CEPOL 2022

The ROXANNE platform for supporting Law Enforcement practitioners in criminal investigations by analysing multi-modal data

ROXANNE

Real time network, text, and speaker analytics for combating organized crime

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LEAs' pain points
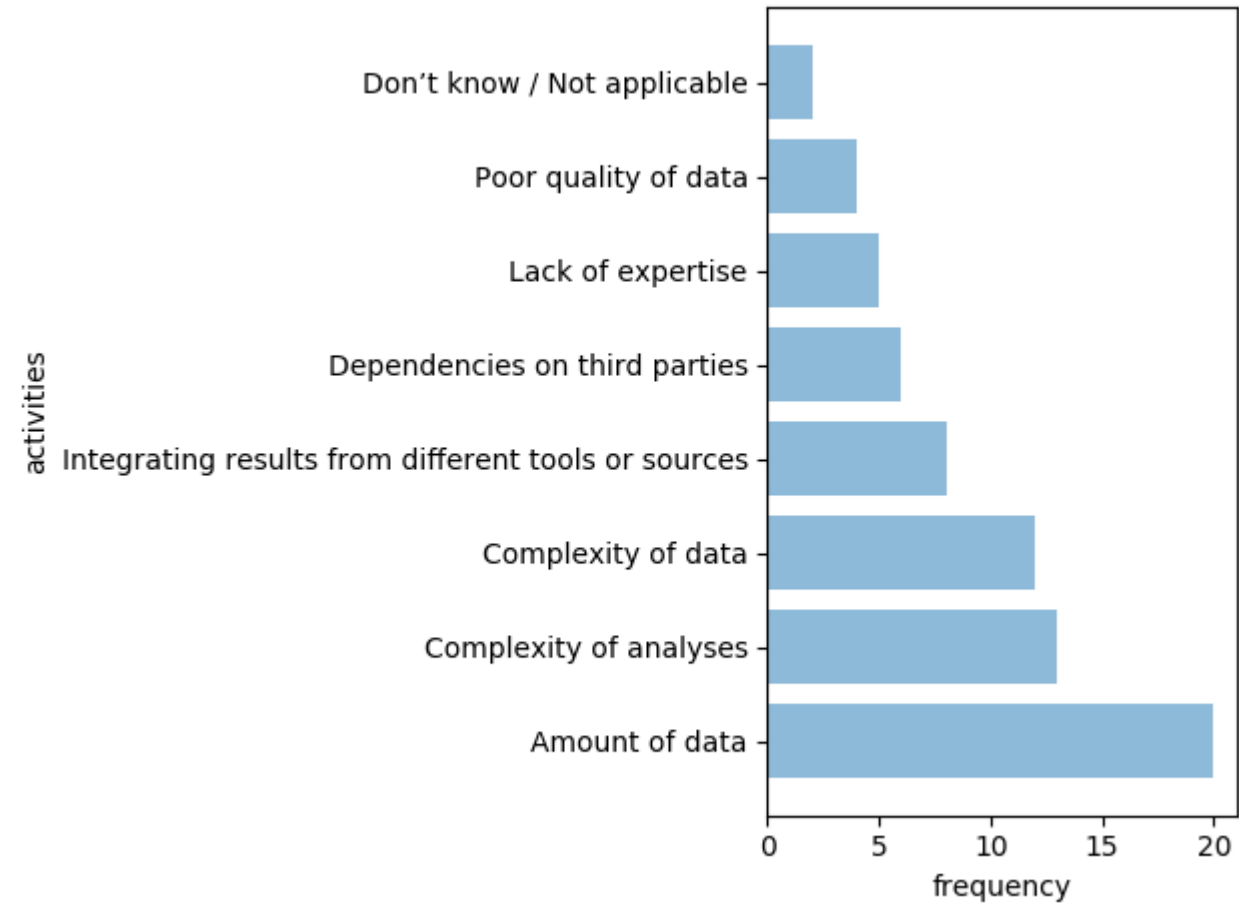
- ROXANNE run a survey on LEAs' requirements

- 121 responses were collected from 40 countries highlighting that amount of data to be processed and analysed is the main pain point

