# ABSTRACT

Door security is crucial for protecting privacy and safety in homes and workplaces, including at Telkom University dormitories, which accommodate 192 students per building. However, there are several issues that need to be addressed, such as uncontrolled access by outsiders, loss of personal belongings, and weaknesses in the current security systems. The existing security solutions, such as manual logbooks, supervision by senior residents, security patrols, and CCTV, still have many limitations.

To address this challenge, a smart lock system based on IoT with *Raspberry Pi 4 Model B* is proposed. This system combines facial recognition for entry access and an ultrasonic sensor for exit access. The implementation involves integrating the HOG (Histogram of Oriented Gradient) method with Haar Cascade, installing a camera to capture facial images, and using a solenoid door lock operated through instructions from the *Raspberry Pi*. The procedure includes connecting hardware components, configuring the network, and utilizing the combined facial recognition methods. When the system detects a registered face, the door will open automatically. If the face is not registered, a notification is sent via the Telegram application, and access is denied. The ultrasonic sensor is used to detect the presence of objects near the door, allowing automatic exit access.

Testing results indicate that the facial recognition system operates with 89% accuracy under normal conditions, with 4% validation errors and 7% undetected faces. However, accuracy drops to 65% when users wear accessories and 58% in low light conditions, indicating challenges under less-than-ideal circumstances. The ultrasonic sensor shows a detection success rate of 94% across various testing durations. Analysis reveals that the system is reliable under optimal conditions but requires improvements in low-light scenarios and when users wear accessories. The Smart Dorm Key system demonstrates significant potential to enhance door security, although further refinement is needed to handle more challenging conditions.

Keywords: Face Recognition, Ultrasonic Sensor, Smart Lock, Security, *Raspberry Pi*, IoT.