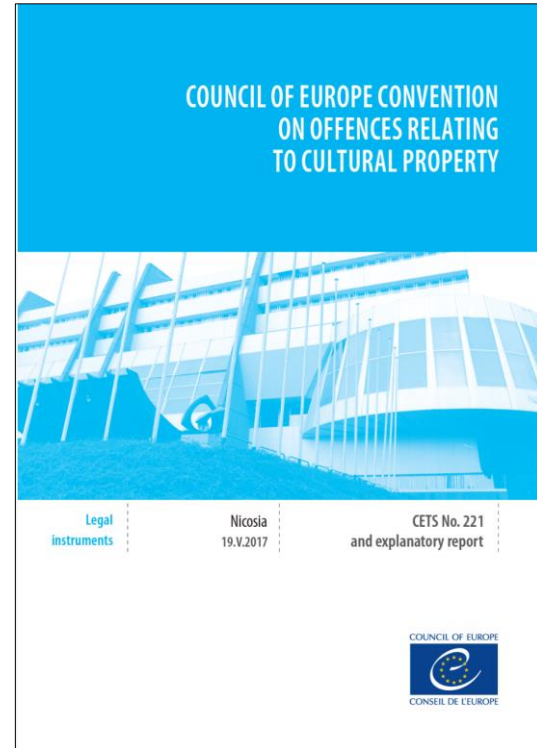COUNCIL OF EUROPE
CONSEIL DE L'EUROPE

Addressing the increasingly organised and criminal nature of offences in cultural goods through technological innovation

Dr A. Traviglia

Center for Cultural Heritage Technology (CCHT) - Italian Institute of Technology (IIT)

International Conference on the Nicosia Convention, CoE, National Library, June 16th 2023, Riga, Latvia

The Nicosia Convention and Technologies

- Not direct mention…

- …but implicit support:
  - "…exchange of information on significant legal, policy or <u>technological</u> developments" (art. 24)

- Clear reference to databases:
  - "…establish or develop inventories or databases of its cultural property…" (art. 20)
  - "…sharing or interconnecting national inventories or databases on cultural property …, and/or contributing to international inventories or databases, such as the Interpol database on stolen works of art"(art. 21).

COUNCIL OF EUROPE CONVENTION ON OFFENCES RELATING TO CULTURAL PROPERTY

Legal instruments | Nicosia 19.V.2017 | CETS No. 221 and explanatory report

COUNCIL OF EUROPE
CONSEIL DE L'EUROPE

Technologies already available

Databases

Social Network Analysis-based methods

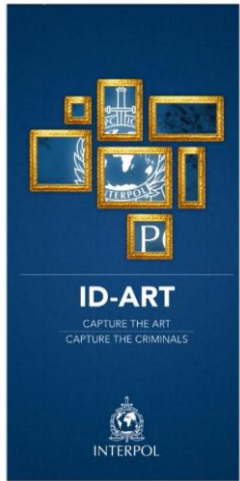Satellite and other airborne imagery

3D modeling

Image retrieval

Blockchain

Databases and Digital Tools

- Italian Carabinieri: Leonardo database and SWOADS project

- French OBC: TREIMA

- INTERPOL: Stolen Works of Art Database and ID-APP

- National scope (INTERPOL excepted)

- Focus on stolen items.

