Implementation of AIoT as Cloud-Edge Collaborative system for Video Surveillance using Raspberry pi.

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Abstract:
Cloud-Edge Collaborative Video Surveillance (CECVS) using Artificial Intelligence of Things (AIoT) is a powerful concept that has wide-reaching implications for modern surveillance systems. This type of surveillance relies on the combination of cloud computing to provide real-time distributed intelligence and edge devices in order to minimize the response time and the cost for complex computations. To achieve the desired result, the AIoT system should be able to effectively monitor a video feed with the help of an edge device such as Raspberry Pi. The Raspberry Pi would be used to capture, encode, and send the video data from the camera to the cloud. The captured video data can then be used for analytics and AI-based applications that require large computing resources such as facial recognition, sentiment identification, and object recognition. Utilizing the cloud platform for distributed intelligence and the edge device for high-level computation, the AIoT system can be used to streamline the security and surveillance process.

Keywords: Cloud-Edge collaboration, Cloud Computing, Edge Computing, Artificial Intelligence, Internet of Things.
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Introduction:
AIoT (Artificial Intelligence of Things) is a cloud-edge collaborative system that enables video surveillance using Raspberry pi. AIoT uses distributed computing technology to process data from multiple sources at the edge, such as cameras, ultrasound rangefinders, and object recognition systems. The data is then sent to cloud for further processing and storage. At the cloud, AI-driven analytics is applied for insights. The insights are used to take informed decisions for better video surveillance. Raspberry pi is used as the edge device in the AIoT system. It is equipped with sensors such as camera, ultrasonic range sensor and object recognition system, which collect data from the environment. The collected data is then sent to the cloud for further processing and analytics. At the cloud, the data is analysed with the help of AI-driven analytics. It is used to take informed decisions for better video surveillance. For example, the data obtained from the sensor can be used to identify intruders, detect fires, and track people in the surveillance area. The insights from the data can be used by the security personnel to take appropriate action to secure the environment. The AIoT system is also used to improve safety and security in public places such as airports, railway stations and shopping malls. It enables

the security personnel to monitor the environment and take appropriate action in unsafe situations. In conclusion, AIoT as a cloud-edge collaborative system for video surveillance using Raspberry pi can be used to improve safety and security in public places. The insights obtained from the sensor data can be used to take informed decisions to secure the environment.

The Raspberry Pi is also the perfect candidate for performing other important security-centric tasks such as anti-tampering and motion detection. Additionally, the use of AI-based algorithms and techniques such as machine learning, and deep learning can help reduce false positives and further enhance the security of the system. This will ensure that the data stream is safe and can be used for analytics and other applications without compromising security. Furthermore, the Raspberry Pi will enable a distributed architecture that can scale to meet the demands of a growing customer base. This scalability and flexibility will allow for a more affordable and efficient solution compared to other solutions. By combining the power of the cloud and the intelligence of the edge in a unified lightweight system, CECVS using AIoT is a powerful new concept for modern surveillance.

Related work:

1. Researching the current technology and trends in cloud and edge computing as applied to the AIoT systems.
2. Investigating the advantages and disadvantages of cloud-edge computing and AIoT as a video surveillance system.
3. Developing a prototype system using Raspberry Pi as the controlling unit and identifying the specifications such as memory and processor needed for this project.
4. Designing a system architecture that integrates the Raspberry Pi, a computer vision library, and third-party cloud services.
5. Writing the code to integrate all the components of the system and refine it to produce accurate and robust results.
6. Using machine learning algorithms to analyze the video streams for identifying potential security concerns.
7. Evaluating the performance of the Cloud-Edge Collaborative system by comparing different experimental scenarios and configurations.
8. Implementing the real-time video surveillance system and testing it in a real-world environment.
9. Writing a user manual and deploying the system in a production environment.
10. Documenting the results for further improvement and scalability.

