WISENET

Hanwha Techwin

R&D Center

2017.10.31

Hanwha Techwin

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CCTV의 현재와 미래

□ AI city

Background (1/3)

□ CCTV 시스템에서 유의미한 정보 추출

Network Camera

NVR (Network Video Recorder)

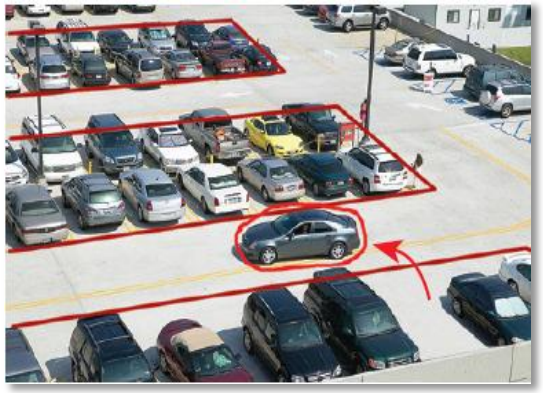
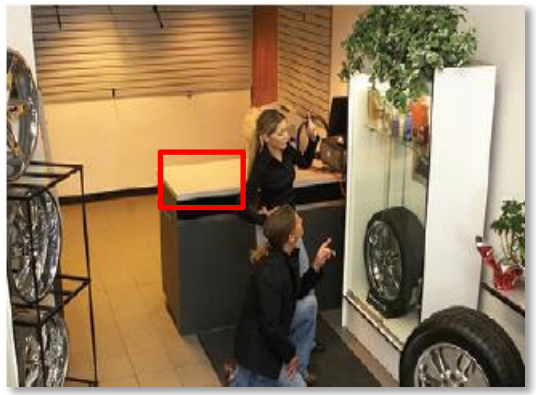
Network
(유무선)

CMS (Central Management Software)

"24/7"
video streams

Background (2/3)

