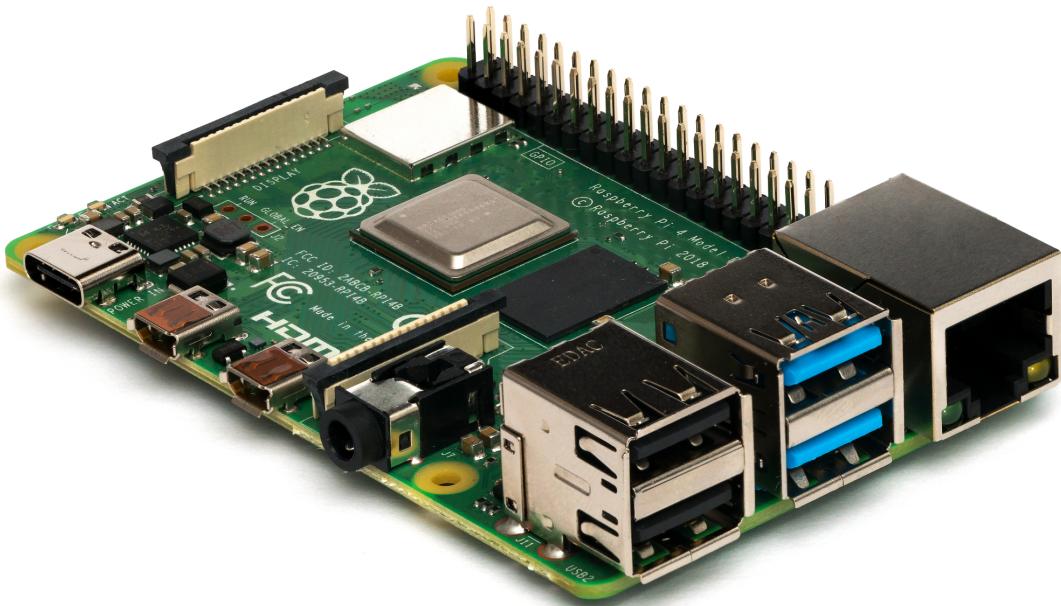


System Requirements

For the demo, we've implemented the system in Raspberry Pi Model 4B powered by 64-bit Quad-core Arm Cortex-A72 processor. In the document I've compared various other systems, and provided alternatives to our solution for feasibility and faster computations.



Using Single Board Computers

Raspberry Pi is a series of small, affordable, single-board computers developed by the Raspberry Pi Foundation, a UK-based charity. The primary goal behind the Raspberry Pi project is to promote computer science education and facilitate easy access to computing resources, particularly for students and beginners. Raspberry Pi computers are widely used in various educational, hobbyist, and industrial projects.

The advantage is that Raspberry can detect incidents, and on the spot send out necessary alerts to officials.

Cost Analysis

The average cost of a Raspberry Pi system is 7000 INR in India. In the model we're proposing, Raspberry Pi is required in each and every camera that gets installed in that region. So even for a medium level retail store which has 10-20 cameras, it would cost them $7000 \times 20 = 1,40,000$ INR which is not a very small investment.

Affordability

In case the owner does not want to invest this much amount on raspberry pi, but still would like to utilize it for a faster IoT based system in the store, then they can go for cheaper versions of Raspberry Pi like Raspberry 3, etc. They'd be able to reduce the cost by 5%-10% on an average.

Availability

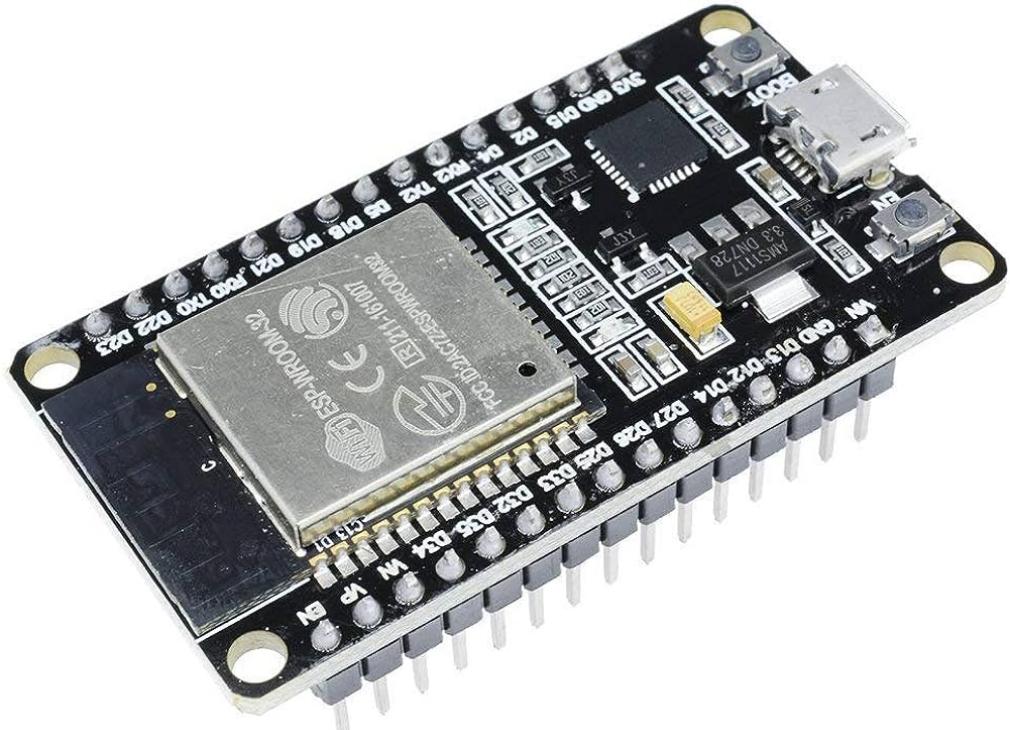
Raspberry Pi systems are widely available even in India. We were able to get one for our project within 1-2 days. Similarly procuring hundreds of such systems won't be an issue because of its easy availability.