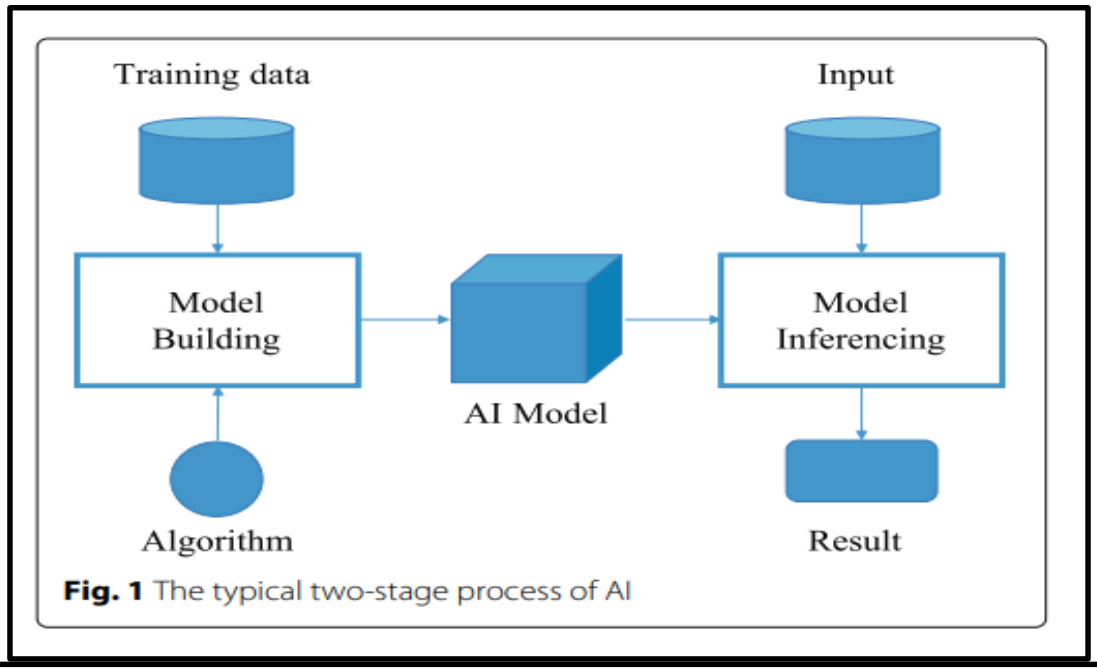

Fig. 1 The typical two-stage process of AI

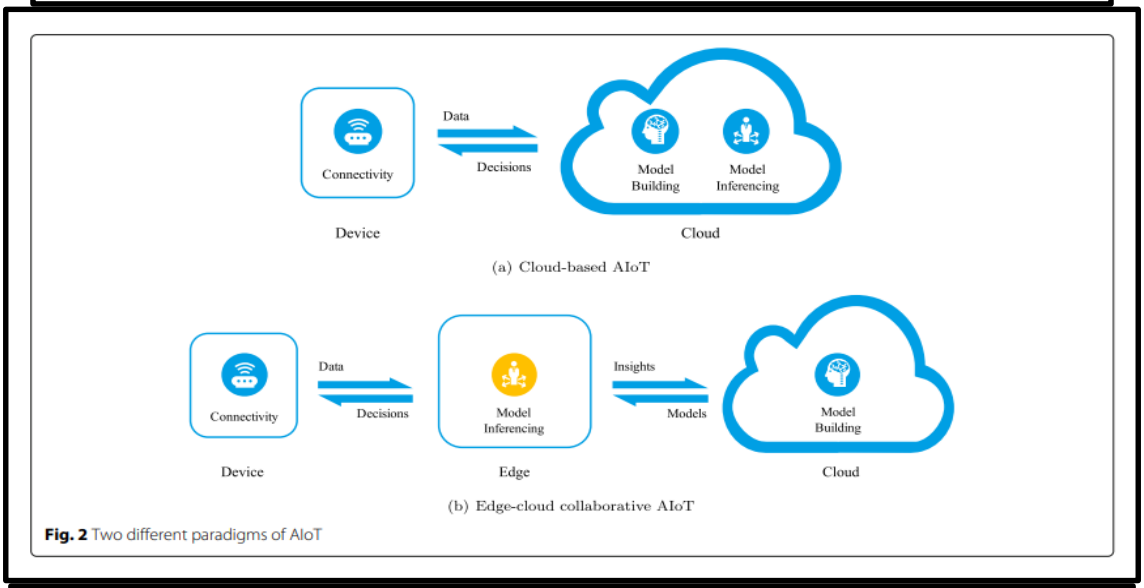

Fig. 2 Two different paradigms of AIoT

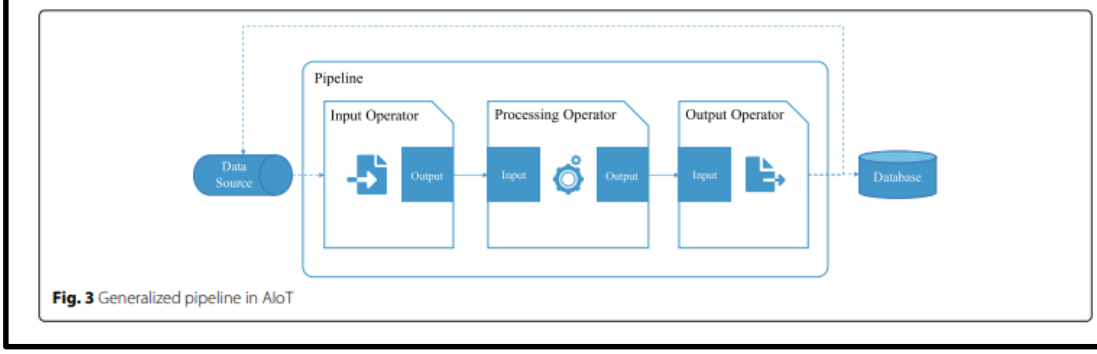

Fig. 3 Generalized pipeline in AIoT

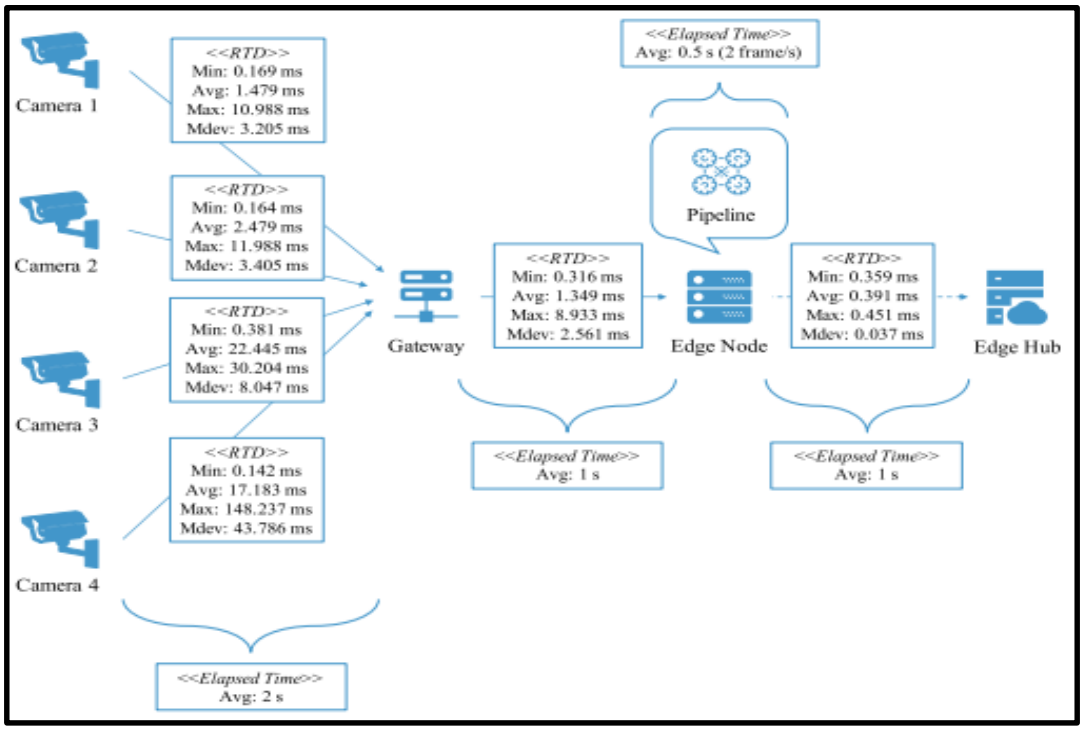

Fig. 3 Latency of this AIoT application

Agile AIoT :

Agile AIoT (Artificial Intelligence of Things) is an approach to IoT (Internet of Things) which uses artificial intelligence to solve challenges that would otherwise hinder the implementation of the technology. It enables the ability of smart devices to interact and respond to the environment and user behavior in a more efficient and effective manner. This is achieved by leveraging AI algorithms and predictive analytics that enable the devices to "learn" from the environment, as well as the users and their behaviors. This enables faster and accurate decisions, increased scalability, automation, and predictive maintenance capabilities. The goal is to create a system that can learn, adapt, and evolve with the changing needs of users and the environment.

Implementation of AIoT as Cloud-Edge Collaborative system using Rpi:

AIoT (Artificial Intelligence of Things) is a relatively new concept that combines the principles of artificial intelligence and the Internet of Things (IoT). Instead of relying solely on edge computing solutions, it establishes a cloud-edge collaborative system to solve complex problems in an automated, smarter, more efficient manner. One of the most efficient ways to implement such a system is using a single-board computer, like the Raspberry Pi (Rpi). The Rpi provides a low-cost and highly extensible platform for developing AI and IoT applications. It can host multiple applications, from connected home technologies to robotics applications. It also can provide a gateway for connecting to the cloud, allowing edge and cloud devices to communicate with each other. To set up a cloud-edge collaborative system, multiple Rpi can be connected together to form a mesh network. Each node in the network can act as an edge device, collecting and processing data, and communicating with the cloud. This data can be used to trigger certain events, like the activation of an alarm system when a security breach is detected. The Rpi can also act as a gateway for connecting IoT devices, such as sensors, cameras, and other peripherals. The data collected by these devices can be sent to the cloud, allowing AI to monitor and analyze the data in real-time. This allows for the creation of complex rules and predictive models that can be used for intelligent actions, like automated response to alarms and warning

signals. Furthermore, the Rpi can also act as a robotic platform. By connecting peripherals, such as motors, cameras, and other components, robotic applications can be built. This allows for further automation and control of intelligent processes. In conclusion, by utilizing the extensible platform of the Rpi, AIoT can become a powerful, cloud-edge collaborative system. This can allow for smarter, more efficient solutions that make use of both edge computing and the cloud.

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