



Declarative Contrast Pattern Mining for Evidence Analysis

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REFERENCE:

Lisi, F.A., Sterlicchio, G.: A declarative approach to contrast pattern mining. In 21st International Conference of the Italian Association for Artificial Intelligence (AIxIA 2022)



EVIDENCE ANALYSIS

Process of analysis of the evidence collected from digital devices related to a crime

DIGforASP

MOBILE PHONE RECORDS

Communication (SMS, calls) between suspects, features:

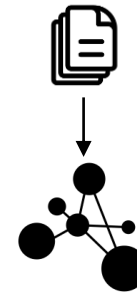
- Communication type
- Caller, Callee
- Street
- Time
- Duration
- Date



DECLARATIVE SOLUTION WITH ASP

KNOWLEDGE REPRESENTATION

Answer Set Programming (ASP) encoding of the mobile phone records



CONTRAST PATTERN MINING

ASP encoding to identify the characteristics of each suspect habit in contrast to other type of communication



```
...
Answer: 4
in_pattern(weekday(4)) absolute_diff(14)
...
Answer: 6
in_pattern(time(afternoon)) absolute_diff(34)
...
Answer: 8
in_pattern(time(morning)) absolute_diff(37)
```

CONCLUSION:

Declarative pattern mining provide a suite of powerful tools for evidence analysis in Digital Forensics. Declarative frameworks like ASP are very interesting in application domains where the requirement of transparency is particularly crucial. This is the basic motivation of a renewed interest of the AI community in declarative approaches.