Dear Reviewer,

I would like to express my sincere gratitude for the time and effort you have dedicated to reviewing our manuscript. Your insightful comments and constructive critiques are immensely valuable to us and have provided a clearer direction for enhancing the quality of our work.

We have thoroughly considered each point raised in your review and have undertaken substantial revisions to address these concerns.

Once again, thank you for your invaluable contribution to the refinement of our research.

Best Regards,
Wenbo

Point-by-point Response to Reviewer's Comments

Reviewer finds the idea of implementing deep learning to solve a novel rail track defect problem. The paper is well-suited and commendable. However, the following should be considered to improve the paper.

Comments 1: Authors claimed to propose novel deep learning methods to process B-Scan images for automatic identification and localization of track defects. However, an expert reviewer does not seem to agree. YOLO v3, YOLO v4 and Faster RCNN as used in this paper are not novel deep learning and not proposed by the authors.

Response1: Thanks very much for your constructive suggestions. YOLO v3, YOLOv4, and Faster RCNN are representative algorithms for detecting internal rail defects, and they were good at detecting them. we have expanded our study to include a comprehensive comparative analysis of four advanced models: YOLO v5, YOLO v8, DETR (a model based on the transformer architecture), and Faster-RCNN. This new comparison aims to provide a broader and more current perspective on deep learning techniques for processing B-Scan images for automatic identification and localization of track defects.

Comments 2: I think authors should rather say "This paper adopted state-of-the-art deep learning algorithms for novel B-scan images for automatic, identification and localization of rail internal tracks.

Response2: We appreciate your comments and have made changes in the summary section based on your comments. We used the novel YOLO algorithm and made some modifications based on it for B-scan images to accomplish the wounding defects for B-scan images.

Comment 3: The most fundamental correction needed in this paper is section 3.1 "YOLO series detectors". Authors can not stop at YOLO v4 for a paper to be published in 2023 or 2024. Currently, there is YOLOv8. It is suggested that the paper should include YOLOv8 or a higher version if any. YOLOv4 as the highest in this paper makes the paper old and outdated.
Other corrections about abbreviations and little English corrections are in the attached PDF.

Response 3:

Thank you for your insightful comments and the constructive critique of our manuscript,

particularly regarding the section on "YOLO series detectors". We appreciate your emphasis on the necessity of incorporating the most current advancements in the field.

In response to your valuable feedback, we wish to inform you that subsequent to the submission of our paper, we have conducted additional experiments using YOLOv8. This decision was motivated by your observation regarding the rapid advancements in YOLO technology and its implications for the relevance of our research. Our re-evaluation with YOLOv8 has not only fortified our initial findings but also provided enhanced results that underscore the effectiveness of the latest iteration in the YOLO series.

We have revised the manuscript to include these updated findings. The new section provides a comprehensive analysis of YOLOv8, comparing its performance metrics against the earlier versions, particularly YOLOv5, which also is a advanced YOLO version. The inclusion of these results adds significant value to our research, offering a more current and comprehensive understanding of the YOLO detectors' evolution and capabilities.

We added YOLOv8 part to the latest manuscript are as follows:

[Page14, Line 497, in Section 3.1]

