



VIDENTIFIER™
FORENSIC

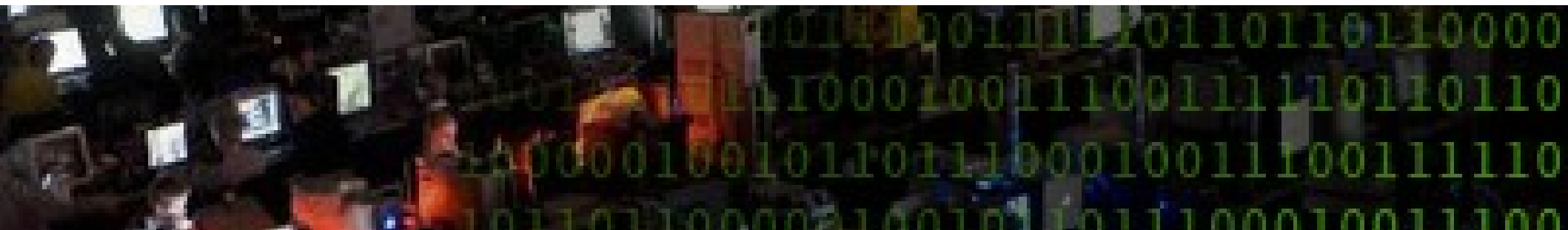
Video and Image Identification:

Tools for Supporting Forensic Investigations

Herwig Lejsek
Videntifier Technologies

The Problem

- Large amount of Multimedia online
 - Still increasing every year
 - How to prevent cyber-crime?
- What kind of Multimedia material?
 - Child abuse material (CAM) – videos & pictures
 - Terrorist / Extremist material
 - Copyright protected material



Current Forensic Process



1. Seized Storage Devices



2. Clone the Content

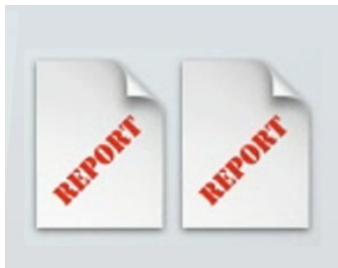


3. Forensic Software

- Encase Forensic
- Forensic Toolkit



4. Manually identify Video Files



5. Print Report

Example: Denmark

- 800-900 cases per year in Denmark
 - Each case ~250 GB of data, ~ 500 video files



Manual Inspection:
8 hours / case

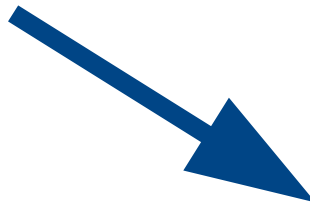
Annual Time:

