Supplementary Material for "BGF-YOLO: Enhanced YOLOv8 with Multiscale Attentional Feature Fusion for Brain Tumor Detection"

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1 Qualitative Results

Fig. 1 presents qualitative results of sample images detected from different models on the same image (y718.jpg) in the test set.

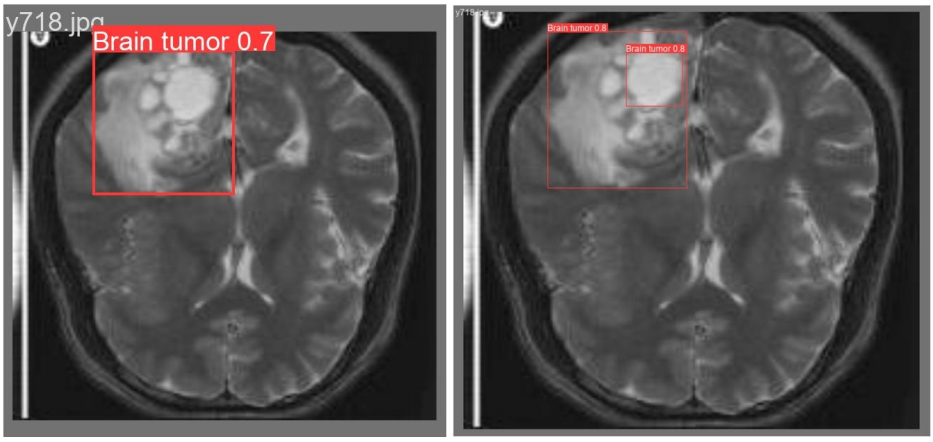

Fig. 1. Qualitative comparison of brain tumor detection sample images predicted by YOLOv8x (left) and BGF-YOLO (ours) (right). Our proposed BGF-YOLO can detect more objects than YOLOv8x with higher accuracy on the same sample image.

2 Tables of Ablation Study

All the results of the ablation study are shown in the following Table 1, 2, 3, and 4.

Table 1. Ablation study of each method in the proposed BGF-YOLO. w/o stands for without.

Method	Precision	Recall	mAP_{50}	$mAP_{50:95}$
w/o BRA	0.913	0.877	0.958	0.674
w/o GFPN	0.908	0.890	0.952	0.661
w/o Fourth Head	0.922	0.866	0.939	0.643

Table 2. Ablation study on multiscale feature fusion structures. The GFPN structure of the BGF-YOLO neck is replaced by the BiFPN and AFPN. The best results are shown in bold.

Model	Precision	Recall	mAP_{50}	$mAP_{50:95}$
BBF-YOLO	**0.932**	0.895	0.953	**0.658**
BAF-YOLO	0.915	0.888	0.958	0.640
BGF-YOLO	0.919	**0.926**	**0.974**	0.653

Table 3. Ablation study on attention mechanisms. The BRA in BGF-YOLO is replaced by SE, ECA, CBAM, CA, and RFA, respectively. The best results are shown in bold.

Model	Precision	Recall	mAP_{50}	$mAP_{50:95}$
SGF-YOLO	0.895	0.861	0.925	0.651
EGF-YOLO	0.918	0.885	0.946	**0.673**
CGF-YOLO	**0.957**	0.905	0.969	0.640
ABF-YOLO	0.913	0.852	0.930	0.656
RBF-YOLO	0.907	0.861	0.944	0.632
BGF-YOLO	0.919	**0.926**	**0.974**	0.653

Table 4. Ablation study on regression losses. The CIoU in BGF-YOLO is replaced by GIoU, DIoU, EIoU, SIoU, and WIoU, respectively. The best results are shown in bold.

Model	Precision	Recall	mAP_{50}	$mAP_{50:95}$
BGFG-YOLO	**0.954**	0.877	0.961	**0.661**
BGFD-YOLO	0.923	0.902	0.965	0.655
BGFE-YOLO	0.896	0.918	0.958	**0.661**
BGFS-YOLO	0.945	0.861	0.958	0.652
BGFW-YOLO	0.915	0.884	0.960	0.655
BGF-YOLO	0.919	**0.926**	**0.974**	0.653