



# Privacy-Preserving CCTV Analytics for Cyber-Physical Threat Intelligence

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SECURING CRITICAL INFRASTRUCTURES OF THE FINANCIAL SECTOR



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# CCTV Footage for Physical Threat Intelligence



## CCTV footage is ubiquitous today

- Surveillance of public and critical infrastructure
- Financial Services: Security of ATM areas and bank branch offices
- Data Centers: Security of rack spaces and data center environments

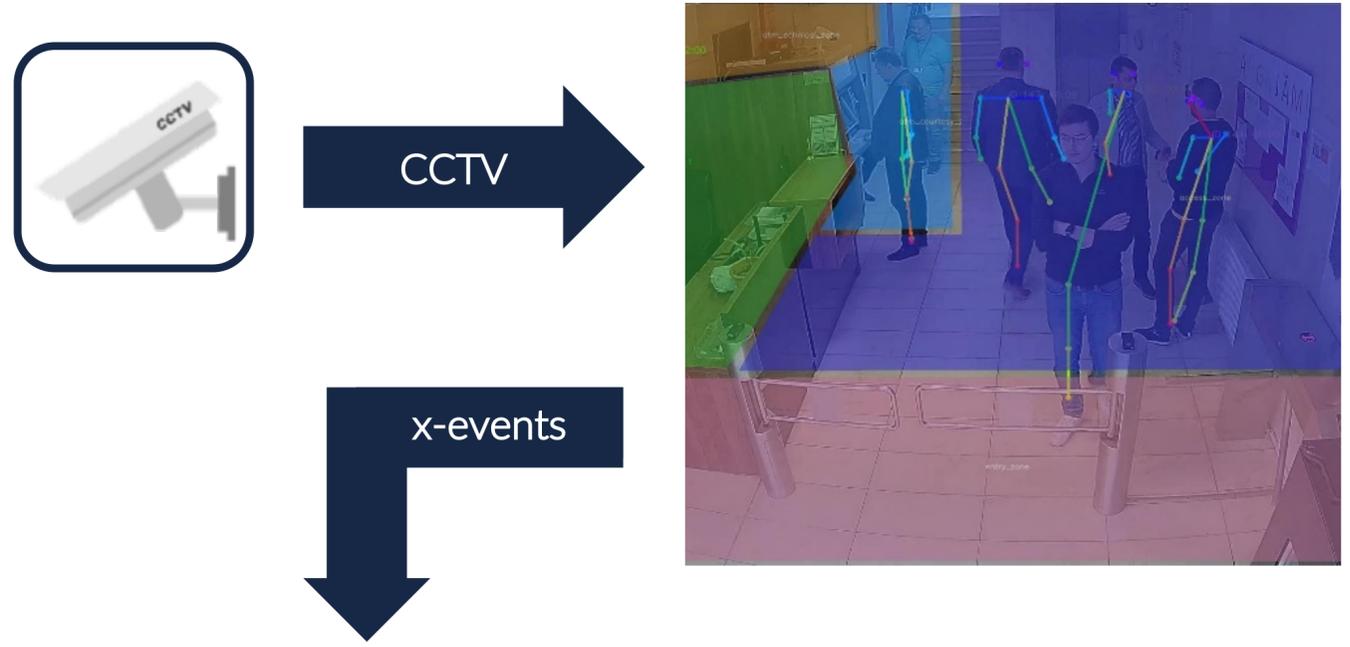
## Enable CCTV beyond forensics

- Facilitate **privacy preserving** CCTV and threat detection
- Support **automated** Anomaly Detection and prediction of threats
- **Integrate** with common (cyber) threat management

# AI-based CCTV Analytics

## Automated & GDPR compliant detection of physical events that may cause threats

- Detection of bodies or body parts in a marked area of a CCTV footage without identification of persons
- Analysis of body poses or actions
- Issuing anonymous FINSTIX x-Events to the FINSEC platform for further security analysis and physical/cyber threat correlation
- PIA based on CNIL methodology