$8 \text{ hours} \times 800 \text{ cases} = 6.400 \text{ man-hours}$

Fight against Cyber Crime



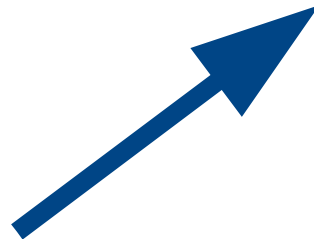
NGOs



Police Authorities



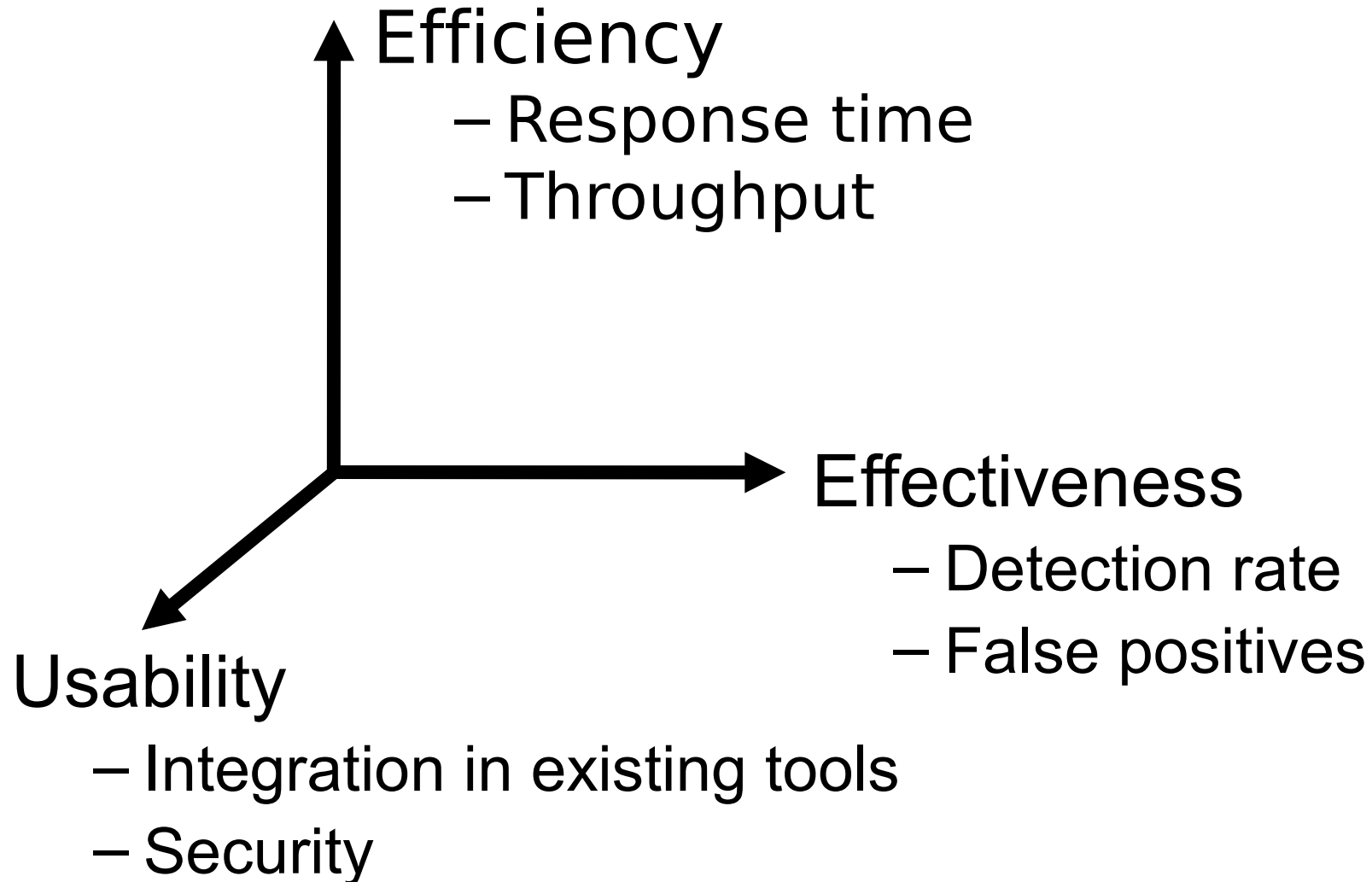
Internet Providers



Outline

- *Introduction*
 - *Embedding of the Problem*
-
- Requirements for Technical Solutions
 - Videntifier Forensic System
 - Performance Evaluation: 25,000 hours of Video
 - Related Work
 - Summary

