

| Object-detection CNN<br>model compared with<br>attention modules | Test dataset  |               |               |               |           |
|--|---------------|---------------|---------------|---------------|-----------|
|  | Precision     | Recall        | F-score       | mAP0.5        | p - value |
| <b>YOLOv5x</b>   | 0.9210        | 0.9350        | <b>0.9279</b> | 0.9440        | -         |
| <b>YOLOv5x - CBAM</b>  | <b>0.9350</b> | 0.9170        | 0.9259        | 0.9420        | 0.779     |
| <b>YOLOv5x – SE</b>  | 0.9040        | <b>0.9380</b> | 0.9207        | <b>0.9450</b> | 0.348     |

**Supplementary Table 1.** Comparative table of object-detection YOLOv5x model with SE and CBAM attention modules performances. Descriptive parameter values of Precision, Recall, F-score, and Mean Average Precision (mAP0.5) are represented for Test dataset. YOLOv5x: You Only Look Once version 5 model x, SE: Squeeze and Excitation, CBAM: Convolutional Block Attention Module. Statistical analysis (paired t-test) to compare the performance of CNN and attention modules was performed ( $p$ -value<0.05).

### **Empirical tests with other databases**

To empirically check if the trained YOLOv5x neural network for malaria parasite detection can adequately perform in other acquisition setups, an open-source image database was employed and analyzed. The Institute of Electrical and Electronic Engineers (IEEE) malaria thick blood smear dataset by F. Yang *et al.*, 2021 was used as an external image sample database (Malaria Thick Blood Smears | IEEE DataPort, n.d.). All images (3024×4032-pixel resolution) were acquired with a smartphone camera. To emulate a real clinical analysis with our system, images were cropped as in our pre-processing protocol. Finally, the YOLOv5x trained model was executed to analyze and

detect leukocytes and parasites in IEEE digital images. Qualitative detection results are shown in **Supplementary Figure 2**. The neural network presented positive results with images from other databases.

## **References**

Malaria Thick Blood Smears | IEEE DataPort (n.d.). Available at: <https://iee-dataport.org/documents/malaria-thick-blood-smears> [Accessed November 15, 2021].