

IoT Based Effective Low Cost Smart Surveillance System for Secure Environment

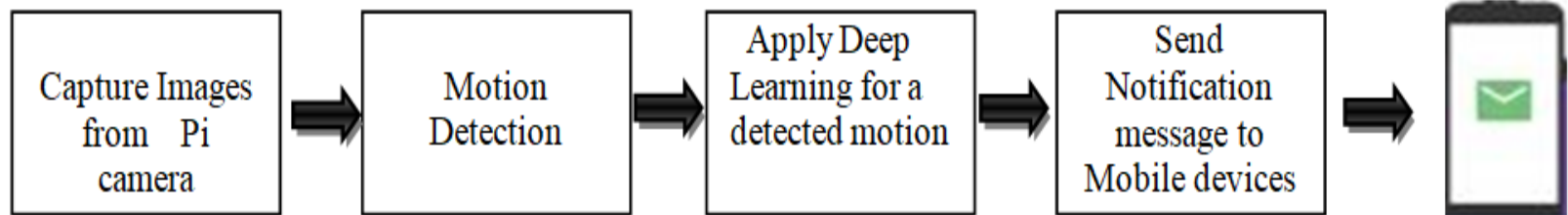
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IoT and Secure Environment

- Internet of Things (IoT) provides society interoperability and connectivity between devices, systems, services, networks.
- With the ease of connected smart environment and technology, we can easily implement low cost smart surveillance system for security environment.
- With smart IoT devices and system such as Android, Raspberry Pi, Motion Sensor, etc.,. we can easily save cost and manpower for society.
- **Objectives:**
 - **Save Cost and Manpower for monitoring smart environment.**
 - **Use advanced Technology (IoT, Cloud Messaging, Deep Learning, Mobile Devices) to build and apply effective and efficient system.**

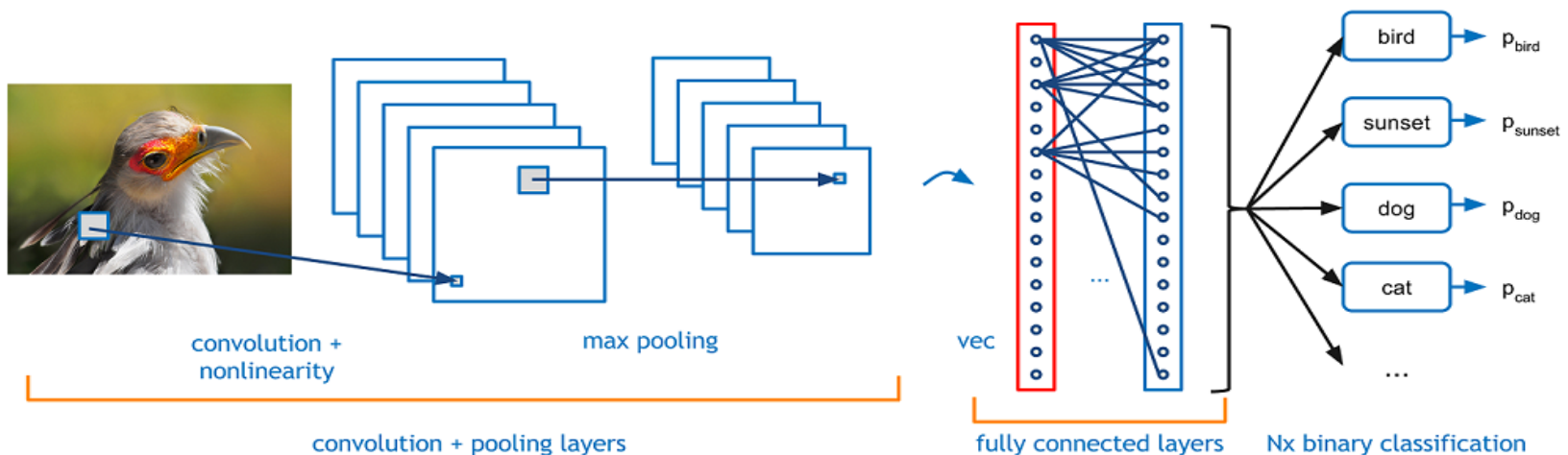
System Overview

- In this system, deep learning algorithms is trained and then run into raspberry pi model 3.
- The system is captured image from pi camera when some motions are detected.
- After a specific motion is detected, deep learning algorithm is applied to classify whether a given motion is person or not.
- The notification message is send to the mobile devices using Cloud Messaging if a given detected motion is a person.



Deep Learning for object detection and classification

- Recently, Deep Learning algorithms are very modernized approaches for Computer vision and Natural Language Processing.
- It's results provide high accuracy for image classification.
- To detect and localize a motion object, deep learning is very suitable for this projects to classify whether a given motion object is a intrusion person or others.



