

### 3D fruit detection in LiDAR point clouds using graph or 3D neural networks

The detection of fruits is of great interest to predict the harvest resources in advance. Non-invasive fruit detection remains a challenging task that must deal with occlusions, which may be caused by the foliage or shadows. Nowadays, depth sensors, such as LiDARs, stereo cameras or structure from motion analysis, are able to successfully register fruit trees into a 3D map of the environment.

The main goal of this project will be to explore and design new deep learning architectures based on Graph or 3D Neural Networks to be able to detect fruits in the 3D representation. The proposed algorithm will be evaluated to compare the different stages of ripeness in the fruit and to compare the performance of different acquisition techniques (LiDAR or SfM).

This project will be done in collaboration with the Image Processing Group (GPI) from the **Universitat Politècnica de Catalunya** (UPC) and the Research Group in AgrolCT & Precision Agriculture (GRAP) from the **Universitat de Lleida** (UdL).

There is a possibility to partially complement the work in this TFM with a job contract associated to the research project at UdL "Precision Crop Protection to achieve European Green Deal goals in pesticide use efficiency and reduction using Precision Agriculture techniques (Ref. PID2021-126648OB-I00)" (with the possibility of teleworking and flexible schedule to make it compatible with the Master studies).

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