Key Parameters



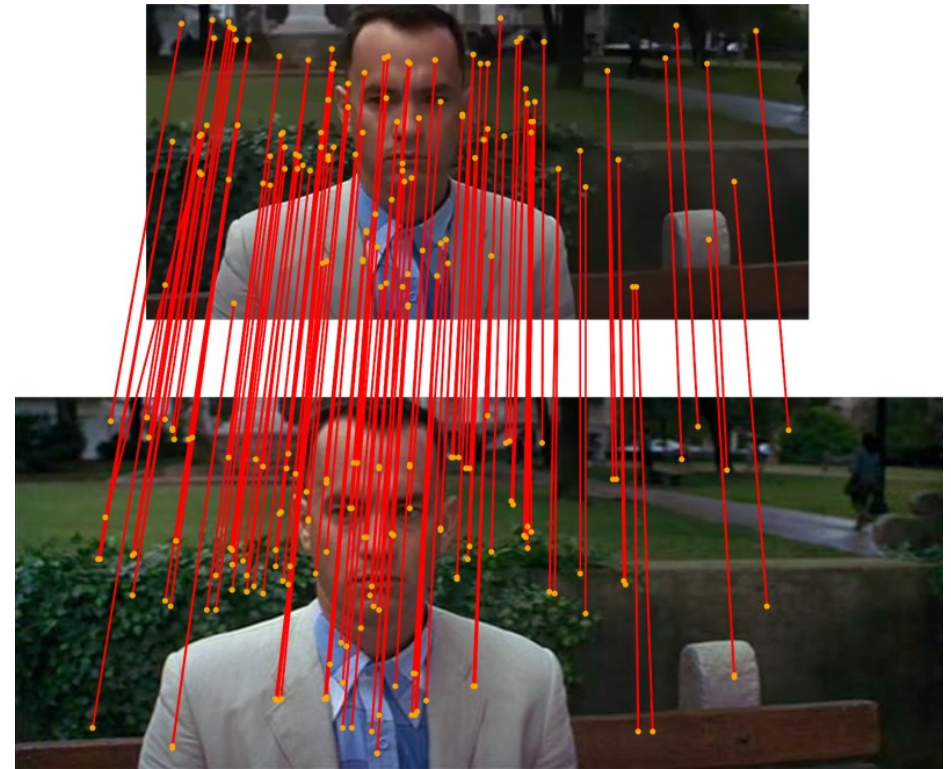
Our Tool



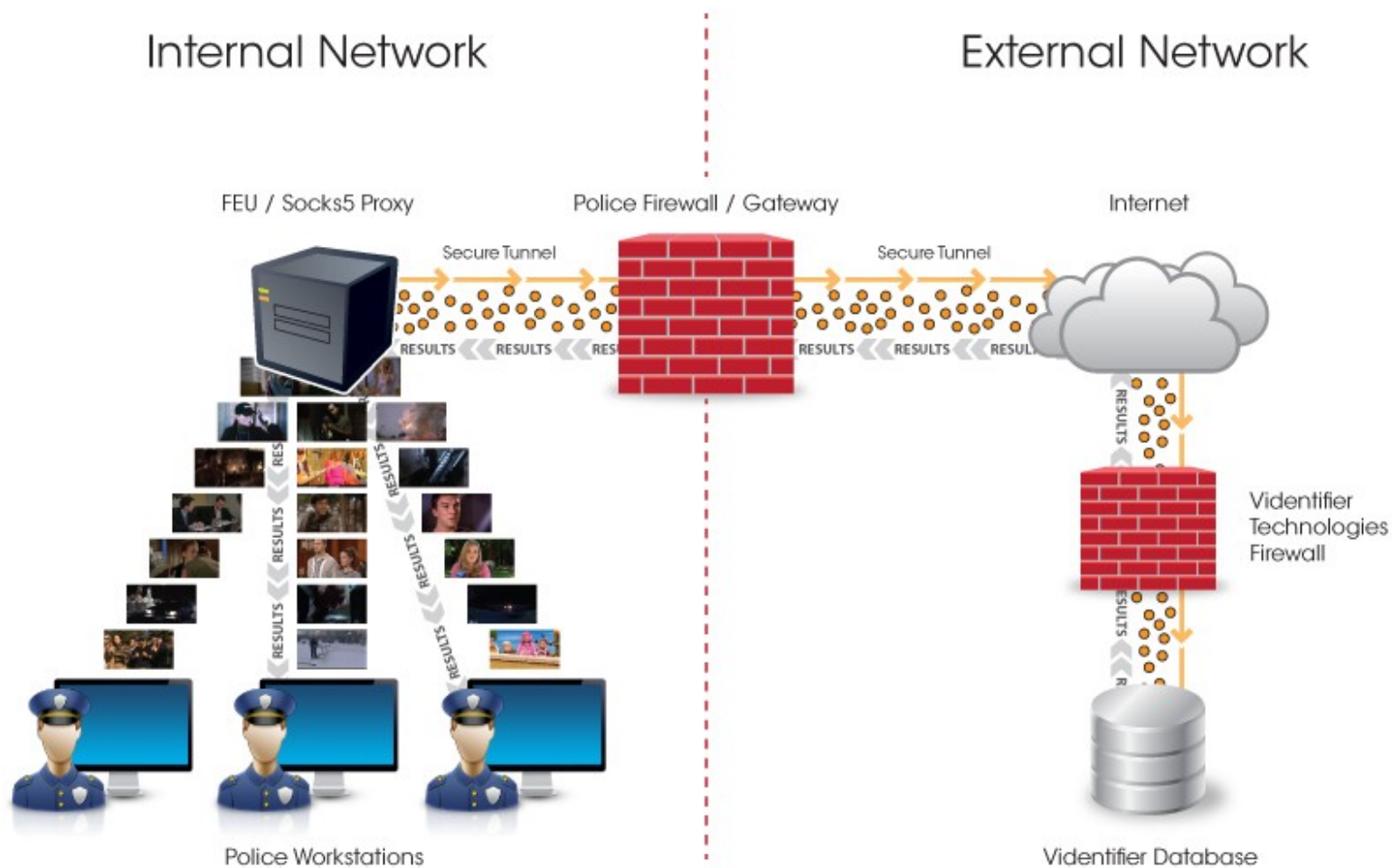
VIDENTIFIER™
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How We Identify Videos

