

For research article

Response to Reviewer 4 Comments

1. Summary

First of all, I would like to express my deepest gratitude for the valuable comments and suggestions you provided during the review process. Your professional guidance is of inestimable value to the improvement of my article, enabling me to more clearly recognize the shortcomings in my research work and how to make improvements to meet higher research standards.

2. Questions for General Evaluation

Reviewer's Evaluation

Response and Revisions

Does the introduction provide sufficient background and include all relevant references?

Yes/Can be improved/**Must be improved**/Not applicable

I agree with the suggestions put forward by the experts and have made corrections point by point.

Is the research design appropriate?

Yes/Can be improved/**Must be improved**/Not applicable

Are the methods adequately described?

Yes/Can be improved/**Must be improved**/Not applicable

Are the results clearly presented?

Yes/Can be improved/**Must be improved**/Not applicable

Are the conclusions supported by the results?

Yes/Can be improved/**Must be improved**/Not applicable

3. Point-by-point response to Comments and Suggestions for Authors

Comments 1: In Figure 1, the authors showed the image of yellow and wilt disease. For "Wilt Disease", it looks like already dead. So the evaluation of disease is necessary, how heavy of the diseases?

Response 1: Thank you for pointing this out. Prompted by the expert, I have consulted the literature and gained a certain understanding of the disease index of wilt disease.

On the one hand, when observing the appearance of plants, apart from checking whether the plants exhibit a wilted state similar to death, we also need to pay attention to the yellowing and withering of leaves. Specifically, we should note the proportion of the yellowed and withered leaf area to the total leaf area of the whole plant. If most of the leaves are severely yellowed and withered, it usually indicates a relatively serious disease condition. At the same time, we should also check whether there are phenomena such as discoloration, atrophy, and necrosis in the stems and branches. The wider the range of the

lesions, the more serious the disease is likely to be.

On the other hand, it is also important to analyze from the perspective of physiological indicators. For example, by detecting the water content of plants, plants with severe diseases usually experience severe water loss, and their water content will be significantly lower than that of healthy plants. In addition, analyzing the changes in the content of internal nutrients in plants, such as the content of nitrogen, phosphorus, potassium and other elements, is also helpful. After the plant is infected, the absorption and transportation of these elements may be hindered, and the abnormal content of these elements can also indicate the severity of the disease to a certain extent.

Furthermore, judging the severity of the disease according to the development stage of the disease is also a viable method. If only a small number of leaves on the plant begin to turn yellow and wilt, which are initial symptoms, then the disease is relatively mild. Conversely, if most of the tissues of the whole plant have become necrotic and are even approaching death, it indicates that the disease has reached a very serious stage. In addition, by counting the proportion of diseased plants in the entire planting area, the severity of the disease can also be reflected indirectly. If only a few scattered plants are diseased, it may mean that the disease is in the local infection stage and the severity is still within a controllable range. However, if a large number of plants show obvious symptoms of verticillium wilt, it indicates that the disease has become relatively serious in this area and corresponding prevention and control measures are urgently needed.

Finally, we think the verticillium wilt (Wilt Disease) shown in Figure 1 presents an appearance of seemingly dead, and it is difficult to directly determine the severity of the disease. It is necessary to comprehensively evaluate the specific severity of verticillium wilt based on multiple indicators and situations. After the improved YOLOv8n in this study identifies a diseased plant, manual in - depth detection and judgment are required. If it is judged to be mild, methods such as applying more organic fertilizers and bio - fertilizers can be used for treatment. If it is judged to be in a severe stage, it can be removed to prevent affecting the growth of healthy plants.

Comments 2: For the "Cotton Bollworm", one is yellow, another one is green. Does it mean there are two varieties or stages of this worm? How about the percentage?

Response 2: Thank you for pointing this out. Prompted by the expert, I've consulted the literature and gained some understanding of the cotton bollworm. The variation in the color of cotton bollworms may stem from individual differences. Factors such as food sources and environmental conditions can have an impact. Consumption of plant leaves with different nutrient components or pigment contents, as well as changes in environmental conditions like temperature, humidity, and light, can all lead to differences in pigment formation and deposition. Although some differences in the growth stage are generally within a certain range and not typically distinct as yellow or green, special external stimuli can cause color changes to deviate from the normal pattern. Gene mutations or genetic diversity can also result in some individuals having special color phenotypes. In Figure 1, all are the larval stages of the cotton bollworm. After verifying the dataset of this study, the ratio of yellow to green cotton bollworms is 4:6.

Comments 3: The "Albumentation" was used in the augmentation. Based on reference 25, it

looks like a toolbox to improve the processing speed, which can " keep GPUs utilization during training close to 100%". So the parameters or details of augmentation are not clear.

