The project tackles the inherent challenges of intrusion detection as an early application. The core of the system lies in an edge visual classifier powered by a MCU(ESP32S3). This model resides on the development board, processing images captured by a camera and identifying specific objects or abnormalities within the vision environment. Our custom PCB, meticulously designed by extracting key components from the LoRa E5 Development module, ensures compatibility with three popular development boards: ESP32S3, ESP32 Board, and Nano BLE sense. This adaptability opens doors for diverse industrial applications while leveraging existing hardware investments.The LoRa module, integrated into the board, enables long-range, low-power communication, sending the classification results to a central server for further analysis and decision-making. Another miniaturised version of the PCB is also designed compatible just with the ESP32S3 for compact form factor especially for our project.

The core system comprises a camera capturing images, a chosen development board processing them using a pre-trained intrusion detection model on the microcontroller, and a LoRa module connected on the custom PCB, efficiently transmitting results to a central server. LoRa's long-range, low-power communication perfectly suits industrial environments, enabling data transmission even in remote locations.

The beauty lies in the system's ability to easily adapt to future applications. By training new models and deploying onto the edge device, the same hardware foundation can handle diverse tasks beyond intrusion detection. This opens doors for functionalities like object identification, density monitoring, anomaly detection, and more, all utilizing the established LoRa network for communication on the same developed board.

Edge computing further empowers the system by processing data locally, minimizing latency and bandwidth requirements. This not only ensures real-time responsiveness but also bolsters data privacy by keeping information off cloud servers.

By merging edge computing, LoRa communication, and versatile development boards, this project presents a promising solution for robust and adaptable intrusion detection and data acquisition in industrial settings. Its potential extends beyond its initial application, offering a future-proof platform for diverse industrial monitoring needs.