**Breaking Through the Limitations of Darkness and Low Pixel Resolution:**

Research on the Adaptive Improvement of YOLOv11 in Pupil Detection on Embedded Platforms

**Abstract**

**INTRODUCTION**

For decades, the technology of artificial intelligence - based detection has been improved sharply. This means that more and more areas in people's daily life need detection technology. At the same time, more and more embedded platforms are being loaded with AI - enabled detection capabilities.

These embedded platforms, such as smart cameras in security systems, wearable health monitors, and intelligent industrial sensors, are playing a crucial role. In security systems, smart cameras with AI - based detection can not only identify faces accurately but also detect abnormal behaviors in real - time. For example, they can recognize when a person loiters in a restricted area for an extended period or when there is an unauthorized entry. This helps to enhance the safety and security of public places, private properties, and critical infrastructure.