- Identification by Remembering
 - Robust against transformations
 - Insert of new videos
- No Learning
- 4 Components
 - GPU-Eff² descriptors
 - Extended filter
 - NV-Tree database
 - Alarm detector

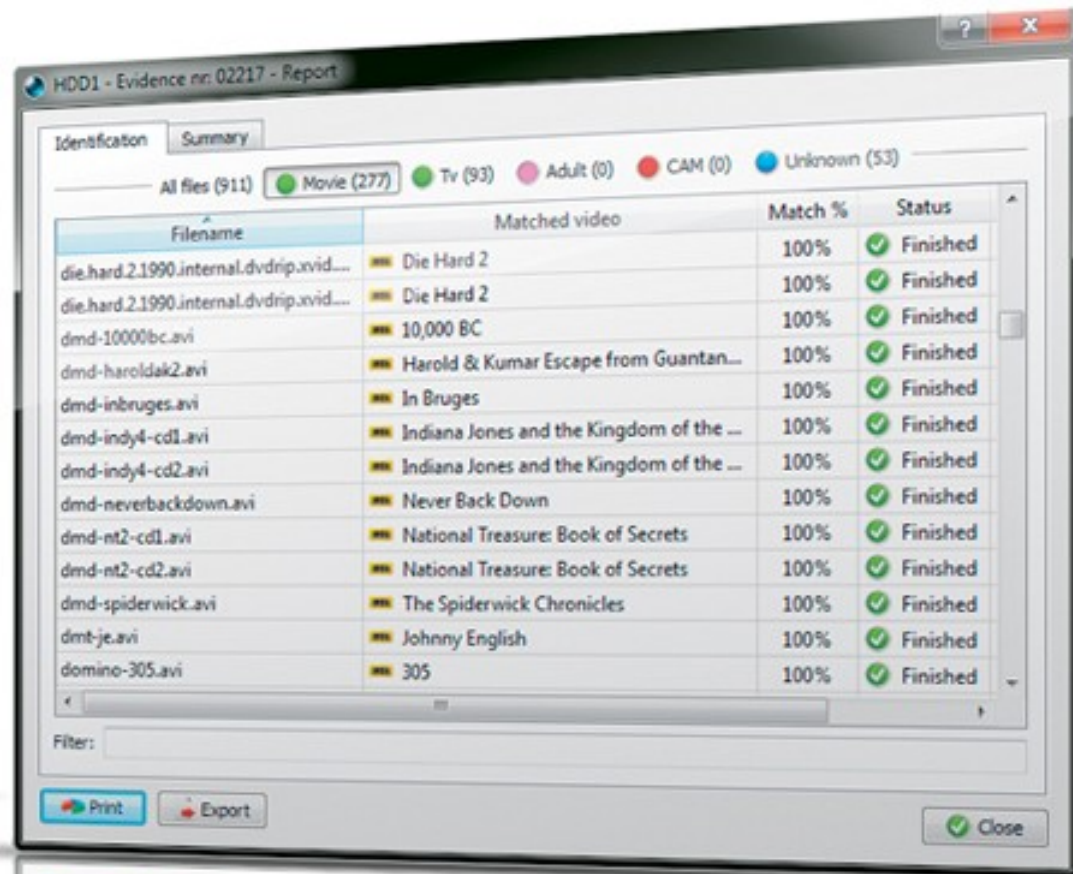


System Setup



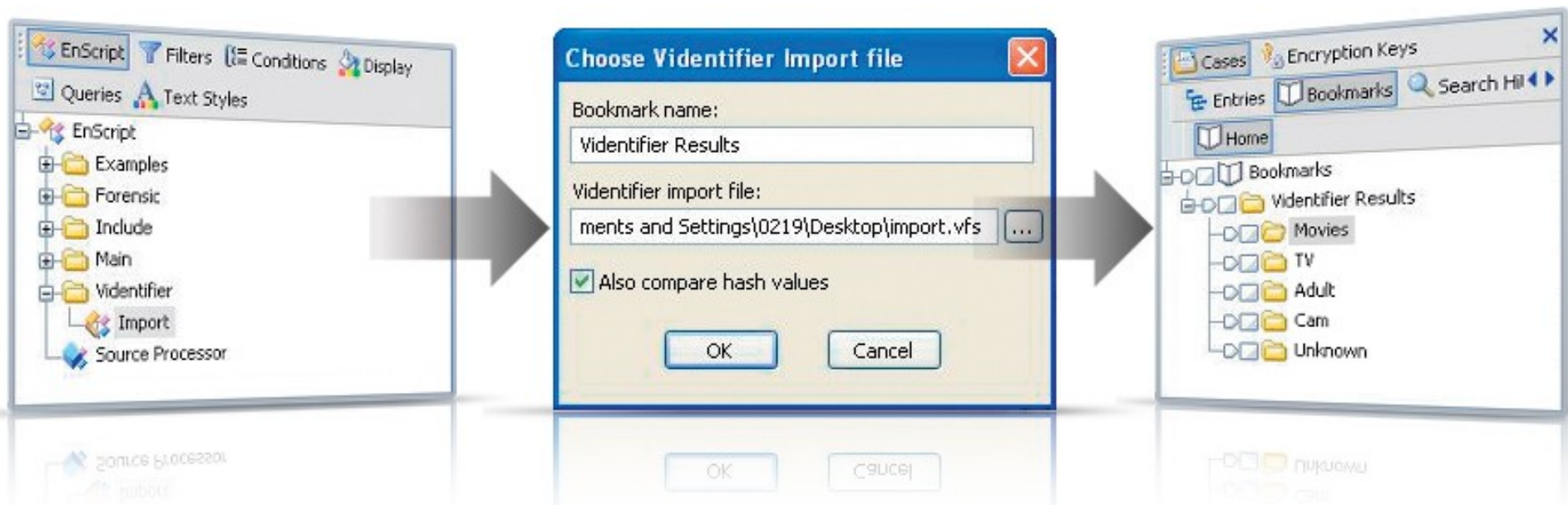
No risk of leaking actual video material!

Easy to Use Graphical Interface



Export Features

- Easy export into forensic software systems
 - Flexible bookmarking and reporting
 - Easily extensible using EnScript



Videntifier™ Database

- Fingerprints from 25.000 hours of video
 - Hollywood movies
 - TV shows
 - Adult material
- Danish Police
 - Child Abuse Material



Acceptance Test

- Performed by the Icelandic Police
 - Police selected 112 video clips
 - Inserted in the service
 - 33 modifications
 - $33 * 112 = 3,696$ queries

