

3D fruit detection and size estimation using graph neural networks

The detection and measurement of fruit size is of great interest to estimate the ripeness of the crop and predict the harvest resources in advance. Non-invasive estimation of fruit size remains a challenging task that has to 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 Neural Networks to be able to detect fruits in the 3D representation. Furthermore, these architectures will be extended to be able to estimate the diameter of the fruits. 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 AgriICT & Precision Agriculture (GRAP) from the **Universitat de Lleida** (UdL).

There is a possibility to partially complement the work in this TFM with a [grant](#) associated to the TEC project at UdL “PRECISION AGRICULTURE TECHNOLOGIES TO OPTIMIZE CANOPY MANAGEMENT AND SUSTAINABLE CROP PROTECTION IN FRUIT ORCHARDS (Ref. [RTI2018-094222-B-I00](#))”.

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