

An Investigation into Computer Vision Methods to Identify Material Other Than Grapes in Harvested Wine Grape Loads

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Abstract : Mass wine production companies across the globe are provided with grapes from winegrowers that predominantly utilize mechanical harvesting machines to harvest wine grapes. Mechanical harvesting accelerates the rate at which grapes are harvested, allowing grapes to be delivered faster to meet the demands of wine cellars. The disadvantage of the mechanical harvesting method is the inclusion of material-other-than-grapes (MOG) in the harvested wine grape loads arriving at the cellar which degrades the quality of wine that can be produced. Currently, wine cellars do not have a method to determine the amount of MOG present within wine grape loads. This paper seeks to find an optimal computer vision method capable of detecting the amount of MOG within a wine grape load. A MOG detection method will encourage winegrowers to deliver MOG-free wine grape loads to avoid penalties which will indirectly enhance the quality of the wine to be produced. Traditional image segmentation methods were compared to deep learning segmentation methods based on images of wine grape loads that were captured at a wine cellar. The Mask R-CNN model with a ResNet-50 convolutional neural network backbone emerged as the optimal method for this study to determine the amount of MOG in an image of a wine grape load. Furthermore, a statistical analysis was conducted to determine how the MOG on the surface of a grape load relates to the mass of MOG within the corresponding grape load.

Keywords : computer vision, wine grapes, machine learning, machine harvested grapes

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