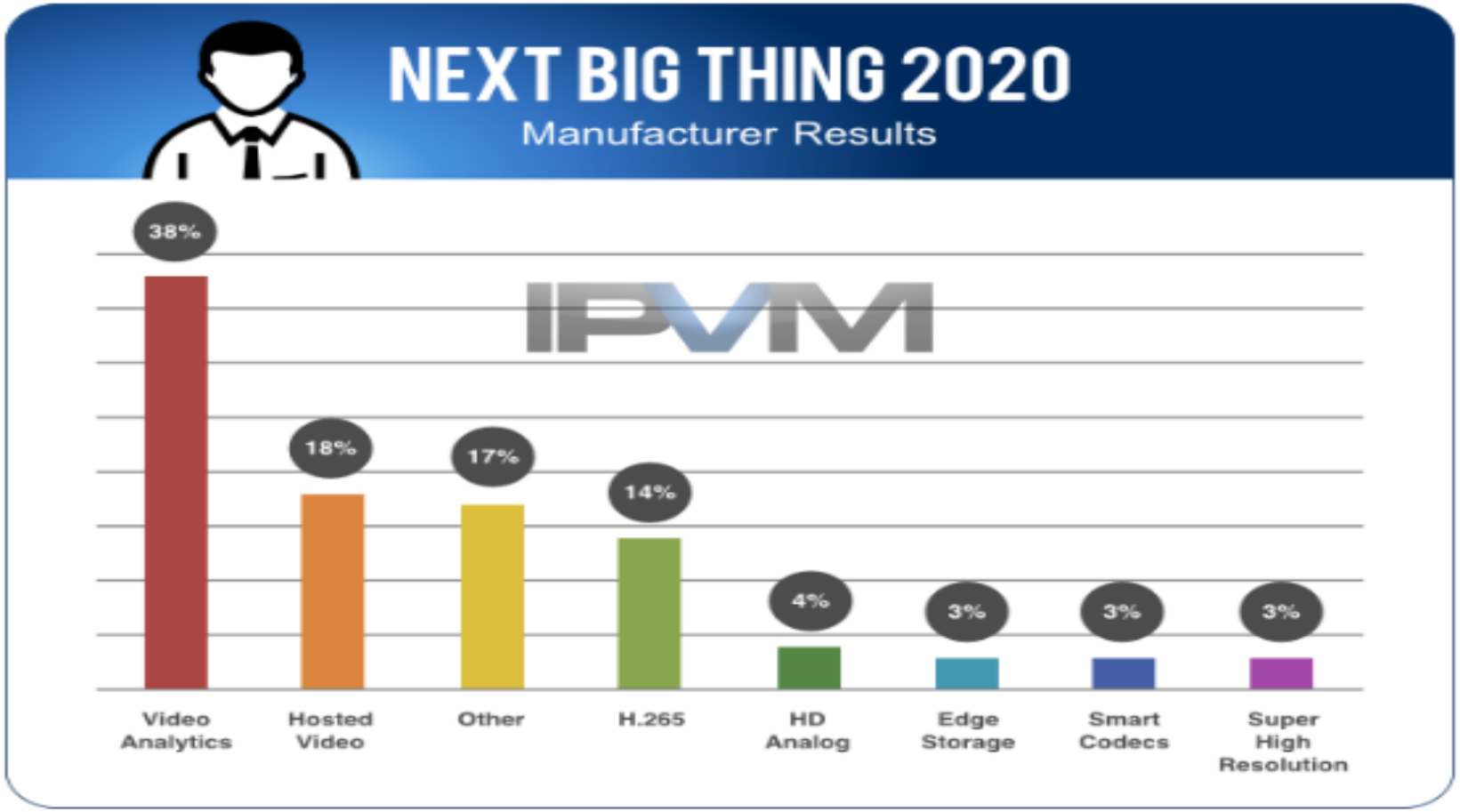
□ CCTV 시스템에서 유의미한 정보 추출

Tampering	Motion Detection	Face Detection	Fog Detection
			
Enter / Exit	**Appear (Disappear)**	**Digital auto tracking**	**DIS**
			

Background (3/3)

□ CCTV 시스템에서 유의미한 정보 추출에 대한 사용자 반응