Social Network Analysis Methodologies

- SNA methodology: structural approach in social sciences

- Studies interactions among social actors

- Maps and analyses social connections using graph theory

- Identifies and understands social networks

- Reveals connections among members of criminal organisations

- Sheds light on dynamics and operations of illicit trafficking groups.
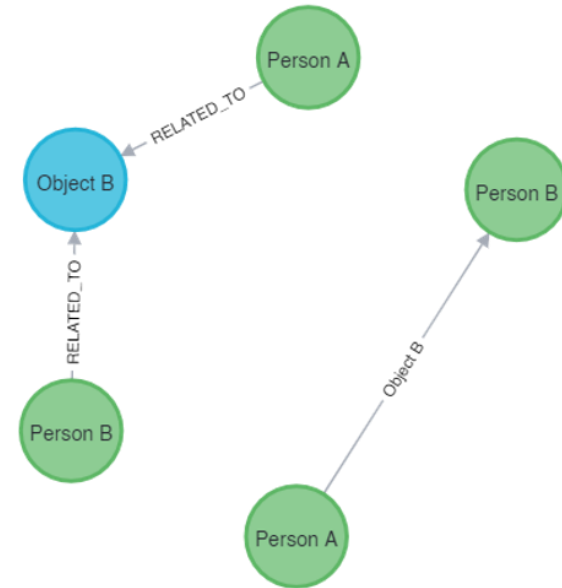
An example: RITHMS
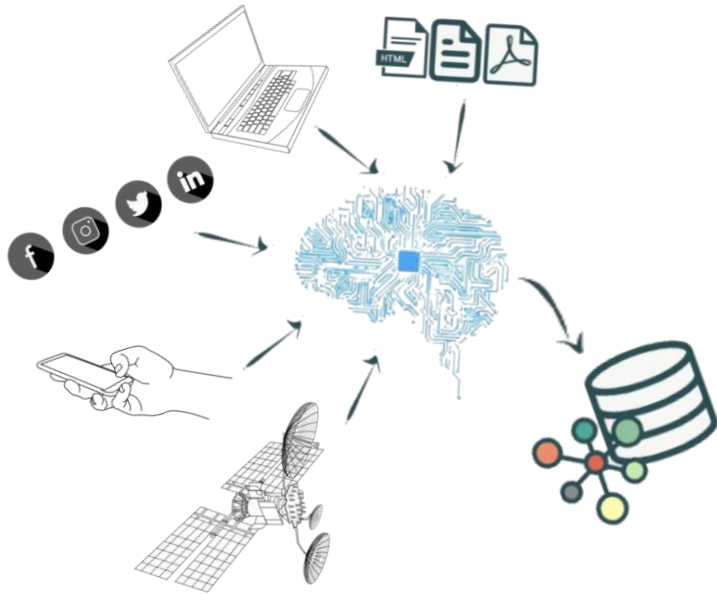
- RITHMS: *Research, Intelligence and Technology for Heritage and Market Security*

- Knowledge-base creation (Multiple, structured Datasets)

- Platform's Core Algorithm for Open-Data collection and correlation

- Customised interface to visualise the networks, input new data, retrieve info

- Testing the platform in segregated LEAs premises

RITHMS
Research, Intelligence and Technology for
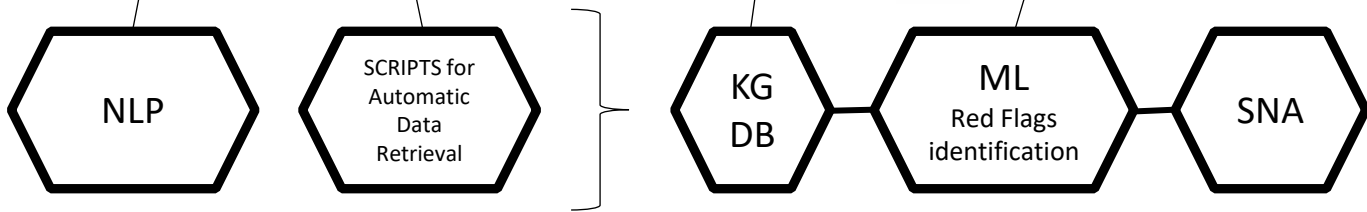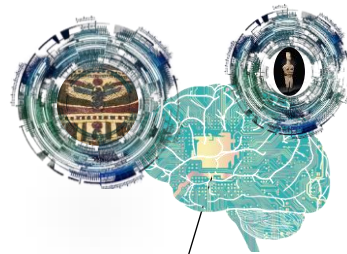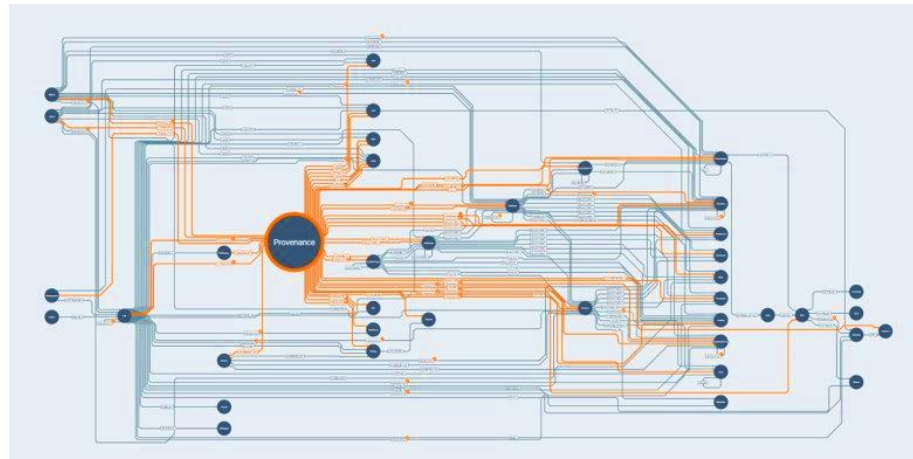Heritage and Market Security