Motion Tracking



Background



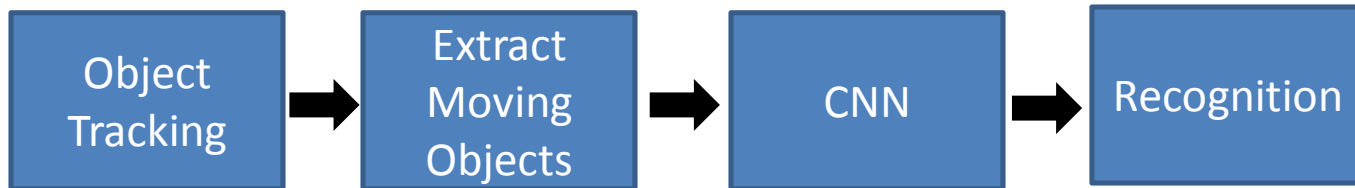
Cv2.absdiff (src1, src2[, dst]) → dst

Calculates the per-element absolute difference between two arrays or between an array and a scalar.

delta = |background_model - current_frame|

Human Detection for Moving Objects

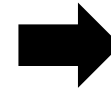
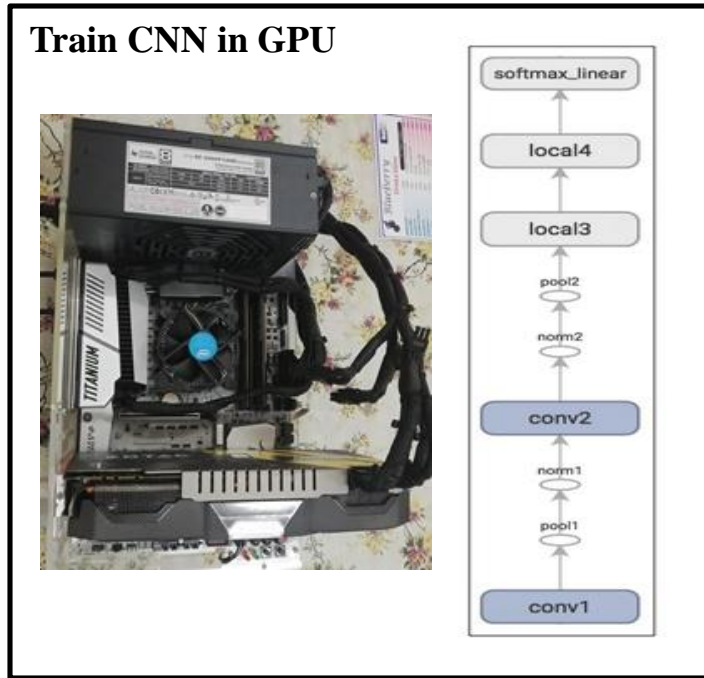
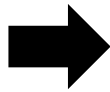
- Haar Cascades for Human Detection
- Histograms of Oriented Gradients for Human Detection
- **Deep Convolution Neural Networks**



Training and Deployment



Human and Non Human Dataset



Trained Model



Deploy to Raspberry Pi

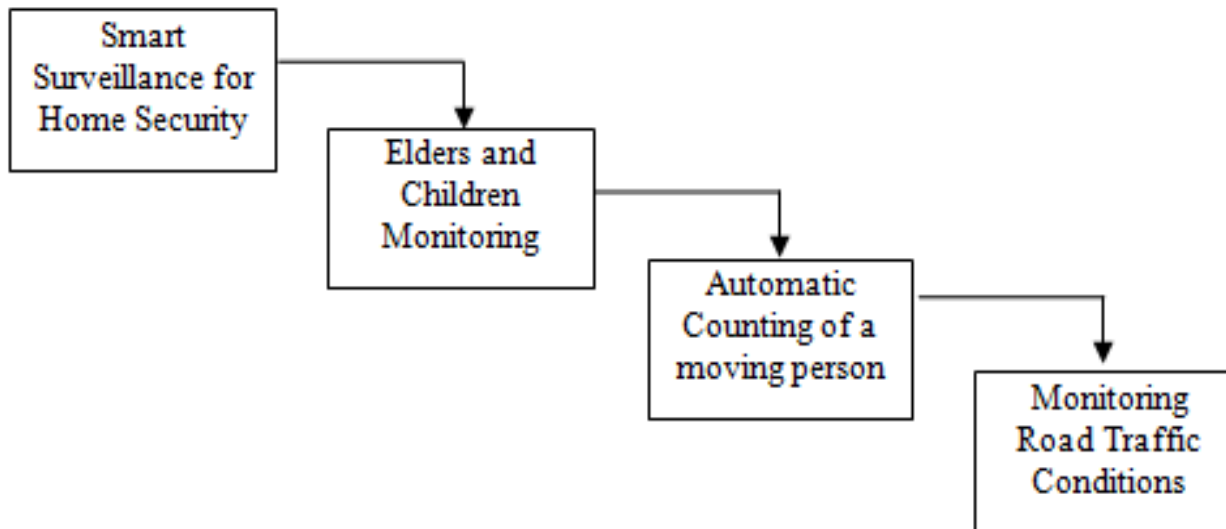


Application areas

- **Using Smart Surveillance system**, there can be applied into many applications areas:
 - Monitoring the security of home and public buildings from a remote areas.
 - Classifying whether a moving object is child or men or women from a specific point of view.
 - Monitoring and tracking the movement location of elders or children within a building for safety living.
 - Counting people in entrance and exit of a specific areas such as Museum.

Future Directions

- we plan to monitor the traffic status of a specific road condition by tracking the movements of pedestrians and cars to give the messages of heavy traffic or light traffic for routing problems.



Thank You