- VA has been the next big thing since at least 2005 and remains that way today



Problem Definition (1/2)

AI Edge Device for Surveillance

- 신뢰도가 높은 객체(사람) 검출을 어떻게 할 것인가?

검출력

- 다양한 환경 및 외형 변화
- UHD vs. 원거리

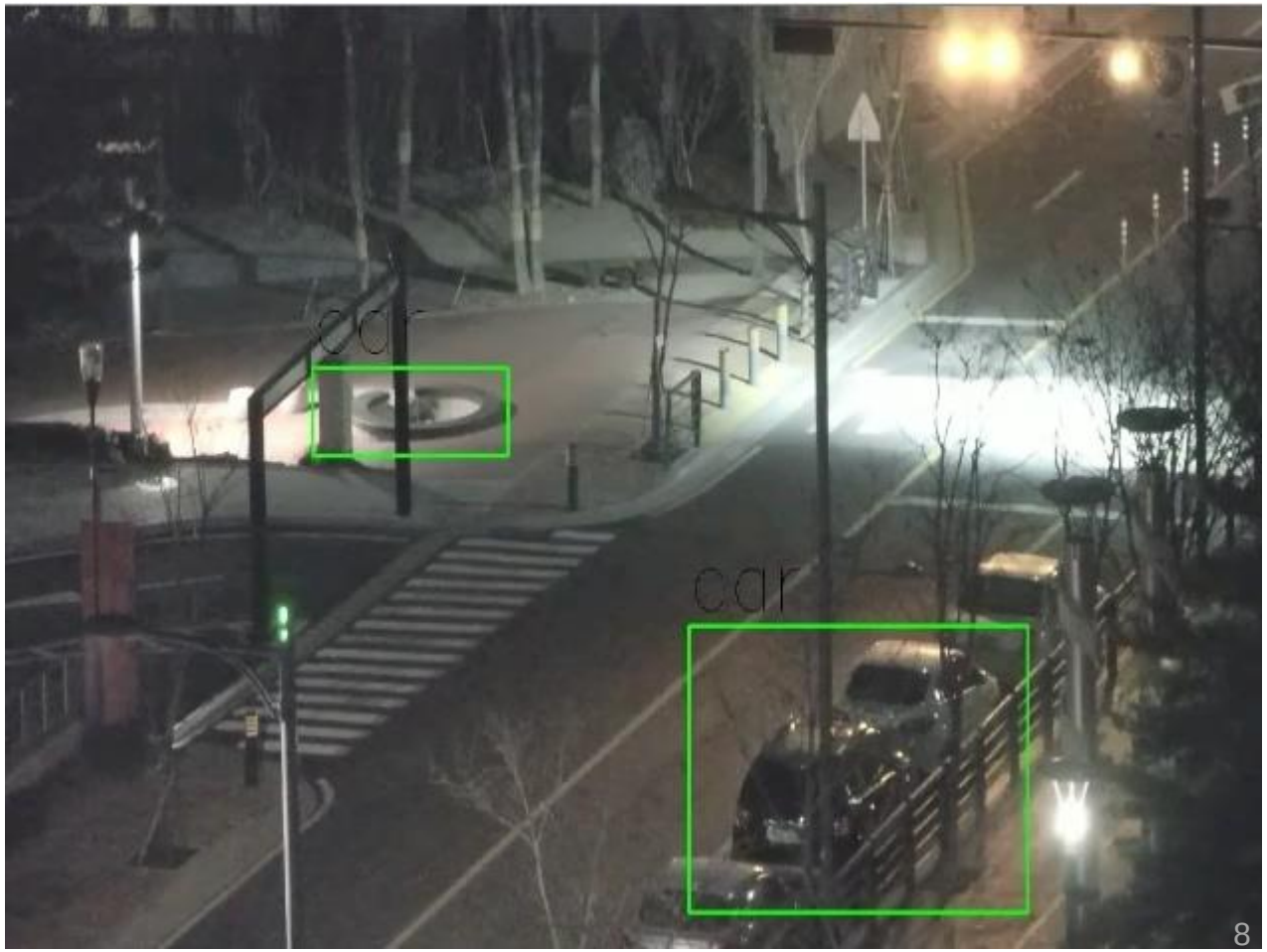
Problem Definition (2/2)