Other Network-based approaches

- Data acquisition of cultural heritage items from web auctions

- ML detection of 'red flagged' objects by analysing textual and visual data

- DB of circulating artefacts

- 'Red List' generation directy notified to LEAs.
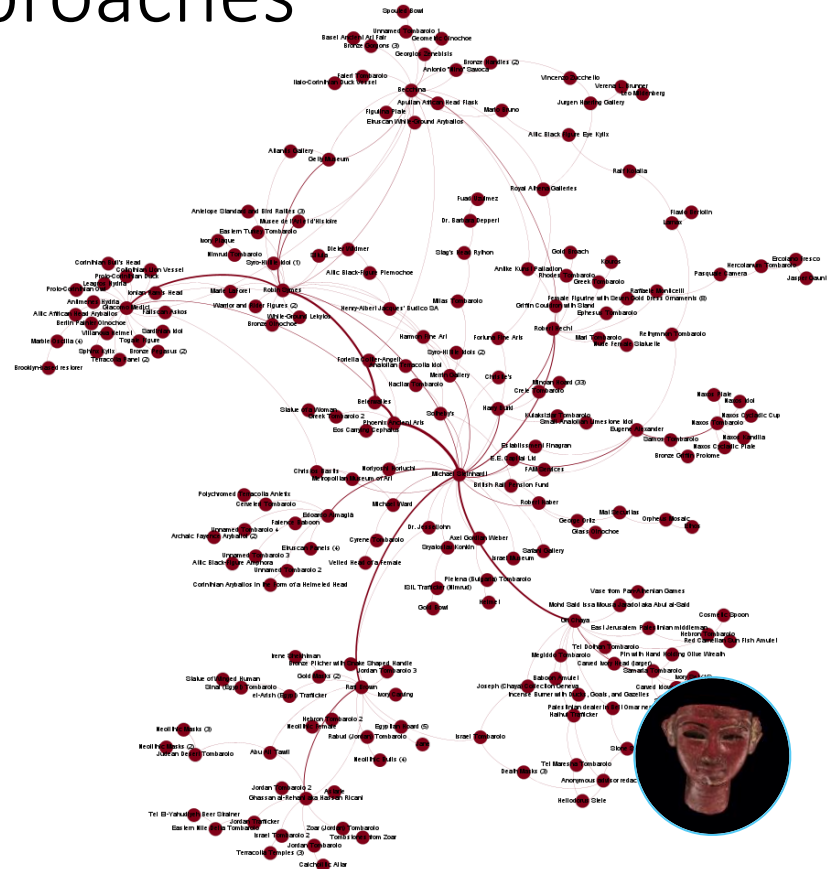
```
914        if pubindex == len(fProv):
915            pubindex = pubindex + 1
916        premenu = fProv[0:int(pubindex - 1)]
917        promenu = []
918        for i in premenu:
919            m = BeautifulSoup(i)
920            promenu.append(m)
921        mult_prov = []
922        multList(promenu, mult_prov, 9)
923
924        k_prov = []
925        base = 'provenance_'
926        for i in range(len(mult_prov)):
927            k_prov.append(base + str(i))
928        provenances = dict(zip(k_prov, mult_prov))
929        dProv = dict(zip([k_dProv], [provenances]))
930        prov_quality = '_quality' + str(len(mult_prov)) + "_"
931        prov_quality_for_dict = len(mult_prov)
932        dPQual = dict(zip([k_dPQual], [prov_quality_for_dict]))
933    except Exception:
934        dProv = dict(zip([k_dProv], ['N.D.']))
935        dPQual = dict(zip([k_dPQual], '0'))
936        exceptionDict(dProv)
937
```