Knowledge level related to ROXANNE learning topics

- ROXANNE also run a survey on LEAs' training requirements

- 31 responses were collected from 8 European countries

Only ~10% of the participants have received some training on all 4 key ROXANNE technologies!
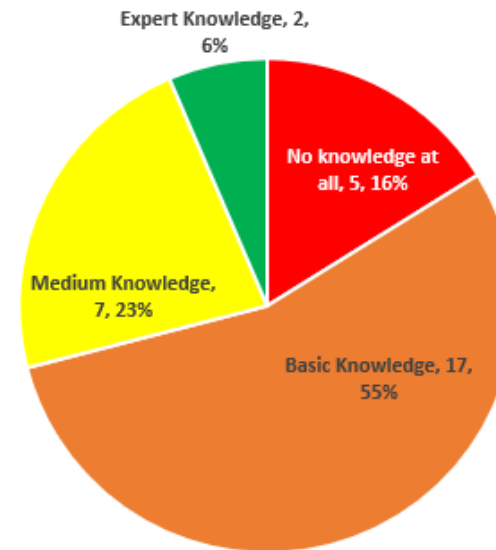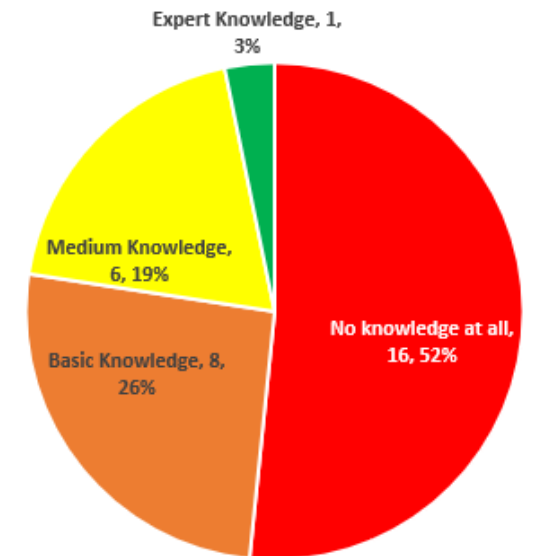

Speaker Identification (SID)

Expert Knowledge, 2, 6%
Medium Knowledge, 4, 13%
Basic Knowledge, 12, 39%
No knowledge at all, 13, 42%

Natural Language Processing (NLP)

Expert Knowledge, 2, 7%
Medium Knowledge, 6, 19%
Basic Knowledge, 10, 32%
No knowledge at all, 13, 42%

Video analysis (VA)

Expert Knowledge, 2, 6%
Medium Knowledge, 7, 23%
Basic Knowledge, 17, 55%
No knowledge at all, 5, 16%

Privacy-enhanced criminal network analysis (NA)

Expert Knowledge, 1, 3%
Medium Knowledge, 6, 19%
Basic Knowledge, 8, 26%
No knowledge at all, 16, 52%

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ROXANNE Objectives

|	
LEA	Speed up investigation of large complex criminal cases (mixing SIM, cross-border, multiple-languages, use of nicknames, detection of leader, innocents, …) and train LEAs on using state-of-the-art technologies
DEV	Platform to combine evidence extracted from multimodal sources with network analysis
RESEARCH	Bi-modal interaction between processing technologies and network analysis
ETHICAL	Implementing an ethics-by-design and privacy-by-design approach