□ AI Edge Device for Surveillance

- 신뢰도가 높은 객체(사람) 검출을 어떻게 할 것인가?

오검출

- 객체 間 형상 유사성
- Trade off (w/ 검출력)



Proposed Method

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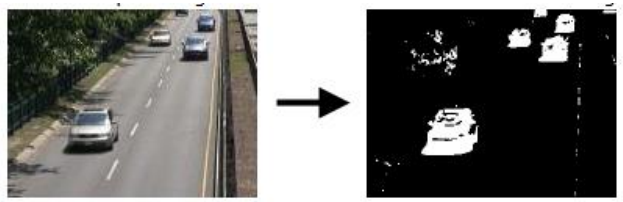
□ AI Edge Device for Surveillance

- Deep learning + Conventional CV

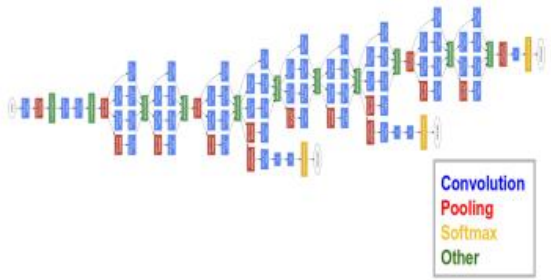
Step 1

Pre-Processing



Step 2

Deep learning 기반
Object Detector



Step 3

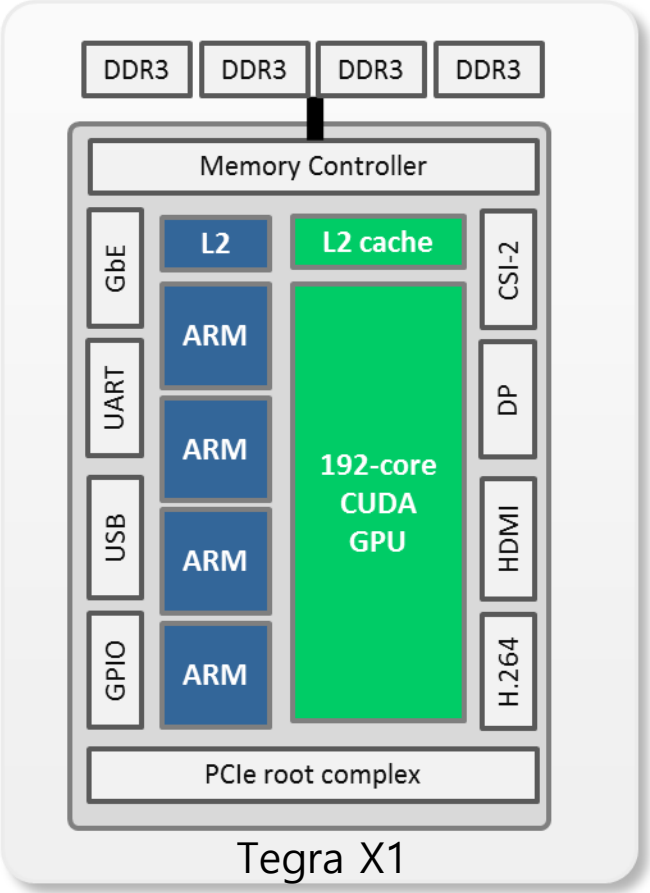
Post-Processing

False Learning™

AI Edge Device for Surveillance

Heterogeneous computing

- Deep learning 프로세서 (GPU, HW Accelerator) & Conventional CV 프로세서(CPU)



Tegra X1

AI Edge Device for Surveillance

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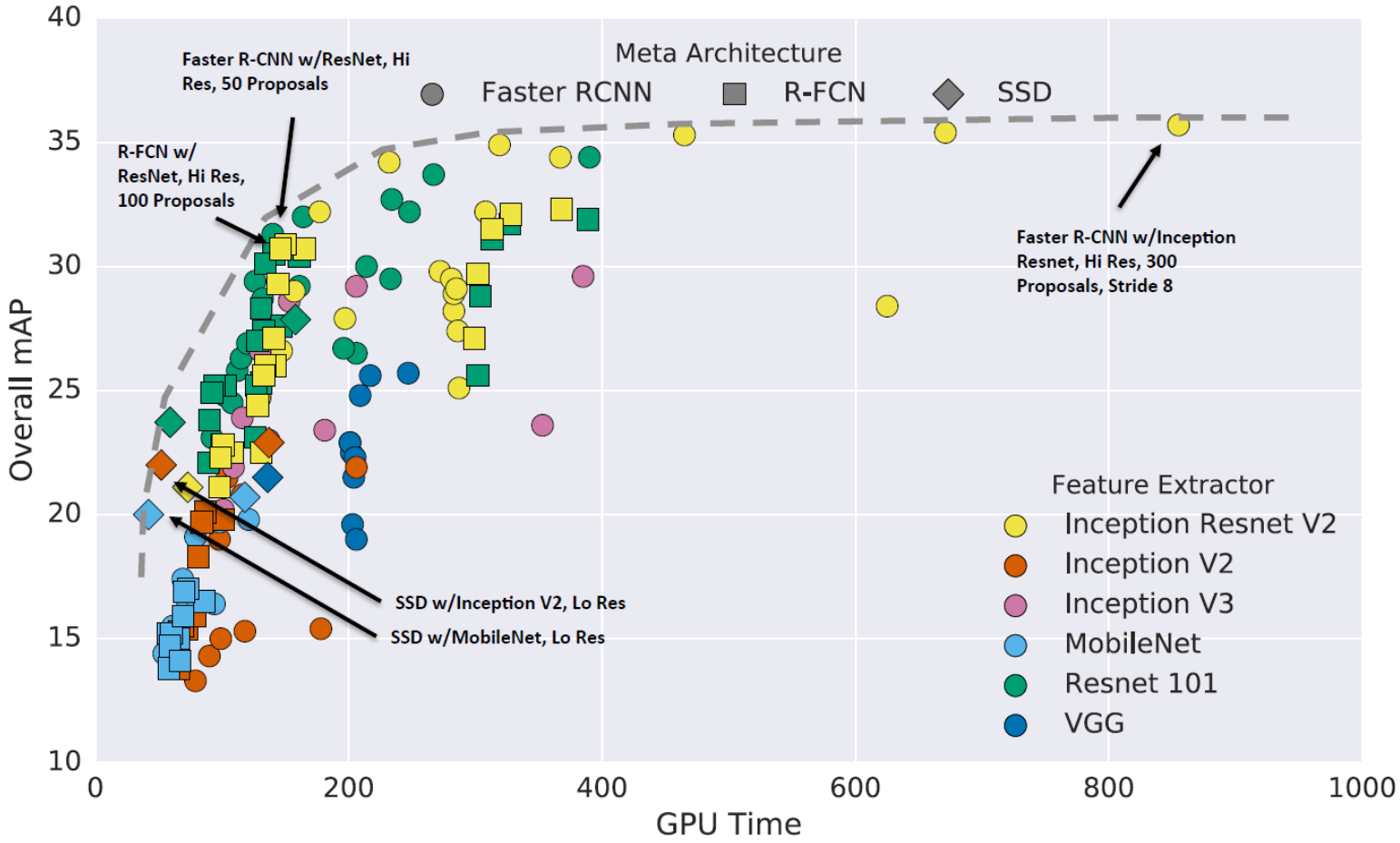
Deep learning based Object Detector



