



AI and Computer Vision for Smart Cities

Artificial Intelligence for Media and Humanities (AIMH) Laboratory
Istituto di Scienza e Tecnologie dell'Informazione "Alessandro Faedo" (ISTI-CNR) of Pisa
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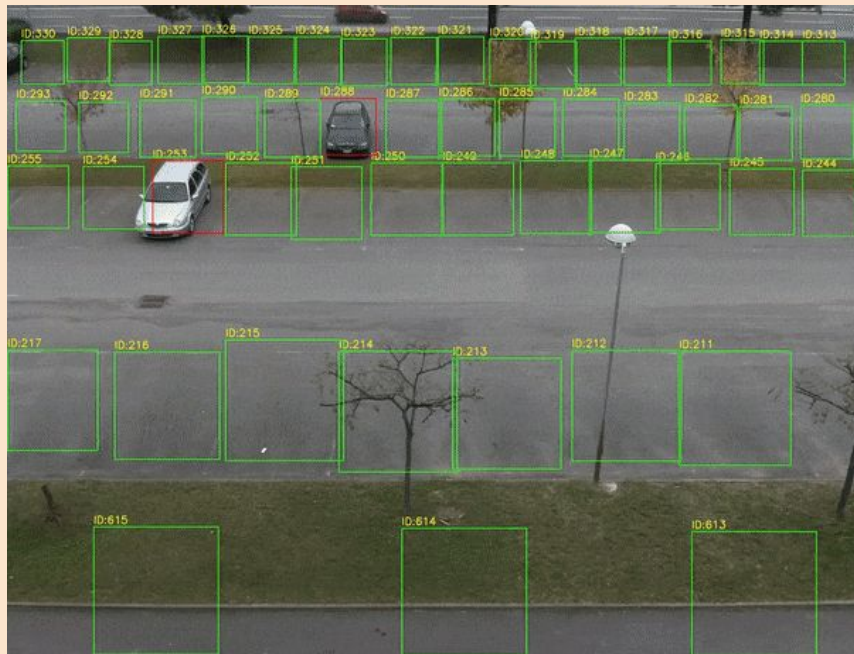
Claudio Vairo

AI and Computer Vision for Smart Cities

- ⇒ AI is increasingly employed to develop Public Services to make life easier
- ⇒ *Human-centered AI*
 - ⇒ AI-based Public Services that interact with physical world
 - ⇒ Systems that process data and make decision to solve real-world problem
 - ⇒ Humans are at the epicenter
- ⇒ We introduce AI-based applications that analyse images from city cameras
 - ⇒ Smart cameras observe physical world and provide visual data to AI systems
 - ⇒ Smart cameras are pervasive
 - ⇒ Applications ranging from smart parking to human activity monitoring

AI and Computer Vision for Smart Cities: Parking Lot Monitoring

Lot Occupancy Detection

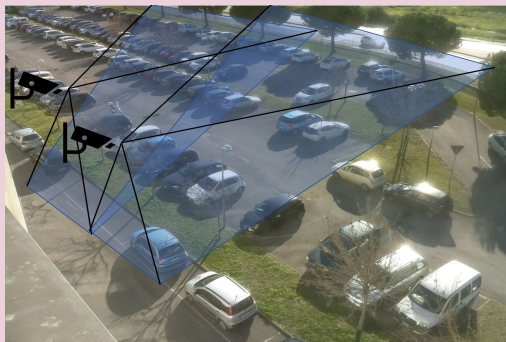


Vehicle Counting



AI and Computer Vision for Smart Cities: Parking Lot Monitoring

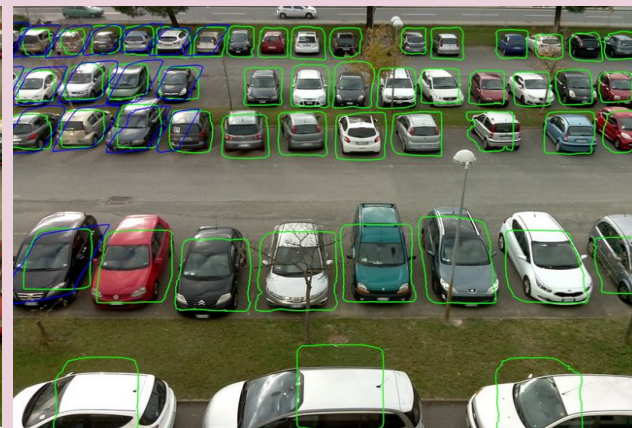
Multi-camera Scenario



CAMERA 9 In Red → From Camera 8 to Camera 9



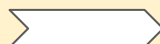
CAMERA 8 In Blue → From Camera 9 to Camera 8



