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Object Detection in Automated Software Testing

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Abstract

This application note presents 'BrightSight', an application to facilitate the entire process of setting up an object detection model to test the presence and display quality of certain elements on specific web pages. The conventional method to achieve this in automated software testing involves parsing the page's HTML. An element being present in the HTML is no guarantee that it is indeed visible and displayed correctly to the user, however. Because of the increased interest in machine learning over the past few years, object detection models are used to verify whether an element is visible. A comparison of state-of-the-art object detection models is made to decide which to focus on, considering the large number available. The presented application allows for the creation of custom datasets which can then be used to train the models (YOLOv9 and RT-DETR) inside the application. Furthermore, the models can be tested after training to verify their performance meets expectations. The goal of creating a proof-of-concept involving object detection of web elements has been completed. However, it remains open to discussion and future research whether machine learning is the best solution to this problem. The application provides a starting point for and encourages the continued research into the use of machine learning in automated software testing. In addition, it serves as a tangible way to determine the effectiveness of object detection in the field of automated software testing.

Conclusion

This application note has presented 'BrightSight', an application to facilitate the entire process of setting up an object detection model to test the presence of certain elements on specific web pages. This process includes the creation of a dataset, and training and testing of the selected models. A choice of two models is currently available, namely YOLOv9 and RT-DETR. The application allows a user to generate an accurate object detection model in a few simple, streamlined steps, without the need for any machine learning knowledge. Thus, the goal of developing a proof-of-concept for an application that facilitates the creation of object detection models to detect elements on web pages has certainly been reached. The only question that remains is whether machine learning, and specifically object detection, is the right solution for testing the presence and display quality of web elements. The entire purpose of an object detection model is to generalize over its training set to be able to detect objects in unseen data. This contradicts somewhat with the requirement of detecting specific web elements. In a way, overfitting is necessary in this case since generalization is not the goal (to a certain extent, slight variations should still be detected). Machine learning also makes it difficult to get consistent results. Some datasets might work a lot better or worse than others without a clear reason why. However, machine learning does provide something that can't be done as well or at all using other methods. Namely, it allows for the testing of the quality of an element being displayed. In conclusion, it is difficult to determine the usefulness of object detection in automated testing without BrightSight being used by testers in real projects. However, as mentioned object detection does have one major unprecedented capability in the current state of automated testing.