ID	Name	Description	Created	Modified
x-event-7d575114-e5c2-11e9-843e-f43009ad1090	Exit	Exit field of view of camera	2019-10-08 13:55:15.3298	2019-10-08 13:55:15.3298
x-event-7d575114-e5c2-11e9-843e-f43009ad1090	Enter	Enter field of view of camera	2019-10-08 13:55:15.3298	2019-10-08 13:55:15.3298
x-event-7d575114-e5c2-11e9-843e-f43009ad1090	Exit	Exit field of view of camera	2019-10-08 13:55:15.3298	2019-10-08 13:55:15.3298
x-event-7d575114-e5c2-11e9-843e-f43009ad1090	Enter	Enter field of view of camera	2019-10-08 13:55:15.3298	2019-10-08 13:55:15.3298
x-event-7d575114-e5c2-11e9-843e-f43009ad1090	Enter	Enter field of view of camera	2019-10-08 13:55:15.3298	2019-10-08 13:55:15.3298



# Demonstration – Real World at ATM

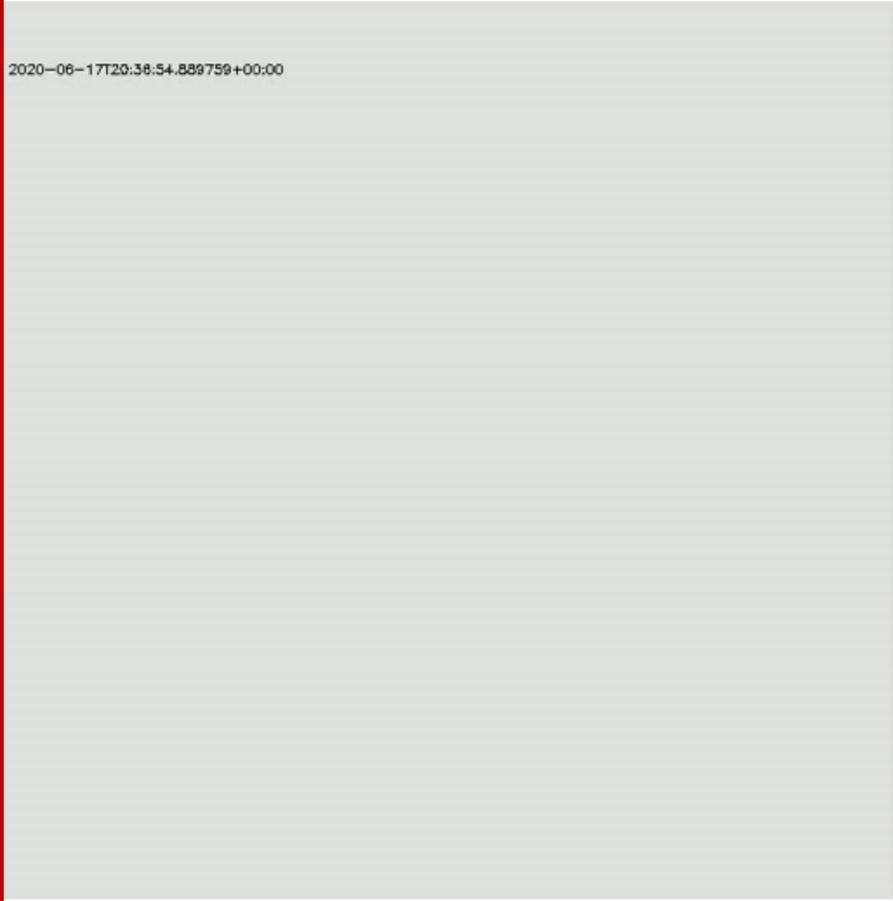


```
EVENT x--event--8b5d7874-aedf-11ea-93a2-0242ac1a0002 : enter  
2020-08-19 10:00:36.7632+0000  
body_part : Hand  
area_label : atm_hands  
tracker_id : 3  
event_type : enter  
  
EVENT x--event--8b318748-aedf-11ea-93a2-0242ac1a0002 : slow_down  
body_speed_part : Neck  
body_speed_threshold : 10.0  
tracker_id : 4  
event_type : slow_down  
  
EVENT x--event--8b5d15aa-aedf-11ea-93a2-0242ac1a0002 : exit  
body_part : Neck  
area_label : atm_body  
tracker_id : 1  
event_type : exit  
  
EVENT x--event--8b5d1fd4-aedf-11ea-93a2-0242ac1a0002 : exit  
body_part : LHand  
area_label : atm_body  
tracker_id : 1  
event_type : exit  
  
EVENT x--event--8b5d263c-aedf-11ea-93a2-0242ac1a0002 : exit  
body_part : LAnkle  
area_label : atm_queue  
tracker_id : 1  
event_type : exit
```

