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Machine Learning Techniques For Automatic Detection Of Xylella Fastidiosa In Vhr Hyperspectral And Thermal Data

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"Xylella fastidiosa (Xf) is a plant pathogen affecting 679 plant species worldwide. In the last years, it has been identified as the bacterium causing a devastating disease on olive trees in the Apulia Region (Italy), with a great impact on the landscape and on the agricultural yields, as well as significant economic losses.

The detection of infected trees and their eradication are the only effective means to stop the Xf spread. Nowadays, the diagnostic checks are made by the quantitative real time-Polymerase-Chain-Reaction (qPCR) using leaves or twigs sampled from trees in order to detect the presence of bacterial DNA. These procedures are complex, time consuming and expensive, moreover often ineffective because early detection of infected trees (also still asymptomatic ones) ought to be made on short temporal and large spatial scales in order to reduce the infection risk for the surrounding plants, which is currently hardly feasible through ground campaigns.

For these reasons, the use of hyperspectral and thermal data, remotely acquired by sensors mounted on airplane or Unmanned Aerial Vehicle (UAV) platforms has been recently assessed. Remotely sensed data have been demonstrated to be an effective tool for the early detection of Xf infection in several case studies. Operational applications require statistically well-founded methodologies to extract useful information from the data, in order to automatically classify healthy and Xf affected trees.

We present some results from the processing of data obtained in the framework of the Remote Early Detection of Xylella (REDoX) project, funded by the Italian Business and Made in Italy Ministry (MISE)."

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