NLP

SCRIPTS for Automatic Data Retrieval

KG DB

ML Red Flags identification

SNA

Remote sensing for looting detection

- Spread of the phenomenon and its geographic extension

- impossibility of physically inspecting unreachable areas or hazardous zones

- surveillance via remote sensing emerged as the most efficient approach to monitor ransacking occurrences.

Applications of Remote Sensing

- Remote sensing can be used for surveillance of
  - Sites difficult to access (rural areas, deserts, forests)
  - Sites too large to patrol
  - Sites away from urbanised areas and transport infrastructures
- Distinctive features common to different locations.


Aswan 2018
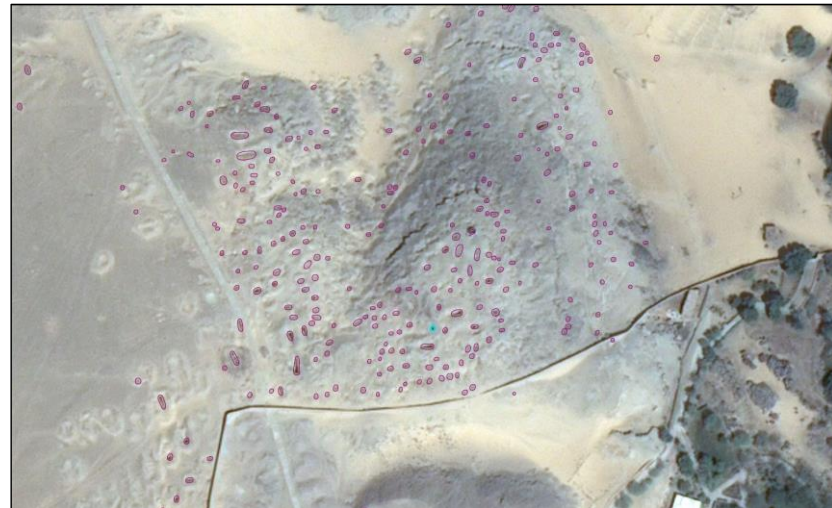
An example: ALCEO Project

- ALCEO: Automatic Looting Classification from Earth Observation

- Development of Artificial Intelligence methods for the automatic identification and classification of cultural heritage looted sites on EO data

- Characterisation and analysis of identified looted archaeological sites to
  - provide intelligence on ongoing and past criminal activities
  - develop advanced methodologies to be applied also to other areas of surveillance

- Funded by ESA (European Space Agency)