Video Footage

Security Events

# Demonstration – Tracking – Floor Map

 <p>A video frame showing a person walking through a hallway. The person is wearing a dark jacket and pants. Several small, semi-transparent numbers are overlaid on the person's body, indicating tracking data. The hallway contains a desk, a chair, and a potted plant. Text labels 'passage_2' and 'ATM_cled' are visible on the floor.</p>	 <p>A floor map visualization of the same hallway. A blue line indicates the path of the person shown in the video. The map shows the layout of the room, including the desk, chair, and plant. A timestamp '2020-06-17T20:36:54.889759+00:00' is visible in the top right corner.</p>	 <p>A panel for security events, currently empty. A timestamp '2020-06-17T20:36:54.889759+00:00' is visible in the top right corner.</p>
<p>Video Footage</p>	<p>Floor Map</p>	<p>Security Events</p>

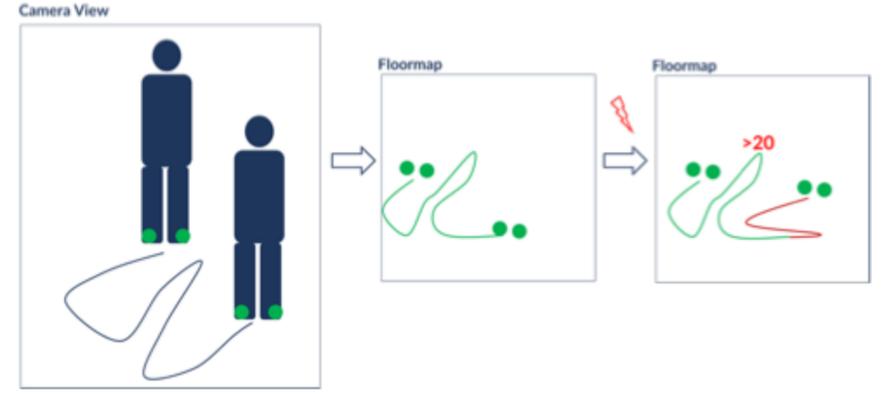
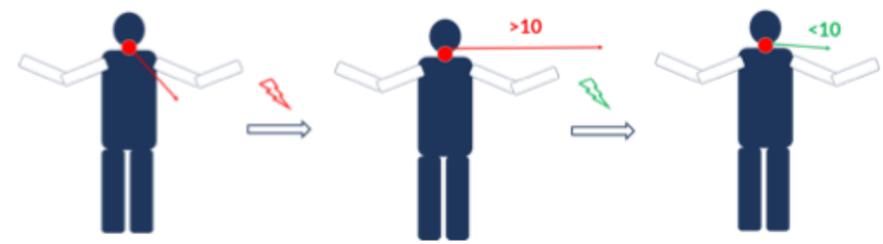
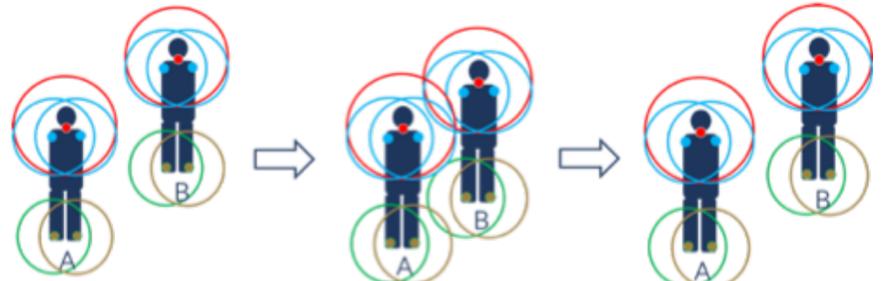
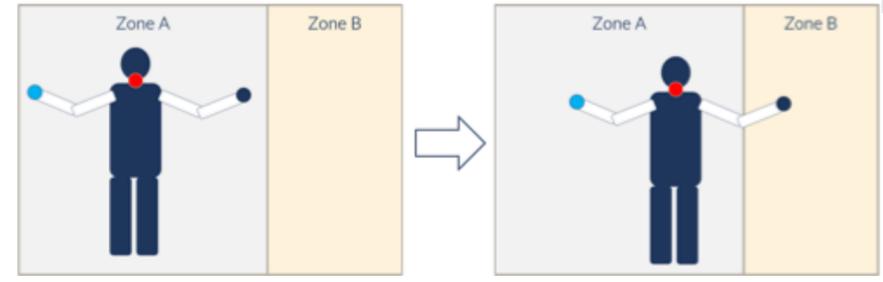
# Privacy-Preserving CCTV Analytics for Cyber-Physical Threat Intelligence