Detection Rate

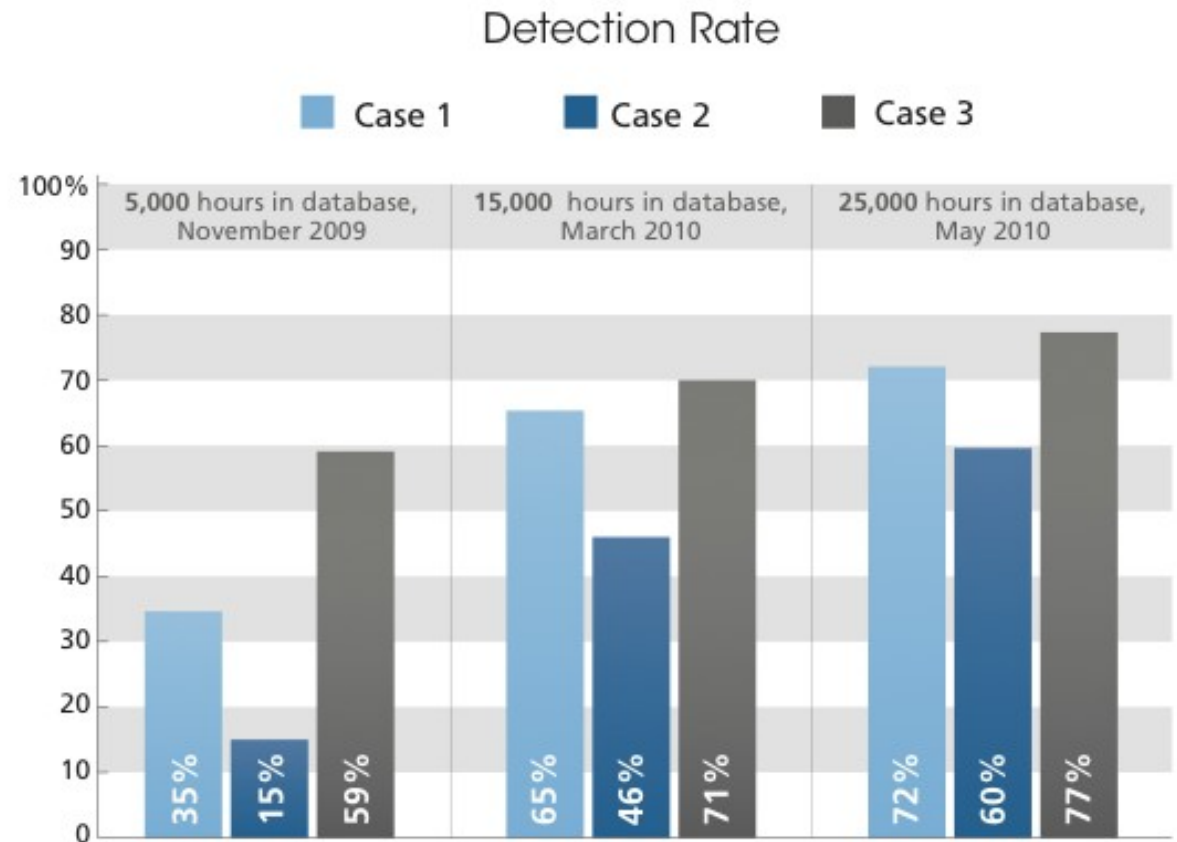
- **98.6% for 100 hours**
- **95.6% for 25,000 hours**
- **No False Positives**



Identification Rate

- Measurements on 3 cases

- Identification increases with database size
- Saves up to 70% of identification time



Next Steps

- **Scale, Scale, Scale!**
 - Goal 100.000+ hours
 - Faster extraction
 - Better handling of specific modifications
- **Extend the service**
 - More customers
 - Flexible categorization
 - Image / logo search



