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COVER LETTER

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Dear,
I/We wish to submit an original research article entitled "[***Car Seatbelt Monitoring System Using Real-Time Object Detection Algorithm Under Low-light and Bright-light Conditions***]" for consideration by SINERGI.

We confirm that this work is original and has not been published elsewhere, nor is it currently under consideration for publication elsewhere. We promise not to withdraw this article after it has been processed by the Editorial Team. If there is a withdrawal, we are willing to pay a penalty of USD 150 (IDR 2000K) to the SINERGI Editorial Team.

In this paper, I/we report on / show that:

Field	:	Object Detection
Topic	:	Real-Time Object Detection for Monitoring Car Seatbelt Usage
Brief Background	:	Seat belt use is an important factor in driving safety. The ETLE system has been implemented to monitor driver compliance in traffic. However, there are still drivers who violate the rules for using seat belts when driving. This is because the location of the ETLE system is limited so that it is less effective in monitoring in real-time. and violation detection interference due to limited lighting conditions.
Research Problem	:	This research proposes a system that can monitor real-time detection of driver seat belt objects installed in the car. The monitoring system will be connected to the car's engine start and the driver's smartphone. So that when the driver is detected not wearing a seat belt, the driver cannot start the car engine, and will receive a notification from the smartphone in the form of a warning message. The monitoring system is tested in low light and bright light to represent the state of the car room when used every day in various conditions.

Overview of Method	:	This study uses the YOLOv5s algorithm for real-time detection of seat belt objects and driver faces. The dataset was collected through the Roboflow website, and manually took pictures when the driver was using and not using a seat belt. The number of datasets used was 1617. The system was trained and tested using Google Colab to generate model weights. The test is to find accuracy, precision, recall, and F1-score. Model weights as the main material for object detection will be entered into the Raspberry Pi 4 device. Raspberry Pi 4 is connected to various other components, namely Webcam, Ignition key, Relay, LED, Buzzer, and Telegram server. When the seat belt and face are detected, the LED and buzzer will not light up, while the Relay will have a CLOSE condition, which connects the Ignition key with the starter dynamo, so that the driver can start the car engine. Meanwhile, when the face is detected and the seat belt is not detected, the LED and buzzer will light up, and the Relay will be OPEN, so the driver cannot start the car engine. Telegram notifications are sent every 5 minutes when the driver is not detected using the seat belt.
Significant finding	:	The system successfully works by detecting the use of seat belts and generating responses according to the driver's detection conditions. The resulting performance is seat belt (accuracy = 93.2%, precision = 100%, recall = 92.4%, F1-score = 96%) and face (accuracy = 98.3%, precision = 98.2%, recall = 100%, F1-score = 98.4%). The confidence score obtained is better in bright lighting conditions (90.3%=face, 85.5%=seatbelt) compared to low lighting (87.7%=face, 83.6%=seatbelt). This is a future evaluation to improve the detection system model to detect seatbelt and face in various conditions using datasets with diverse conditions (e.g. dim lighting, obstructed hands or clothing, different object positions).

We have no conflicts of interest to disclose.

Thank you for your consideration of this manuscript.

Sincerely,
[*Agus Suryanto*]

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AUTHORSHIP STATEMENT

I/We wish to submit an original research article entitled "[***Car Seatbelt Monitoring System Using Real-Time Object Detection Algorithm Under Low-light and Bright-light Conditions***]" for consideration by SINERGI.

All persons who meet authorship criteria are listed as authors, and all authors certify that they have participated sufficiently in work to take public responsibility for the content, including participation in the concept, design, analysis, writing, or revision of the manuscript.

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