- Motivation: Combine Cyber & Physical Threats**
- Integration of physical Security in automated Security event management
  - Facilitate unified analysis of physical and cyber events for anomaly detection and prediction
  - Preserve privacy in physical threat monitoring by anonymous tracking and events
  - Applicability in common and well-known Data Centre and ATM security scenarios
  - COVID-19 related application scenarios for this technology in Public Safety & Security.



Detection & Tracking of Body Parts

## Pose Analysis & Event Generation



Finsec Table

ID	Name	Description	Created	Modified
x-event-7eb749cb-e9c2-11e9-842e-f43099ad1090	Exit RWrst	Exit field of view of camera	2019-10-08 13:55:16.329861+02:00	2019-10-08 13:55:16.3298
x-event-7e575114-e9c2-11e9-842e-f43099ad1090	Enter RWrst	Enter field of view of camera	2019-10-08 13:55:16.329861+02:00	2019-10-08 13:55:16.3298
x-event-7e57511e-e9c2-11e9-842e-f43099ad1090	Exit LWrst	Exit field of view of camera	2019-10-08 13:55:16.329861+02:00	2019-10-08 13:55:16.3298
x-event-7e57511c-e9c2-11e9-842e-f43099ad1090	Enter LWrst	Enter field of view of camera	2019-10-08 13:55:16.329861+02:00	2019-10-08 13:55:16.3298
x-event-7f71e85c-e9c2-11e9-842e-f43099ad1090	Enter RWrst	Enter field of view of camera	2019-10-08 13:55:18.187286+02:00	2019-10-08 13:55:18.1872

## Security Event Management

## Towards an intelligent Sensor



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# Validation – Scenario Data Centre

