Master's Thesis Proposal: Detection and Measurement of Fruits Using Multi-Task Neural Networks

Knowing the size of fruits (specifically apples) is essential for fruit growers, as it facilitates agronomic tasks such as thinning, harvest prediction, and post-harvest logistics, as well as being a key factor in determining their market value. Currently, measurement methods are manual, time-consuming, and prone to errors. As an alternative, the University of Lleida (UdL) and IRTA, in collaboration with the Polytechnic University of Catalonia (UPC), are developing an innovative mobile application, FruitMeasureApp, which leverages computer vision algorithms to detect and measure fruits with precision.

A limitation of the current methodology in FruitMeasureApp is its reliance on a calibration target requiring a physical support attached to the mobile device for optical corrections, which may be inconvenient for users.

The aim of this Master's Thesis is to develop a new methodology that eliminates the need for reference objects, enabling fruit measurement without external calibration tools. The proposed algorithm will be based on a multi-task neural network with two parallel branches: one for object detection and another for regression to predict fruit diameters. This will optimize the mobile application and simplify the data acquisition process.

The project will be carried out in collaboration with the Image Processing Group (GPI, UPC), the Research Group on AgroICT & Precision Agriculture (GRAP, UdL) and IRTA. Furthermore, there is an opportunity for the student to receive **financial compensation through an employment contract** associated with the project "FruitMeasureApp – Validació i prototipatge d'una aplicació mòbil basada en IA per mesurar fruits en camp" (ref. ACC_2023_EXP_SIA002_33_0000039).

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