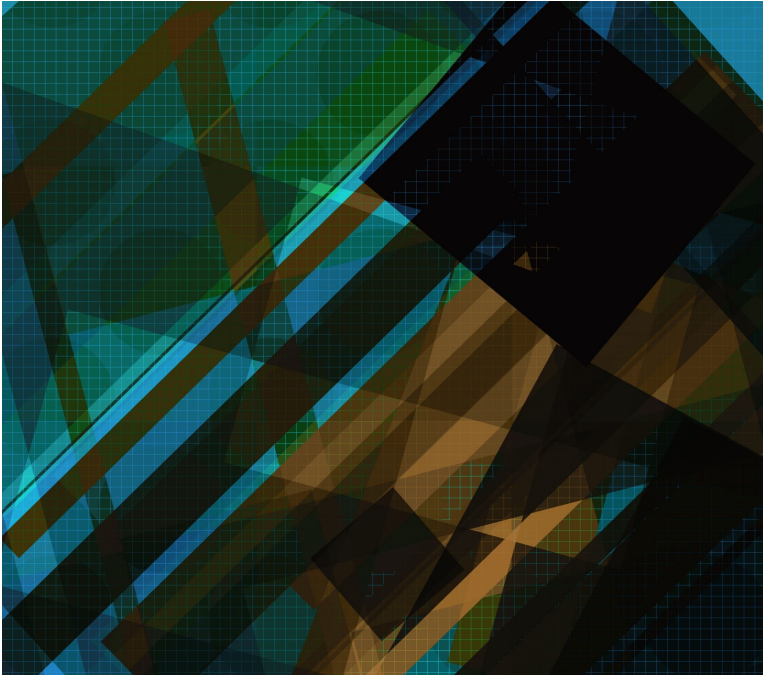


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*(continues)  
Which effective  
remedy?/2*



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- Which value for the second assessment?
- Does it substitute the first one?
  - expert witness approach
  - Which evaluation rules?
- Need to upgrade the structural resources, eg Appeals Court



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## The problems of dealing with digital evidence: Overview

- Volatile and fragile information
- Great amounts
- A type of forensic evidence...but much more common than other typologies...

### *General problems*

- *Data fundamentalism*
- *Training*
- *Methodology*

### *Specific problems*

- *Preservation*
- *Fake risk*
- *Conflicting principles*



## The problems of dealing with digital evidence/2

# Digital Forensics Standards and Procedure



ISO IEC technical standards (2012 – 2015):  
for all kinds of digital investigations

- *International*
- *Technical neutrality*

Reference term for European and national Guidelines and Standards, e.g.:

- *Guidelines on Digital Forensic Procedures for OLAF Staff* [https://ec.europa.eu/antifraud/sites/antifraud/files/guidelines\\_en.pdf](https://ec.europa.eu/antifraud/sites/antifraud/files/guidelines_en.pdf)
- *Electronic evidence - a basic guide for First Responders*, <https://www.enisa.europa.eu/publications/electronic-evidence-a-basic-guide-for-first-responders>
- *UNE standards, which are certified by AENOR (Asociación Española de Normalización y Certificación): UNE 71506 Methodology for forensic analysis of electronic evidence (July 2013); UNE 71505-1 Information Technology (IT). Electronic Evidence Handling System (SGEE). Part 1: Vocabulary and general principles. UNE 71505-2 Information Technology (IT). Electronic Evidence Handling System (SGEE).*
- *Good Practice Guide for Computer-Based Electronic Evidence (ACPO – Association of Chief Police Officers, UK, 2012),* [https://www.npcc.police.uk/documents/crime/2014/Revised%20Good%20Practice%20Guide%20for%20Digital%20Evidence\\_Vers%205\\_Oct%202011\\_Website.pdf](https://www.npcc.police.uk/documents/crime/2014/Revised%20Good%20Practice%20Guide%20for%20Digital%20Evidence_Vers%205_Oct%202011_Website.pdf)



The problems of dealing with digital evidence/3

## Digital Forensics Standards and Procedure

- Sets of pre-defined procedures
- Definition of roles and expertise
  - *Digital Evidence First Responder*
  - *Digital Evidence Specialist*

➤ Focus on training



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## The problems of dealing with digital evidence/4 Principles and Problems

### General Principles

- Integrity
- Authenticity & Reliability
- Completeness
- Pertinence
- Adequacy
- Documentation: chain of custody paradigm

### ➤ *Completeness vs Privacy*



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## Comparative solutions at the national level

DEVICES

Digital forensic EVIDENCE: towards Common European Standards in antifraud administrative and criminal investigations

DIGITAL FORENSIC EVIDENCE  
TOWARDS COMMON EUROPEAN STANDARDS IN  
ANTIFRAUD ADMINISTRATIVE AND CRIMINAL  
INVESTIGATIONS

*edited by*  
Michele Caianiello and Alberto Canon

Wolters Kluwer

CEDAM



<https://site.unibo.it/devices/en>

The problems of dealing with digital evidence/5  
Principles and Problems

### Luxembourg

Agreement in advance and in writing about the procedure to be followed (*Ch. c. C.*, 11 November 2014, N° 824/14)

### Spain

*Letrado de la Administración de Justicia* (Article 569 LECRIM)

### Italy

*Incidente probatorio* (Article 392 cpp)



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**Comparative solutions at  
the national level/2**

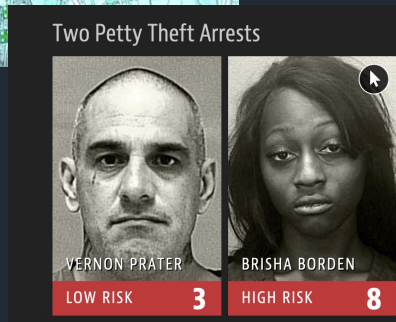
## **USA**

«Special Master» for Mar-a-Lago Trump's investigation

### **Common features:**

- Preponderant role of the courts
- No established model
- Usually difficult to apply on a «daily basis»





## Which Role for AI Systems?



- Often used to optimize (or trying to optimize) parts of criminal investigation
  - Can AI be used to solve the problem concerning digital evidence?