※ Speed/Accuracy Trade-Offs for Modern Convolutional Object Detectors
Jonathan Huang, Vivek Rathod, Chen Sun, Menglong Zhu, Anoop Korattikara, Alireza Fathi, Ian Fischer, Zbigniew Wojna, Yang Song, Sergio Guadarrama, Kevin Murphy, The IEEE Conference on Computer Vision and Pattern Recognition (CVPR), 2017, pp. 7310-7311

AI Edge Device for Surveillance

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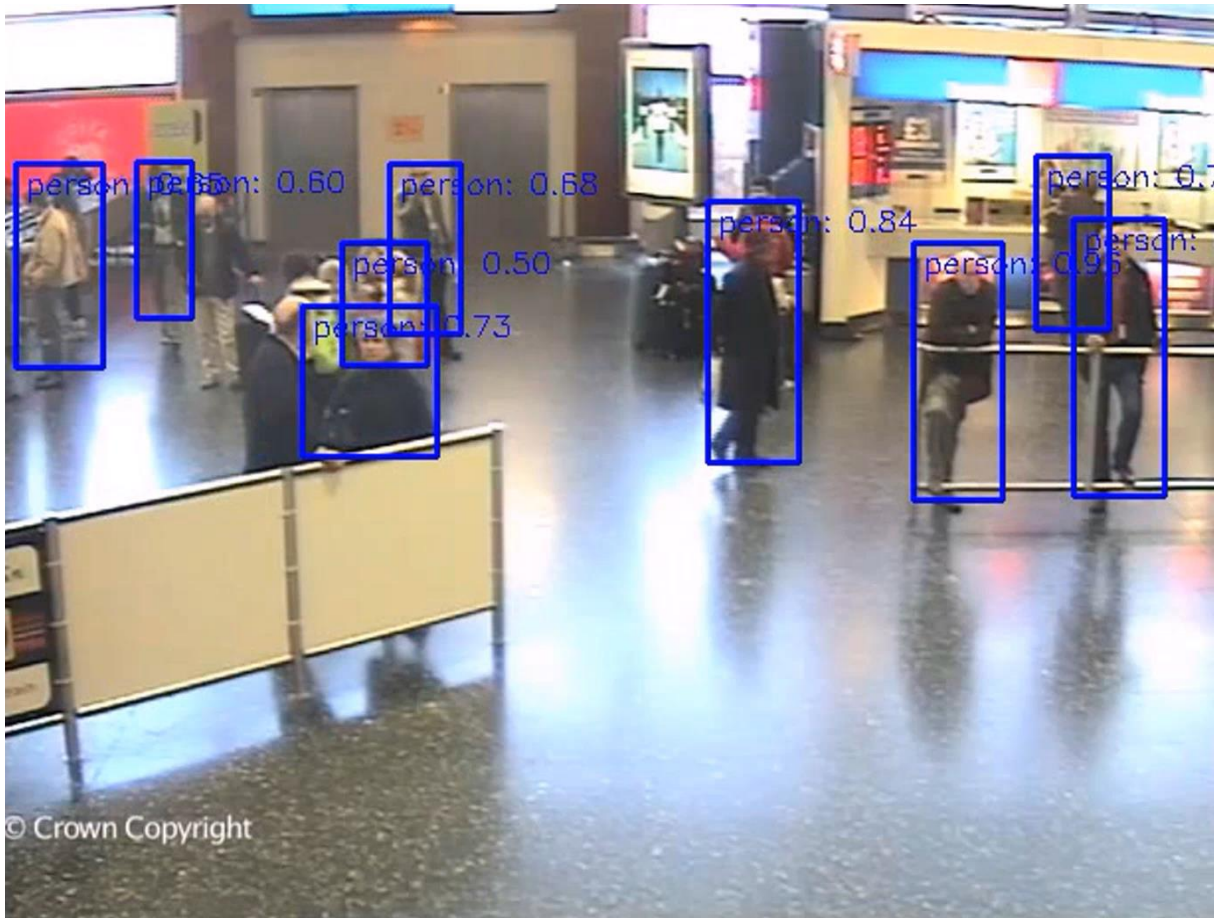
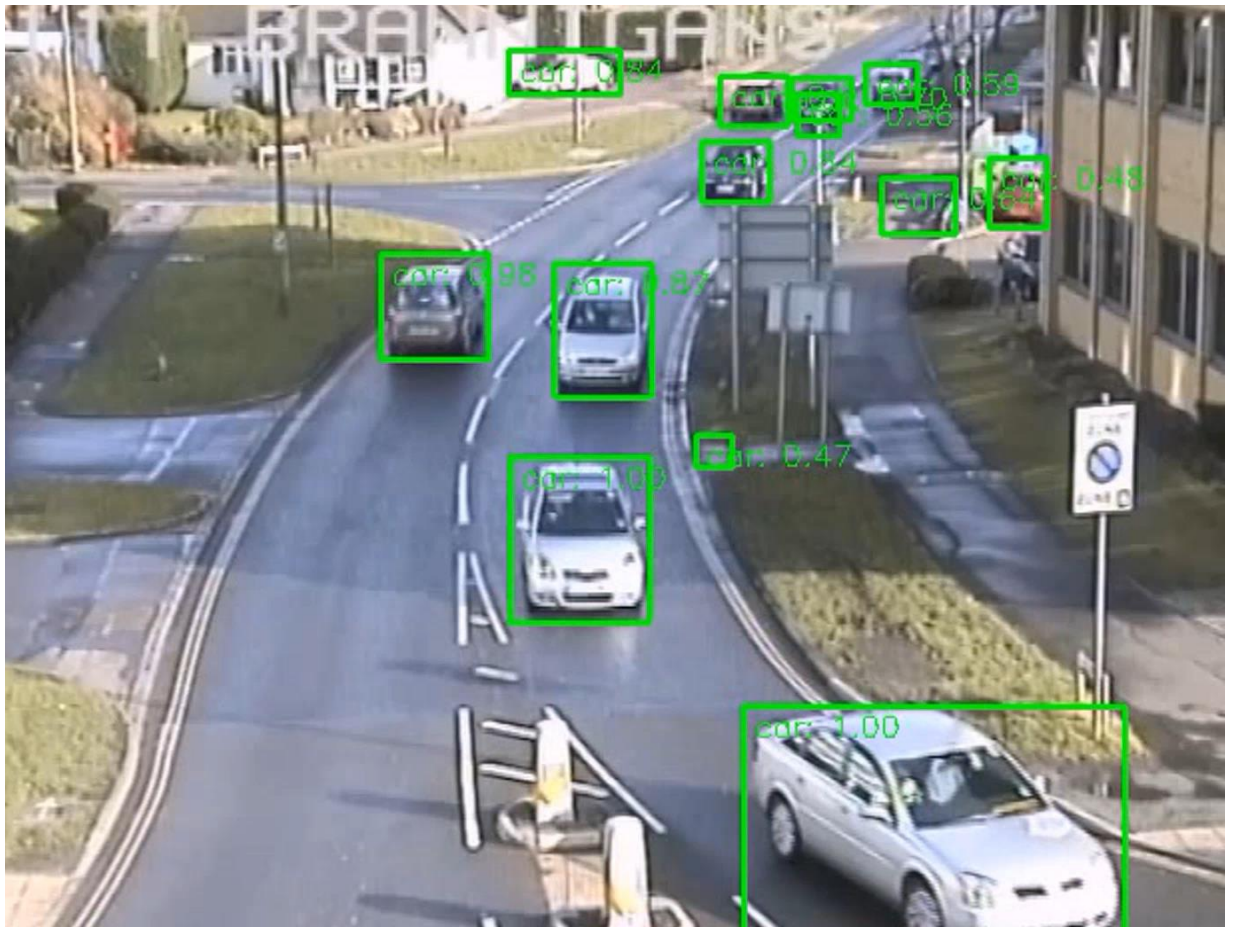
- Deep learning based Object Detector