Speed

Speed becomes a significant issue while utilizing this system. The reason being that raspberry pi's can't perform too complex mathematical operations on frames, along with multiprocessing tasks. The Frames per Second speed here comes out to be just 2-5 FPS.

Hence utilizing advanced models of Raspberry Pi, like Raspberry pi 4 64-bit Quad-core Arm Cortex-A72 processor can enhance the speed, up to 5-10 FPS.

Using Micro Controllers



A microcontroller is a compact integrated circuit (IC) that combines a processor (CPU), memory, input/output peripherals, and sometimes other components, all on a single chip. Microcontrollers are designed to perform specific tasks and are commonly used in embedded systems to control a wide range of devices and applications.

Previously we experimented with a Microcontroller ESP 32, with its camera module, but due to its poor performance while implementing advanced Machine Learning Algorithms, we shifted to Raspberry Pi. Hence considering the practicality and the efficiency required for proper performance of our application, we would like to drop the idea of using Micro controllers for advanced ML algorithms.

Developing a Centralized Video Surveillance System

In order to improve the performance of the application, and enhance computational capability, we propose another idea of developing a server with high computational power capable of analyzing footage from all the CCTV's simultaneously. This can reduce the cost significantly, but can lead to a slight reduction in the speed of alerts.



Speed

Developing such a system can speed up the machine learning part, and can prevent unnecessary delay. It's ideal for medium and large level business stores as it saves them from investing money on multiple micro processors and devices like raspberry pi. This method ensures better scalability at reduced costs.

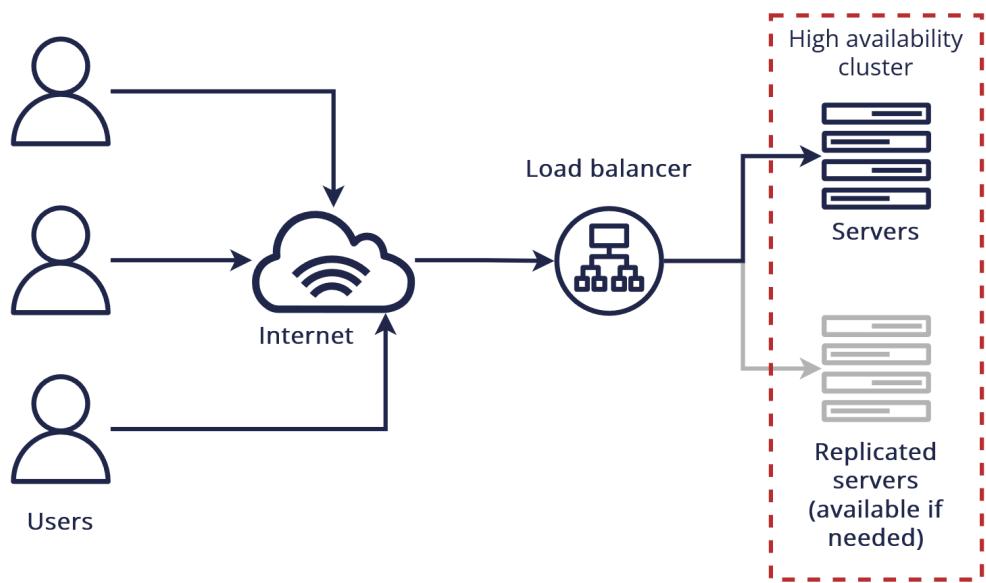
Cost

Installing servers like these cost lakhs. For analyzing footage from 100 cameras, the server costs a minimum 4 Lakhs. This cost can go up to 10 Lakhs for high speed servers.

Scalability

As compared to putting raspberry pi's on each and every CCTV camera, this method is easier to implement and is scalable provided that the server does not get overloaded.

Distributed Video Surveillance System



In a distributed video surveillance system, there are multiple servers instead of just one. This leads to even faster analysis of footage. The load balancer in between can divide the tasks among servers who have comparatively less load. This ensures that no server gets overloaded and all of them function well.

Cost

The cost of implementing this system can be several times the cost of implementing a central video surveillance system as it requires multiple servers. The starting cost of such a system can be assumed to be 10-20 Lakhs. This architecture is ideal for MNCs and universities where they have the capability to invest a considerable amount on cutting edge technologies.