## Which Role for AI Systems? /2

# Multi-Agent Systems



= complex informatic systems resulting from the interaction of several “intelligent” artificial agents

- subject of study and research by the most careful literature since the late 1990s (R. CONTE, R. FALCONE e G. SARTOR, *Introduction: Agents and Norms How to Fill the Gap*, in *Artificial Intelligence and Law* 1999, 7, p. 1–15; C. CEVENINI e A. OSKAMP, *Proceedings of the 4th International Workshop on the Law of Electronic Agents*, LEA 2005)

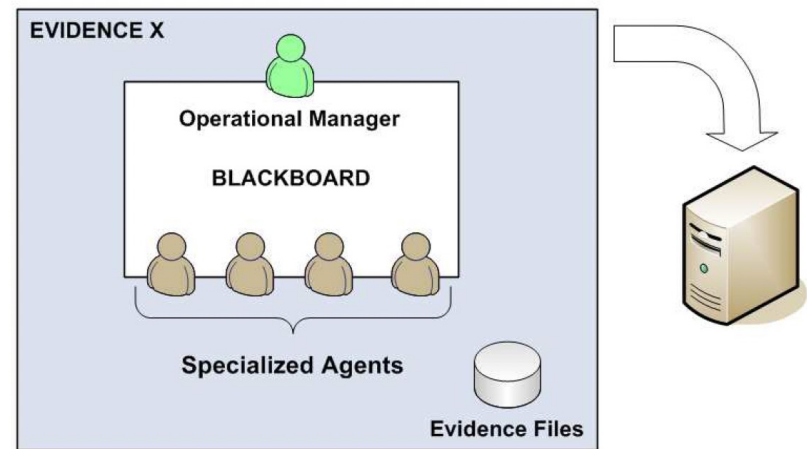
--> Interesting potential for the criminal justice field in several contexts



## Which Role for AI Systems? /3

# Multi-Agent Systems

- A way to address complex problems
- different layers
- hierarchical organization
- rules to establish priorities/taking decisions



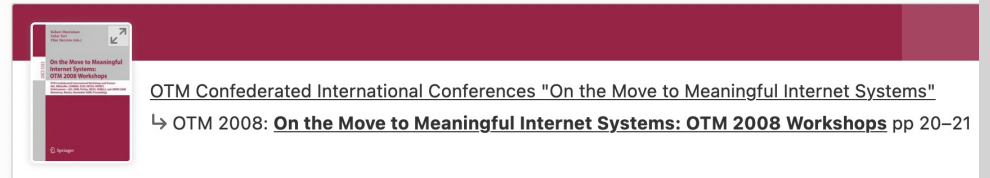
**Figure 1. The operational manager actuation.**



Which Role for AI Systems? /4

## Multi-Agent Systems & Digital Forensics

- A way to answer to the completeness/privacy dilemma?
- More accessible than the other methods?
  - What about the asymmetry among parties?



OTM Confederated International Conferences "On the Move to Meaningful Internet Systems"  
↳ OTM 2008: On the Move to Meaningful Internet Systems: OTM 2008 Workshops pp 20–21

### MADIK: A Collaborative Multi-agent ToolKit to Computer Forensics

[Bruno W. P. Hoelz](#), [Célia G. Ralha](#), [Rajiv Geeverghese](#) & [Hugo C. Junior](#)

Conference paper

1389 Accesses | 1 Citations

Part of the [Lecture Notes in Computer Science](#) book series (LNISA, volume 5333)

#### Abstract

In this article, we present **MADIK**, a **Multi-Agent Digital Investigation ToolKit** to help experts during the forensic examination process. MADIK uses a four layer multi-agent architecture, as a metaphor to the organizational hierarchy levels: strategic, tactical,



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## Not just digital evidence: AML/CFT Investigations



Inefficiency of AML/CFT regimes under several aspects:

- Excessive number of SARs
- SARs of poor quality
- No homogeneous standards for red flags
- Limited FIU resources

**Table 1:** Growth of STRs over the Years

SAR/STR/SMR numbers received	2012	2013	2014	2015	2016	Average annual growth rate 2013 to 2015
US	N/A	1,218,083	1,659,119	1,812,247	1,975,644	23%
UK	278,665	316,527	354,186	381,882	Not published	10%
HK	23,282	32,907	37,188	42,555	76,590	14%
Singapore	17,975	22,417	29,082	30,511	34,129	17%
Australia	44,062	64,076	81,074	78,846	Not published	12%
Canada	79,294	81,735	92,531	114,422	Not published	18%

*The Role of Financial Information-Sharing Partnerships in the Disruption of Crime*  
RUSI Occasional Paper, October 2017



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# Which Way Forward?



- Are other deployments possible?

For instance, to enhance defence rights?

G Lasagni, *Policing through AI and algorithms: The new face of criminal investigations?* In L. Bachmaier Winter, S. Ruggeri (eds), *Investigating and Preventing Crime in the Digital Era. New Safeguards, New Rights*, Springer 2022



*Thank you for the attention!*

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