Estimate the number of cars present in the *entire* parking area

AI and Computer Vision for Smart Cities: Pedestrian Detection and Counting

Train using Virtual Worlds



Test on Real Scenarios

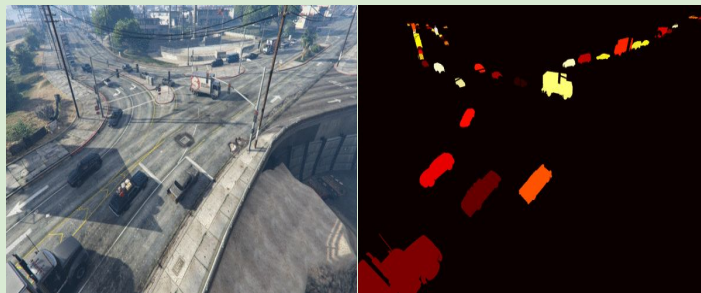


AI and Computer Vision for Smart Cities: Traffic Flow Monitoring

Traffic Density Estimation and Counting



Train using Virtual Worlds + Domain Adaptation



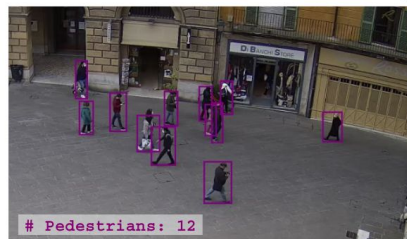
Test on Real Scenarios

Smart Cameras for: Human Activity Monitoring

Social Distance Measurement



Pedestrian Detection + Instance-based Counting



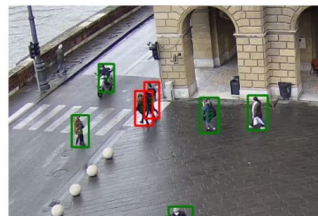
Density-based Pedestrian Counting



PPE Detection



Distance Measurement



Pedestrian Tracking

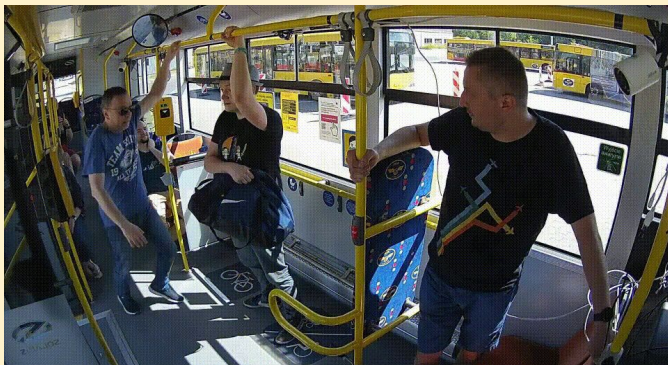


AI and Computer Vision for Smart Cities: Pedestrian Density Estimation and Counting in Videos

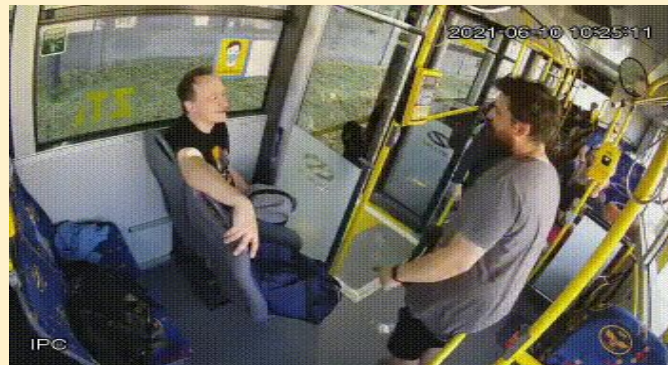


AI and Computer Vision for Smart Cities: Video Violence Detection

Violent Actions



Non-Violent Actions



Conclusion

- ⇒ We presented several *human-centered AI* public services that make life easier and safer for people in modern smart-cities
- ⇒ The introduced applications are based on the automatic analysis of images gathered from city cameras
- ⇒ They range from smart mobility, infrastructure management, and surveillance
- ⇒ We believe that images are the best sensing modality that can observe and simultaneously provide visual data to AI systems to extract relevant information

AI and Computer Vision for Smart Cities:

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Thanks! Questions?



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Extension

Smart Cameras for: Counting Vehicles with Drones