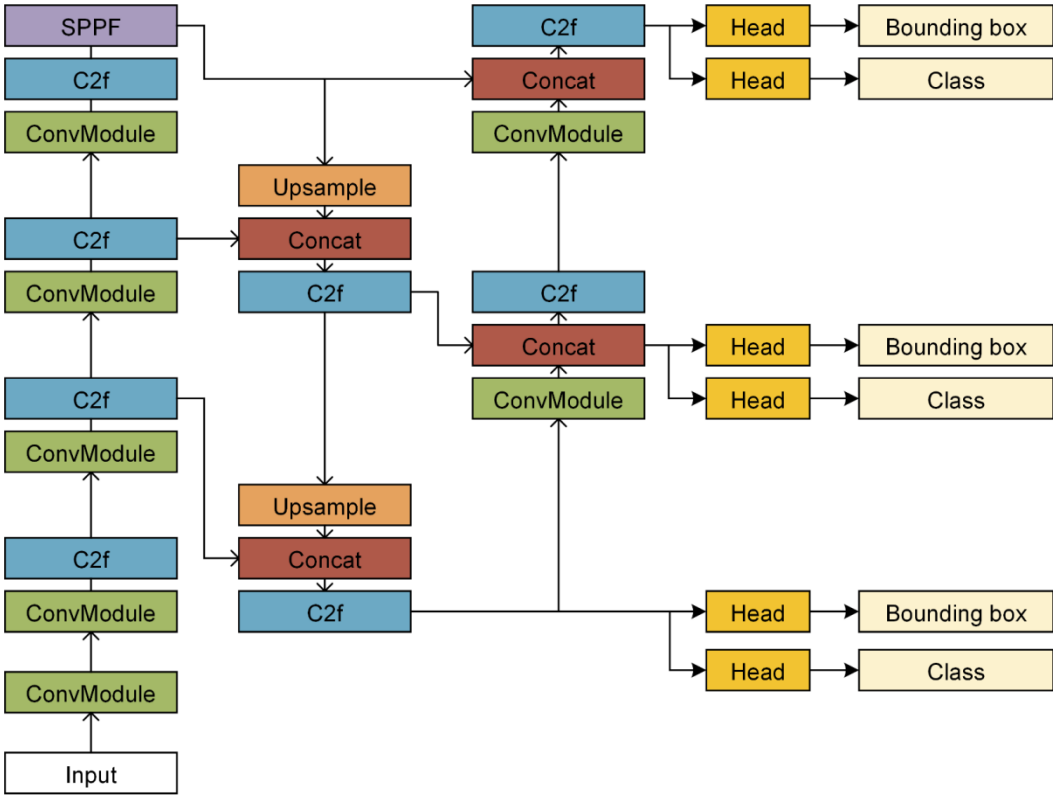
[The latest YOLO version, v8, has shown significant improvements in accuracy and speed of deep learning for object detection, particularly in terms of accuracy and speed in defect detection[36-37]. YOLOv8, while maintaining a comparable parameter count, achieves a higher throughput, signifying a substantial progression in deep learning applied to object detection. This development has propelled YOLOv8 to the forefront of this research, surpassing previous versions of YOLO.

YOLOv8 inherits and enhances the core attributes of the YOLO series, including its capacity to directly predict bounding boxes, confidence levels, and class probabilities from input images. Compared to Faster R-CNN, YOLOv8 generates significantly few-er bounding boxes per image, facilitating an end-to-end real-time detection process. Moreover, YOLOv8 introduces innovations in structure and performance, employing a novel network architecture and advanced feature extraction methodologies. Notably, YOLOv8 adopts a new backbone network structure and an anchor-free detection head, leading to heightened detection precision, augmented multi-scale detection capabilities, and more efficient feature fusion. These improvements ensure the acquisition of rich semantic information while enhancing multi-scale detection ability and feature fusion effectiveness. YOLOv8 also incorporates new loss functions, including classification loss, bounding box regression loss, and IOU balance loss, optimizing model performance during training.

Recent advancements in YOLOv8 encompass an array of training and network optimization techniques[38], such as data augmentation, learning rate adjustments, and the selection of activation functions, further enhancing the model's performance across various scenarios. This is evident in the rail defect B-scan image inspection process depicted in Figures 6 and 7, as well as the comprehensive architecture of YOLOv8.]

And the updated figure of architecture of YOLOv8 as follows:

[Page 16, Line530, Section3.1]


SPPF
C2f
ConvModule
C2f
ConvModule
C2f
ConvModule
C2f
ConvModule
Input
Upsample
Concat
C2f
Upsample
Concat
C2f
C2f
Concat
ConvModule
C2f
Concat
ConvModule
Head
Head
Head
Head
Head
Head
Bounding box
Class
Bounding box
Class
Bounding box
Class