## Security relevant: Opening a rack following a security procedure

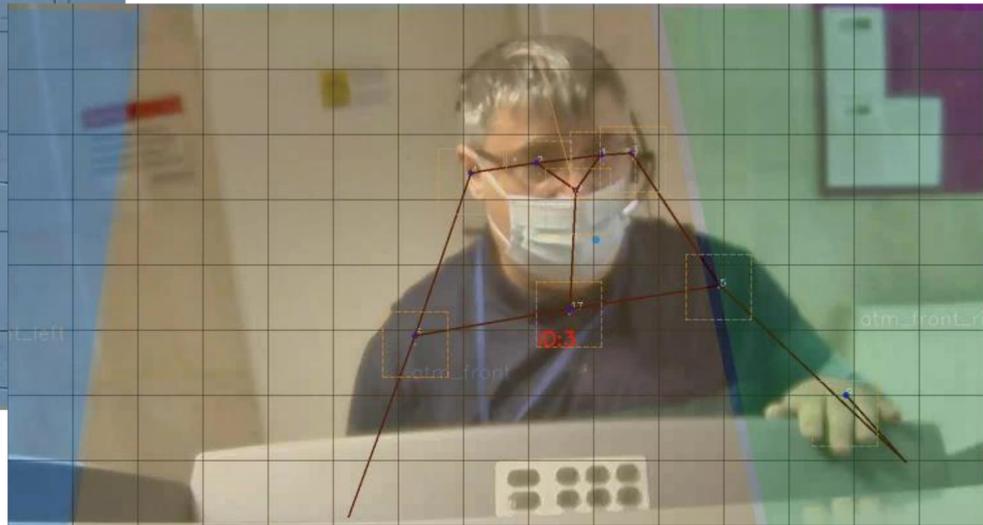


**Objective:** Detect and track interaction with rack's keyholes by two independent agents

# Validation – Scenario ATM

Objective: Detect persons in ATM zone and track interaction

## Security Relevant: Malicious Interactions at/with ATM



### ATM-UC1 - Attack to Person

- Min 2 people in scene
- Proximity lower than 1m

### ATM-UC2 – Attack to ATM

- Enter ATM-Zone (must)

### ATM-UC3 – Loitering

- Staying in an area/scene for longer than time  $t_0$
- length of trajectory

### ATM-UC4 – Introduction of Malware (incl. UC2)

- Enter ATM zone
- Staying in an area/scene for longer than time  $t_1$

### ATM-UC5 – Jackpotting (incl. UC2 / UC4)

- min. 2 people in the ATM zone (must)
- Staying in an area/scene for longer than time  $t_2$

# Takeaways / Conclusions

- Privacy preserving automated CCTV analysis shall benefit physical security and safety of critical and public infrastructures
- FCAS is a privacy preserving probe providing only FINSTIX x-Events to a data or Security platform (e.g. SIEM)
- The development of edge based analytics is ongoing
- FCAS is validated in Data Centre and ATM use cases
- Other application areas:
  - Shops, Malls, Smart City, Public Security & Safety
  - For instance: COVID-19 scenarios (masking, distance, etc.)



# Many thanks for your interest and your time!



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# CCTV Footage for Physical Threat Intelligence



**How ATMs can**  
By Enterprise Security

Tweet Share



or the software to gain  
operators need to embr  
mentions some ways by

• **Guarding Against Ph**

ATMs should have gl  
vulnerable areas. A phy  
automated can be a ble  
imaging and image-pro  
mechanisms can be use  
block robbery attempt  
sensors could also be  
readers. Besides, peri  
valuable.



# CCTV Footage for Physical Threat Intelligence



HOME > OPINIONS > RACKS & CABINETS

## Data center physical hacks: How to safeguard equipment in cabinets

**Rack Solutions Blog** Home Categories Shop

**Data center physical security**  
July 7, 2020 | blog

### Securing the Physical Safety of Data with Rack-Level Access Control

In our networked and internet-dependent world, securing personal and business data from theft, hacking and other forms of cybercrime has become an issue of paramount importance – and the world’s data centers, where data has its physical presence, are key points where multiple layers of security need to be established and sustained.

Consider just two of the many documented costs of cybercrime:

- Database breaches cost global organizations over \$3.62 million annually, based on a 2017 industry study.

Physical data potentially demand a larger initial investment than their being exposed is due to trust in affiliated companies’ about how physical security, among other factors, stacks

### tiers

security structure. Each layer represents the security



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