An AI –based system to counter looting
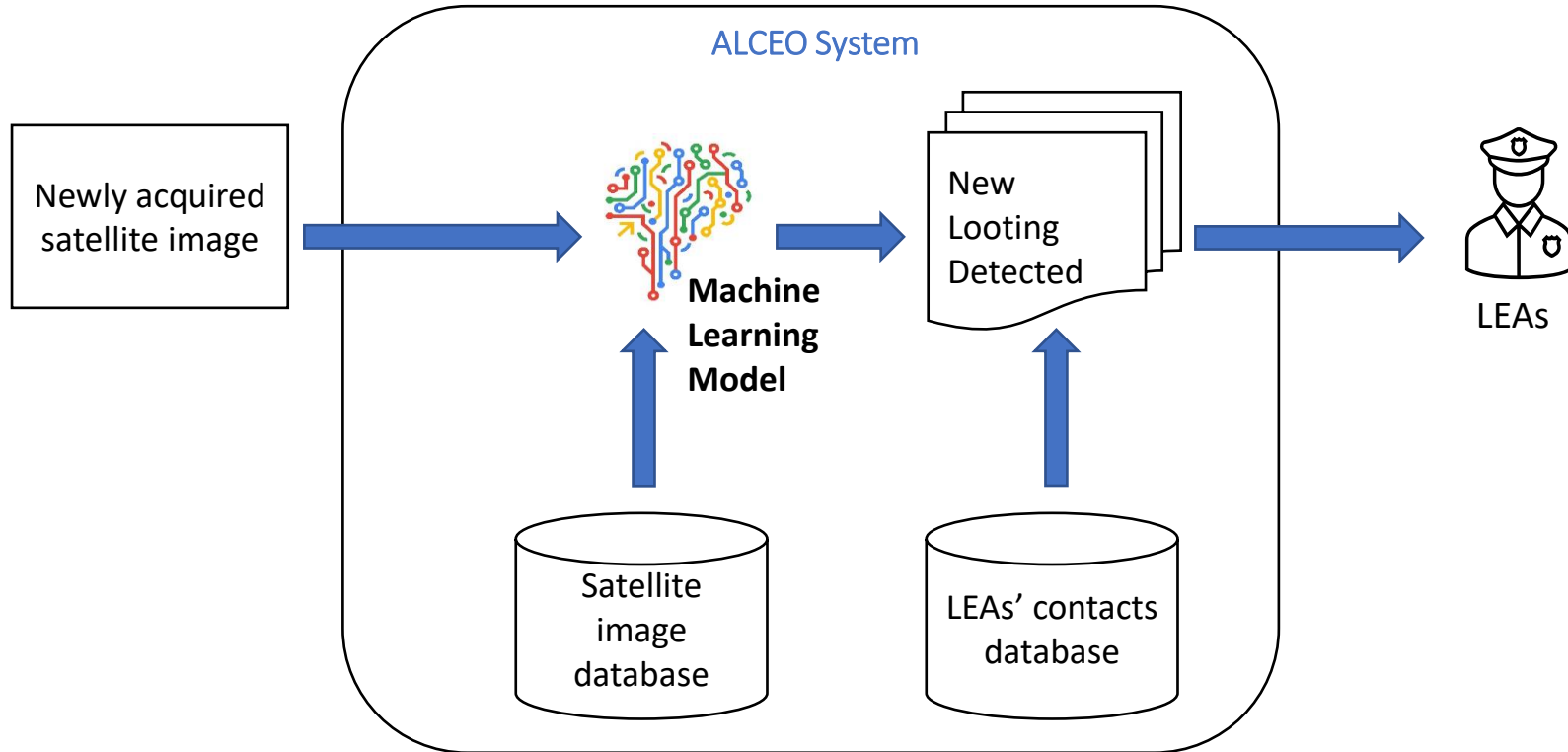
Benefits of Remote Sensing

- Why mapping past looting activities?
  - Modelling criminal behaviour;
  - Preparing the stage for when the revisit time of satellite images will be faster and availability of data increased;
  - Satellite analysis can be used to predict the type and period of antiquities entering the market, providing valuable intelligence for international policing of the illicit antiquities trade.