AI Edge Device for Surveillance

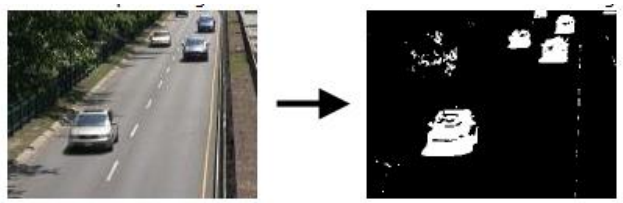
□ Deep learning based Object Detector 한계

- VGA급 영상 입력시 처리속도 : 10fps 내외 (FP16, TX1 Board 기준)
- 객체 사이즈: 최소 25x50
- 객체 거리: 약 20~30m

Deep Learning 입력 데이터 재구성 by Conventional CV

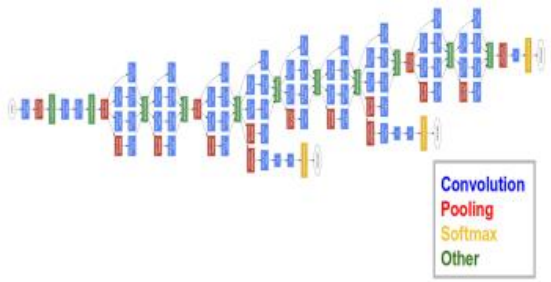
Step 1

Pre-Processing



Step 2

Deep learning 기반
Object Detector



Step 3

Post-Processing

False Learning™

AI Edge Device for Surveillance

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- Deep Learning 입력 데이터 재구성 by Conventional CV

AI Edge Device for Surveillance

False Learning™

- MD 오검출 영역이 사람의 외형과 비슷한 경우에는 최종적으로 오검출 발생

[MD 오검출]
차량 앞유리에 반사된
나뭇가지 그림자,
바람에 의해 흔들리는 상황

[CNN Detector 오검출]
사람 상반신 외형과
유사한 MD 오검출 영역

AI Edge Device for Surveillance

Results

- Deep Learning 기반 객체검출(사람/차)이 원거리 객체 검출 성능 향상

AI Edge Device for Surveillance

Results

- Deep Learning 기반 객체검출(사람/차)이 오검출 강인함

AI Edge Device for Surveillance

Results

- Dataset : Techwin-Surveillance DB

Performance	Motion Detection	CNN Detector	MD + CNN Detector
Detection Rate	82.2%	38.2%	80.4%
False Alarm Rate	25.6%	12.1%	11.6%

Future plan

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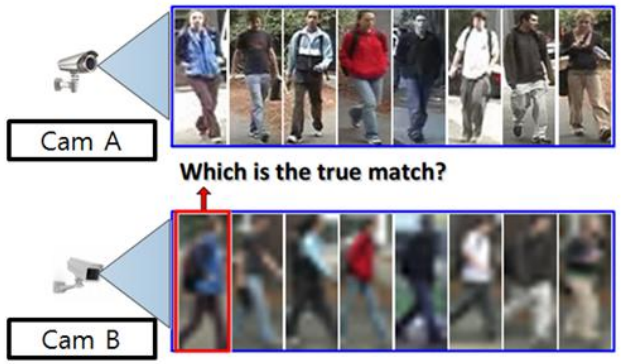
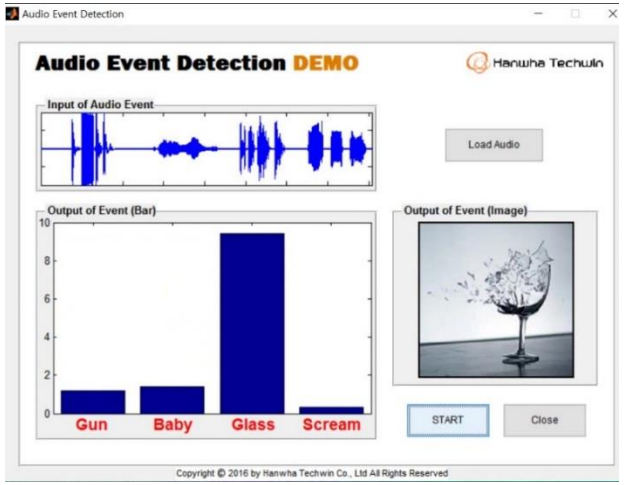
□ 객체 분석 → 상황 분석

Re-identification	행동 분석	차량 분석	오디오 분석





감사합니다 .