Related Work

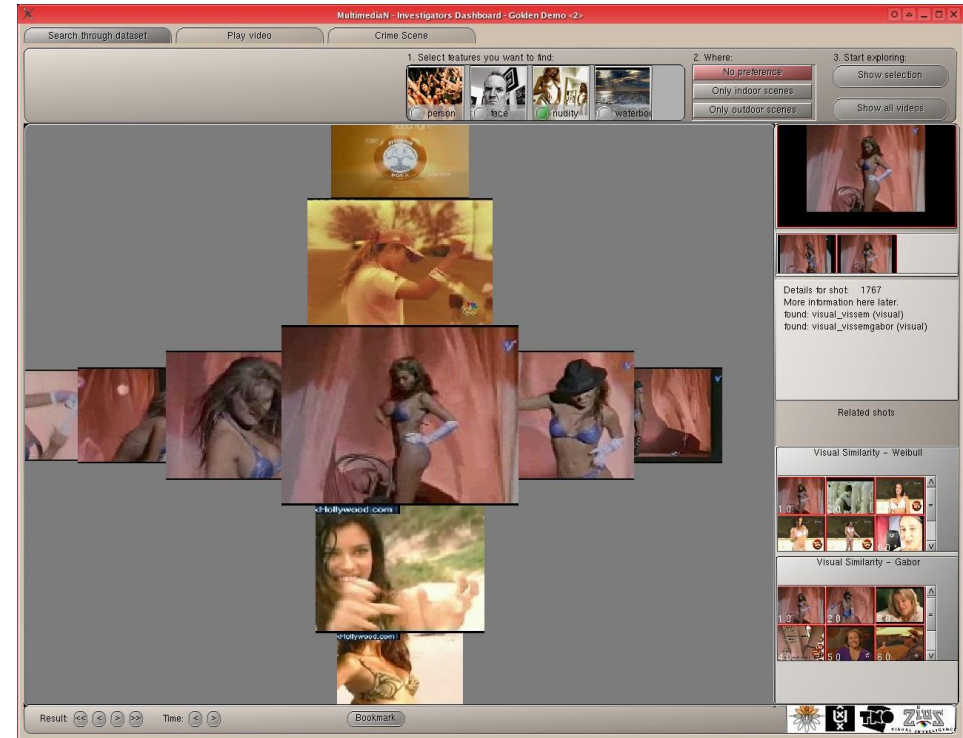
- i-DASH 
 - Investigators Dashboard
- FIVES
 - Forensic Image and Video Examination Support

I-Dash

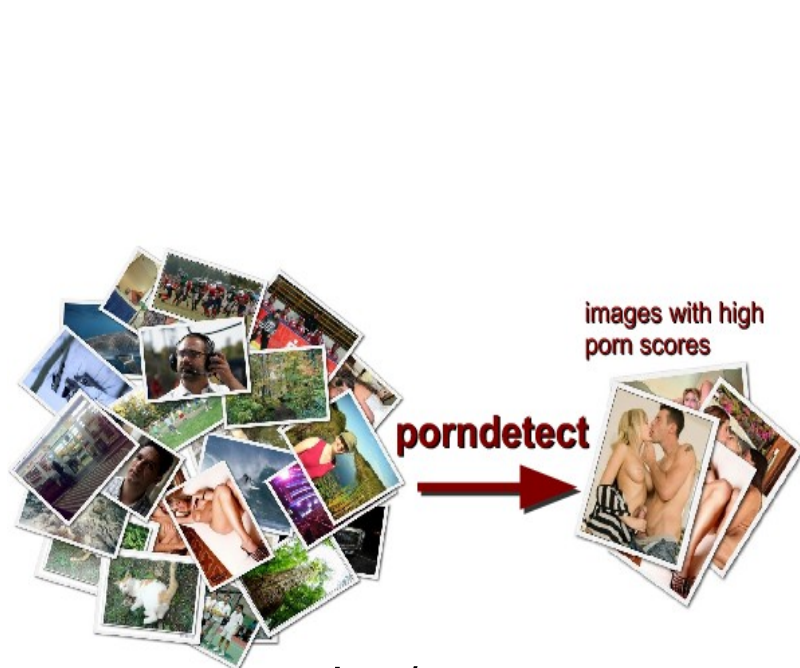
- Fingerprinting videos containing child pornography
 - Establishing links between videos
- Standard for exchanging video fingerprints
 - Increase collaboration
 - European database of CAM fingerprints