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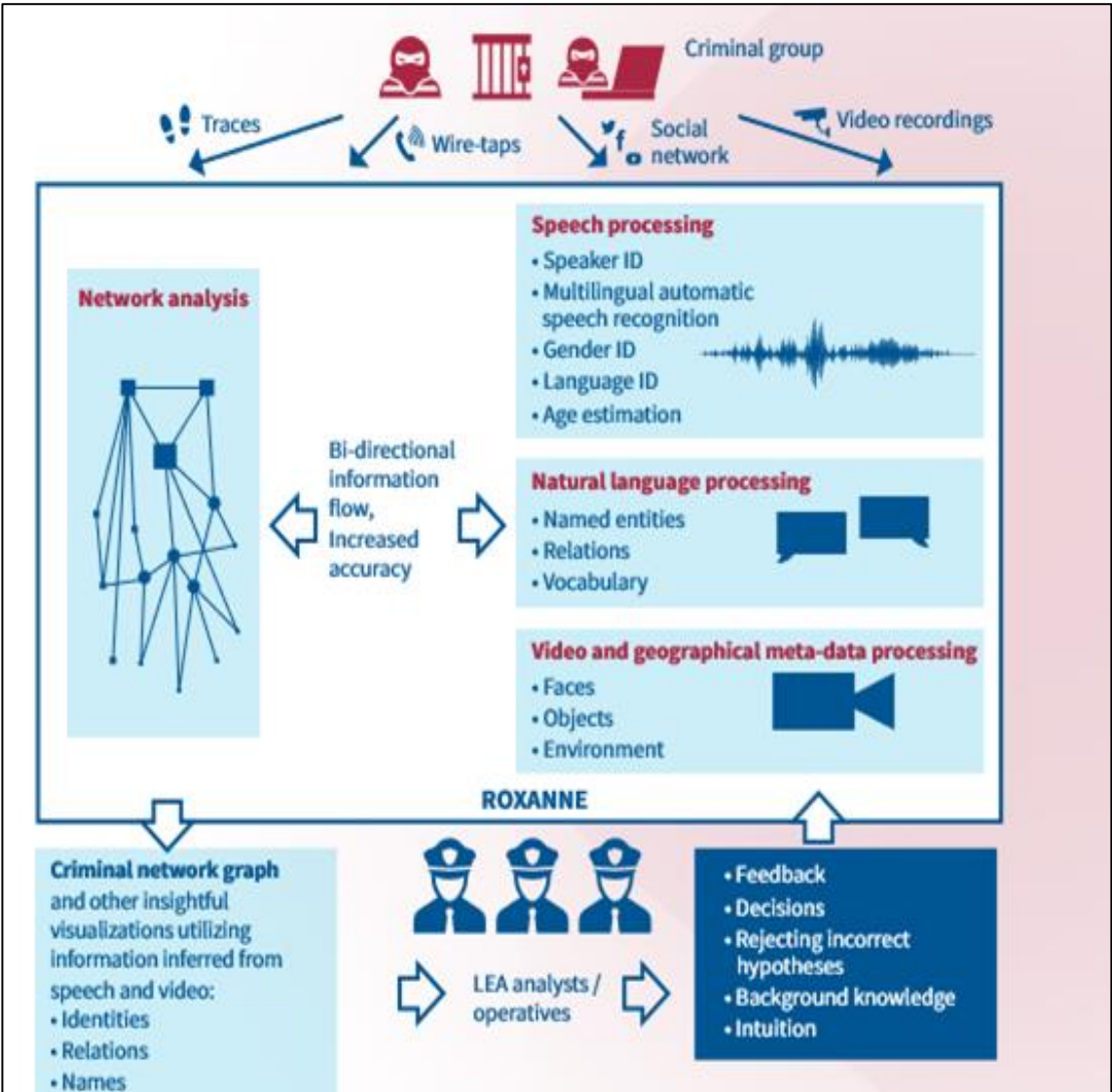
ROXANNE Overview

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Speaker Verification & Network Analysis

A wiretapped call
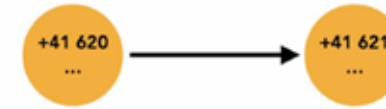
Voiceprint repository

New wiretapped call

Speaker verification process

Updated Voiceprint repository

Network Analysis

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The ROXANNE synthetic dataset

- ROXANNE prepared **a synthetic dataset** of 200+ simulated wiretapped phone calls and related metadata (i.e., Call Details Records (CDR) info)

- The screenplay involves three drug dealing cases
  - **A drug distribution case in Prague universities**
    - The police has wiretapped the two mobile phones of Krystof, as well as some of his partners.
  - **A drug distribution case in Prague city centre**
    - The police has wiretapped the mobile phones of Alexo
  - **A drug lab**
    - The police has wiretapped the mobile phones of Tuan and Hoang

- The investigator uses the Autocrime platform in order to identify whether and how these suspects are connected.

🏠 › Cases Overview

ID: **roxsdv1**
-> audios : 243

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Choose Scenario
Default Dataset ▾