Response 3: Thank you for pointing this out. I agree with this suggestion. I have added the parameters and details of "Albumentation", as follows:

Albumentations is an efficient image processing library specifically designed for data augmentation. It offers a rich set of image transformation functions, each equipped with multiple practical parameters. For instance, in the random fog transformation, there are parameters like "fog_coef_lower" and "fog_coef_upper". These parameters are used to control the concentration range of the fog. They can add fog to different positions of the image and blur the background. By adjusting these two parameters, one can precisely simulate the image effects under different levels of hazy weather. In the rain transformation, the "rain_type" parameter is used to specify the type of rain, such as "drizzle" (light rain) or "heavy" (heavy rain). Meanwhile, the "rain_amount" parameter can adjust the amount of rainfall, thus simulating various rainy - day images. This enhances the adaptability of the dataset to rainy - day environments and improves the model's detection accuracy in rainy conditions. The random sunlight transformation utilizes the "sun_flare_brightness" parameter in combination with natural light and light - adjustment techniques. This parameter can set the brightness of the sun flare, thereby simulating images with random sun flares and enriching the diversity of the dataset. These elaborate image transformations provide the model with more comprehensive and realistic training samples, significantly enhancing its recognition ability in complex environments. These transformation functions can be flexibly combined to meet complex and diverse augmentation requirements. (Page 6,Line247-265)

Comments 4: Section 3, the Yolov8 was improved based on which version? The improvement was not described clearly.

Response 4: Thank you for pointing this out. After being reminded by the expert, I have described in Section 3 which version of YOLOv8 was the basis for the improvement, and the description of the improvements follows immediately, in Sub - sections 3.3 - 3.5. The specific modifications are as follows:

The original YOLOv8n has a relatively small number of network parameters and a low computational cost. Therefore, the object of this study is the lightweight and highly adaptable YOLOv8n. The specific experiments are presented in Section 4, specifically 4.3 Comparison of YOLOv8 Baseline Models. (Page 8,Line316-320)

Comments 5: Section 3.2 and Section 3.3, titles are the same.

Response 5: After being reminded by the expert, I have revised the title of Section 3.3. The title is "Weighted Bidirectional Feature Pyramid Network "(Page 9,Line354)

Comments 6: Because the precisions, recalls, and mAPs are quite close in this manuscript. The statistic analysis is necessary to prove the improvement if it is significant. I strongly ask you to submit this result (for example, SPSS result files) to check in the future.

Response 6: Thank you for pointing this out. After being reminded by the expert, I have uploaded the result files, namely results.csv before the improvement and results1.csv after the improvement.

Comments 7: Table 4, the "t/s" is ? Testing time?

Response 7: Dear expert, I'm sorry that the expression in this part is not clear. In Table 4, "t/s" indicates that the difference in test time between the improved YOLOv8n model in this study and the baseline model is not significant and is within an appropriate range.

Comments 8: Figure 7. The colormap meaning is necessary.

Response 8: Thank you for pointing this out. I agree with this suggestion. I have provided an explanation of the meaning of the color map in Figure 7, as follows:

A heatmap is a type of chart that presents data information in an intuitive and visual way. It uses variations in color intensity to map the magnitude or density distribution of data values. In a heatmap, darker colors typically represent higher data values or areas with a more dense data distribution, while lighter colors correspond to lower data values or relatively sparser areas. (Page 18,Line675-680)

Comments 9: Figure 8 and the connected contents, I didn't get the points. How to observe "improved model is more sensitive to subtle disease and pest symptoms"?

Response 9: Thank you for pointing this out. I agree with this suggestion. After being reminded by the expert, I have increased the resolution of the images, making the confidence level values visible. Additionally, I have added relevant explanations on how to observe the issue of "the improved model being more sensitive to subtle pest and disease symptoms", as follows:

Figure 8 showcases a comparison of the performance between the original YOLOv8 model and the improved model in sesame disease and pest detection. The recognition results of the first and second groups of images in the vertical direction show that the original model has false detections of flax pests and diseases, while the improved model with the SimAM attention mechanism is more accurate in detection. Comparing the third and fourth groups of images, the original model has missed detections and misdetections. After adding the BiFPN feature fusion mechanism and the EIOU loss function, the improved model has a higher accuracy in identifying pests and diseases under complex backgrounds. Observing the last group of images, the original model has inaccurate detections and false detections for small and medium - sized targets. The improved model with four detection heads is more sensitive to the detection of small and medium - sized targets, effectively improving the overall detection effect. (Page 24,Line692-702)

4. Response to Comments on the Quality of English Language

Point 1: The writing should be very clear, and use less general or macro words.

Response 1: Thank you for pointing this out. I agree with this suggestion. I have polished the expressions in the article and removed the general statements. I hope it will be clearer for you to read.

5. Additional clarifications

In this study, the dataset used was independently constructed, and there are no issues related to infringement. At the same time, the code involved also has no copyright risks. Additionally, the entire experimental process strictly adheres to ethical and moral norms, and there is absolutely no act of violating ethics and morality.