3D and connected technologies

- Ability to scan cultural heritage objects in 3D:
- Variety of tools available for scanning:
  - Photogrammetry
  - Laser Scanning
  - Structured Light Scanning
- Enables detailed and accurate digital representations
- Preserves and documents cultural heritage objects
- Enhances accessibility and virtual exploration
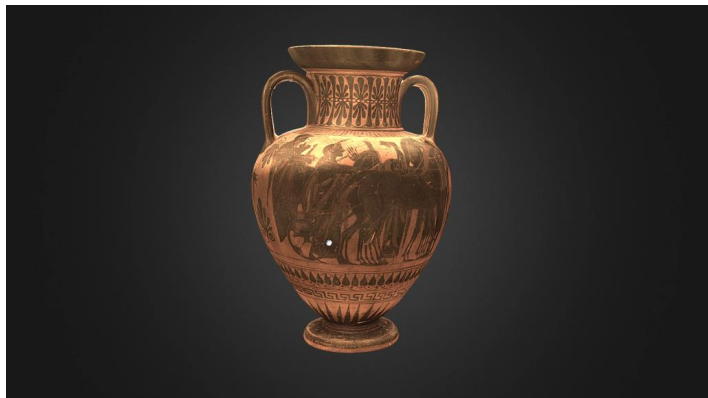- Facilitates research and analysis

Object identification through Image Retrieval of different angulations and details
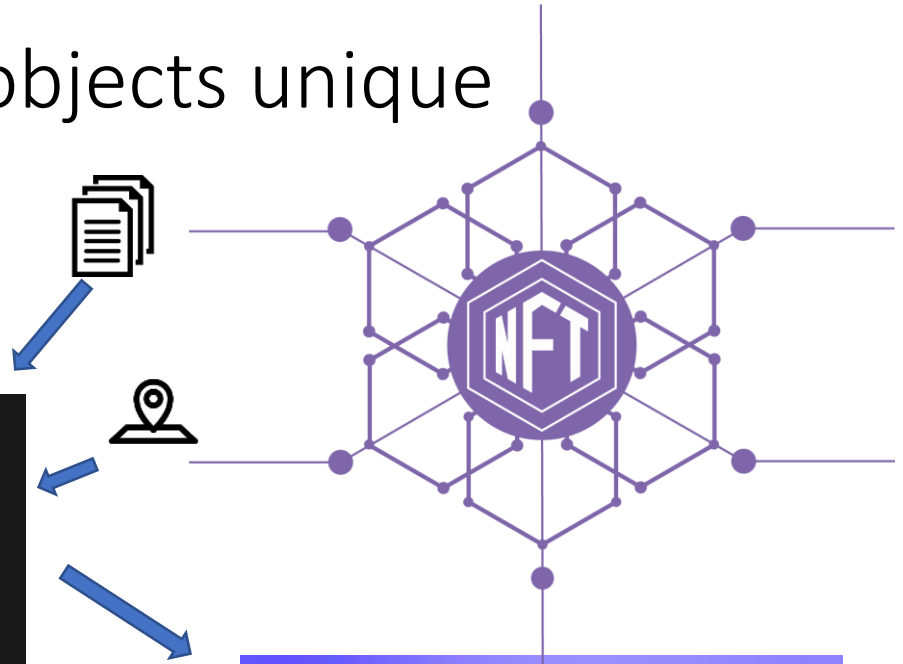

Davis Museum 1973.56: Amphora (terracotta vase) with scenes of Bacchic revelry and a wedding procession, late 6th century B.C.E.

Blockchain: making objects unique

Davis Museum 1973.56:

The future of technologies

- Innovative technologies that are revolutionizing the fight against looting and trafficking of cultural heritage.

- By leveraging these advancements, we are strengthening our ability to detect, prevent, and combat cultural heritage crimes.

- Collaborative efforts among researchers, law enforcement agencies, and cultural institutions are crucial in implementing these technologies effectively.

- Invest in and explore the potential of these technologies, working together to safeguard and preserve our shared cultural heritage.

Thank you for your attention.

🖥 www.ccht.iit.it

👤 Via Torino 155, Venice

in Centre for Cultural Heritage Technology