➕ ⚙ open

Create New Case

Training Platform

https://roxanne.kemea-research.gr/

Registration is via invitation only
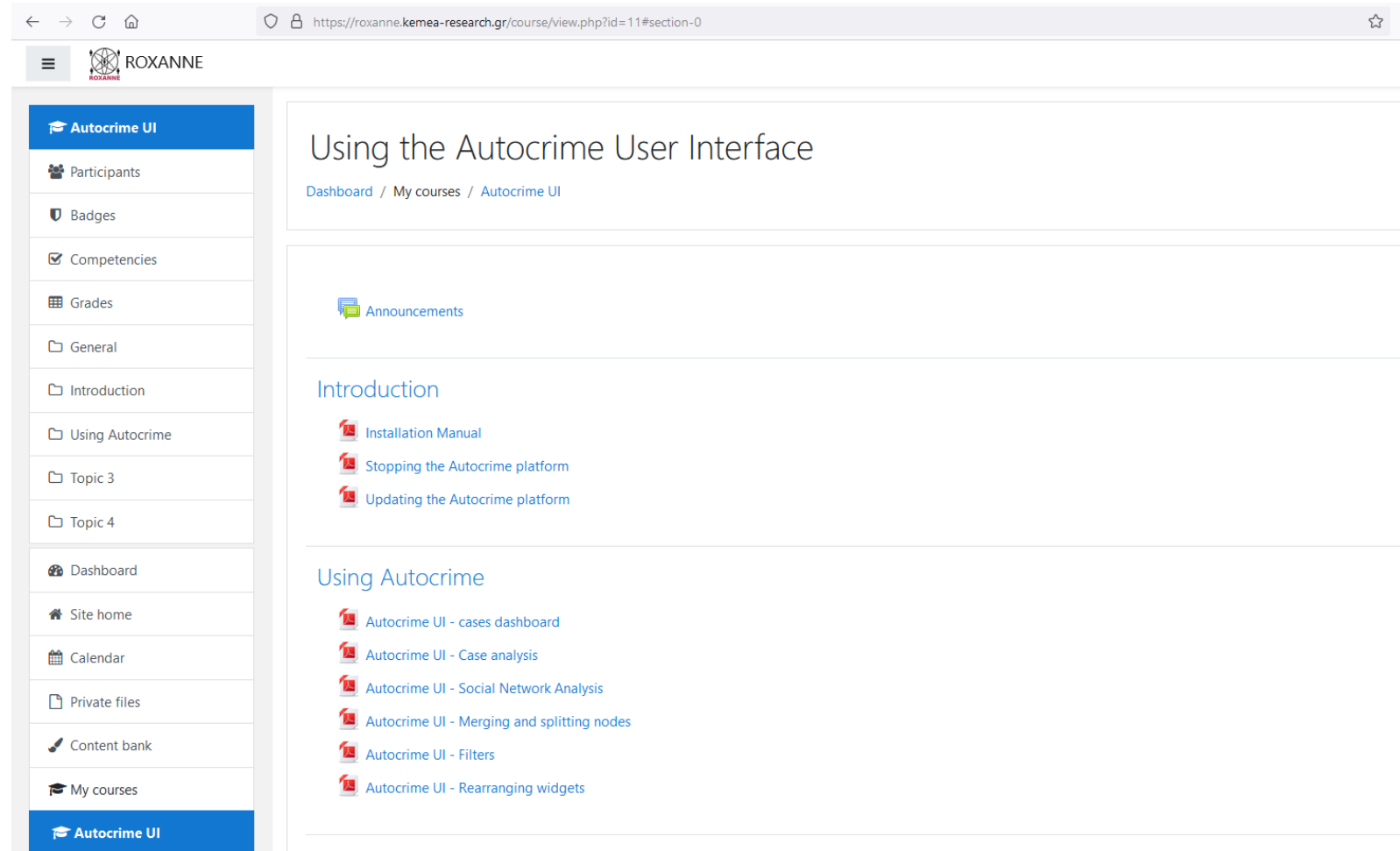
https://docs.google.com/forms/d/e/1FAIpQLSc9kiBOvqmWV2YAqKnkwAIHQLGG49xQhMOFozKmcbR5D-eMaQ/viewform

List of courses

- Autocrime Platform

- Voice Activity Detection (VAD) and Speaker Diarization (DIAR)

- Speaker Identification (SID)

- Voiceprint Extraction

- Gender Identification

- Automatic Speech Recognition

- Topic Detection

- Named Entity Recognition

- Mention Network

- Network Analysis

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Next Steps

- The Autocrime platform is currently being extended to support additional modalities (e.g., video) and export results to other known formats

- On Oct 6th 2022, the ROXANNE project will run the final field test in Lyon, France (INTERPOL premises)
  - Let us know if you are interested to participate on site

- On Jan 2023, the ROXANNE project shall release:
  - the ROXANNE platform **free of charge** to interested LEAs
  - the synthetic dataset to other researchers (expanded to also include videos and chat messages)

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ROXANNE Consortium - Partners

25 Partners across 16 Countries

Thank you!

Any questions?

