

## **Fruit detection and counting from Terrestrial LASER Scanning data via Machine Learning methods**

This postdoc proposal aims at developing a new approach for accurate estimation of orange fruit production by using Terrestrial Laser Scanning (TLS) data and machine/deep learning (ML/DL) methods. The main challenges to be overcome by the method that will be developed are, e.g., point cloud density variation and occlusion caused by orange branches and leaves, which can affect the semantic segmentation and classification by ML/DP methods applied to remote sensing data, such as 3D point clouds. The ML/DP approach to be developed will be based on both attribute learning and attribute engineering, taking into account TLS point cloud geometric information.

### **Project information**

This postdoc proposal is part of a thematic project, entitled “High Resolution Remote Sensing For Digital Agriculture” funded by FAPESP (*Fundação de Amparo à Pesquisa do Estado de São Paulo* - <https://fapesp.br/en>), Brazil. It has been developed in several campuses of Unesp (São Paulo State University - <https://www.international.unesp.br/>), Brazil. The main aim of this main project is to study the use of multitemporal, multi-resolution, and multi-platform data collected from multiple sensors in different resolutions and various types of sensors: orbital, aerial high-resolution systems with UAVs, static ground and mobile. The results will include the development of a terrestrial multi-sensor platform and the corresponding calibration processes, allowing the integrated orientation and enabling the generation of multispectral point clouds. This type of data will be classified to generate information on the existence of plaques, pathogens, nutritional deficiencies, structural changes and fruit quantification or individual plants, being used in this project for Citrus, Coffee and other crops.

The postdoc project will be developed at Unesp campus of Presidente Prudente city. Excellent work environment, composed by labs (including the Sensor Integration Lab) and software/hardware (including the Ouster Lidar, FARO Focus Premium 70, Nvidia 3080/3090 graphics card, and many other resources) are available. In this context, we are looking for a postdoc researcher with the capacity to develop new and innovative approaches for accurate estimation of orange fruit production by using TLS data and ML/DL methods. In order to address related challenges that potentially degraded the semantic segmentation and classification by ML/DP methods, like the branches’ and leaves’ occlusions and the point cloud density variation, new and efficient strategies are expected to be developed. In addition to the aforementioned, it is expected that the selected postdoc can also contribute to the campaign preparation and field data collection. This may require studies and developments involving the integration and intercalibration of sensors, which is essential for other phases of the project.

### **Your profile**

- PhD degree in Remote Sensing, Photogrammetry, or related sciences.
- Solid background in Photogrammetry, Remote Sensing, Adjustment of Observations, Cartography and related subjects.
- Strong knowledge of programming involving C, C++, Python, among other languages.
- Good knowledge of DL/DP theory, algorithm, and implementation.
- Experience with TLS data processing.

- Good communication skills in English and willingness to work in an interdisciplinary and research team.
- Good record of peer-reviewed publications in the related field.
- Availability for frequent field works in inland orange orchards of São Paulo State, Brazil.
- Full-time dedication to the project.

### **Funds**

- FAPESP fellowship of R\$ 8,479.20 (circa US\$ 1,600.00), along with extra funds (for, e.g.: participation in scientific events; settlement; aerial tickets to/from Brazil for starting/finalizing the PD); the duration of this fellowship is 24 months, with the possibility of extension for more 12 or 24 months, upon evaluation and acceptance by FAPESP.

### **Application**

The application, in English, must be emailed to us with the following information/attached documents:

- Curriculum vitae.
- PhD degree Diploma.
- Research plan related to the above postdoc proposal (Max. 10 pages).
- Journal links (or doi) of 3 particularly relevant papers.
- Other documents that demonstrate your experience/profile.

Please, beware that the deadline for application is **14<sup>th</sup> of April 2023, 23:59 GMT -3**.

### **Contact**

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