Semantic Features

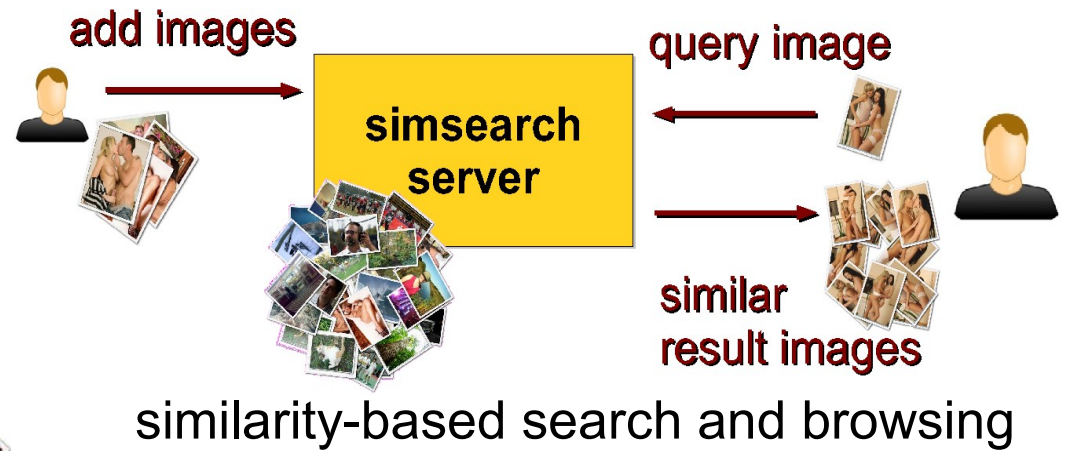
- Advanced video browsing
- Interactive search
 - Genre classification
 - Concept search
 - Object/location matching
 - Video linking



FIVES Functionality - Images



pornography /
child pornography detection



similarity-based search and browsing



text extraction and face extraction

FIVES Functionality - Video



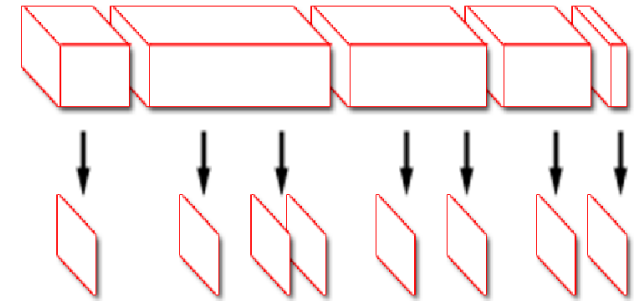
**porndetect-
video**



video scenes with
high porn scores



video porn detection



keyframe extraction
(+ image functionality)



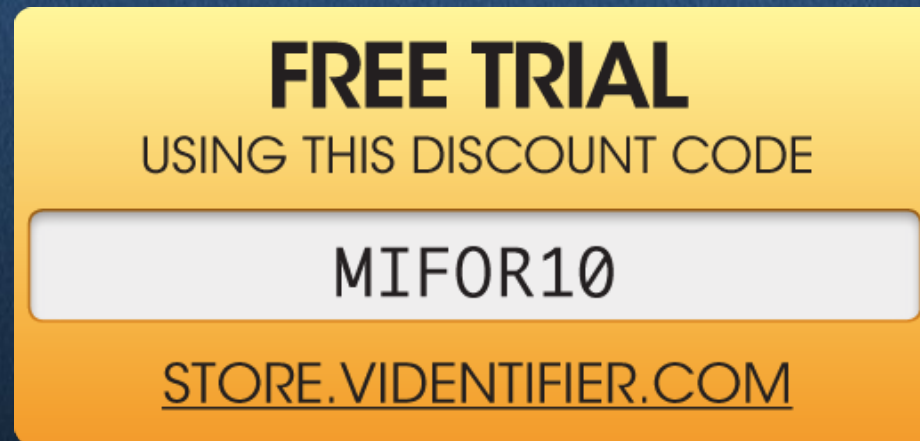
video summaries

Summary

- Problem of forensic investigation
 - Large amount of multimedia
- 3 projects working on forensic tools
 - Videntifier Forensic, i-Dash, FIVES
- Performance of Videntifier Forensic
 - With a large video fingerprint database

Try it out!

- Videntifier Forensic - 1 month free trial



- 2-3 research/development positions open
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