Backup slides

Autocrime components and interactions
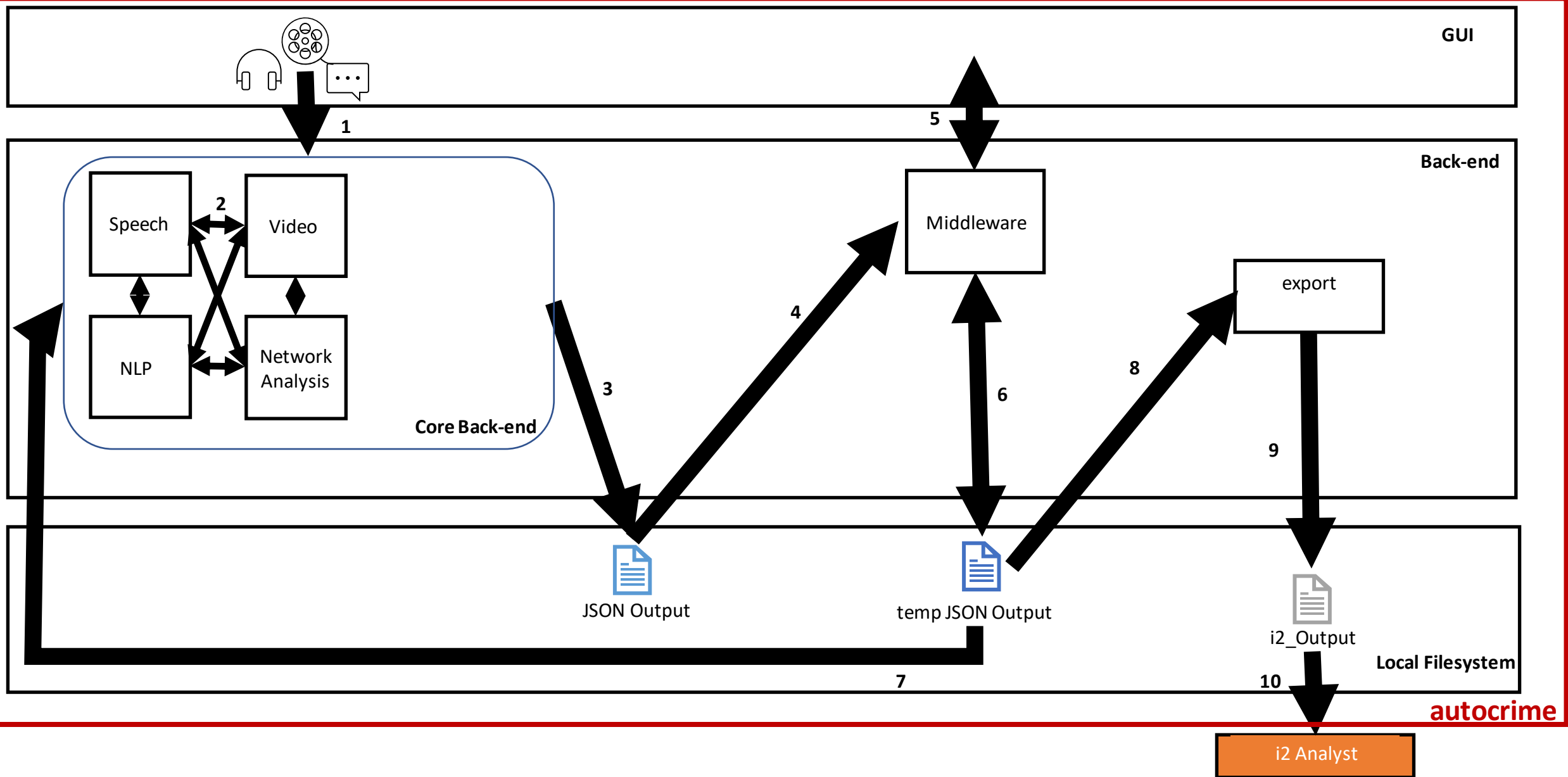
Evaluation of Autocrime Technologies

Technology	Partner(s)	Method	Status	Performance
Speaker Diarization	BUT & Phonexia	Energy-based VAD + VBx	🟢	DER 5.91%
Speaker ID	BUT & Phonexia	ResNet architecture	🟢	99.95% speaker accuracy
Open set Speaker ID	BUT	Same as SID	🟢	90%
Gender ID	Idiap	GMM-based	🟢	66% accuracy
LID	Idiap	ECAPA-TDNN on Speechbrain	🟢	76.5% accuracy
ASR	Idiap	Wav2Vec 2.0 + LM, English	🟢	46.3% Word Error Rate
ASR	HENS	Hybrid TDNN AM + 3-gram LM, English	🟢	48% Word Error Rate
Topic	Idiap	Zero-shot	🟢	Not measured yet
NER	USAAR	BERT-based	🟢	Not measured yet
Mention network	USAAR	Custom co-reference analysis module	🟢	89% accuracy
Network analysis	LUH	Community Detection, Social Influence Analysis, Link Prediction and Node Embedding	🟢	Community Detection: F1-score 75% Link Prediction: 67.22% accuracy (Top-5)