

A semi-automatic tool for instance segmentation labeling

Participants: [Ricardo Bertoglio](#), [Nico Catalano](#), [Maximilian Fehrentz](#), [Matteo Matteucci](#)

Start date: 2022-09-12

Due date: 2022-02-28

End date:

Goal of the project: Development of a semi-automatic labeling tool for grape bunches instance segmentation datasets

Keywords:

Thesis outline

- State of the art: a literature analysis and test of some publicly available (semi-)automatic labeling tools, like [CVAT](#) and its automatic labeling features. Recognize the strengths and limitations. The literature analysis also include foreground segmentation and extraction methods like [GrabCut](#). The output will be a presentation. **Deadline: 2022-09-29**
- Write a document to define the characteristics and requirements of the software and a general overview of the pipeline. **Deadline: 2022-10-07**
- Development of a semi-automatic labeling tool for the annotation of grape bunches. The tool will be designed taking into account the findings of the literature research, but it could be structured as follows. **First prototype deadline: 2023-12-18:**
 - Exploiting an already trained network for grape bunches instance segmentation (a Faster R-CNN network), the tool will show the user preliminary bounding boxes of grape bunches on new unseen images collected in a different environment.
 - The user will flag the correct/wrong bounding boxes with a simple mouse click and will have the possibility to add new bounding boxes. The software should track (in a JSON file) for each bounding box, the number of correct/wrong pixels as long as the position of the bounding box.
 - For each correct or added bounding box, the support trained network will provide segmentation of the grape inside the box.
 - The tool will show each segmentation to the user and ask them to confirm or improve it. The improvement will be based on quick and rough user input to identify incorrectly labeled areas (false positives and false negatives). An automatic algorithm like GrabCut will refine the rough user input to obtain the final annotation.
 - After confirming or correcting all the single segmentations, the new labeled image will be used to fine-tune the support network and provide more accurate labels in an iterative loop.
- Testing the developed tool on a new dataset (collected in a different environment than the one used to train the support network) and verifying the average labeling time. **Deadline: 2023-02-28.**

Libraries and tools

- Python 3
- OpenCV
- [Qt](#) or [GTK](#)

Thesis outputs

- Open-source tool written in Python and uploaded to GitHub
- Test of the tool on grape bunches images collected in real vineyards
- Estimate of the average time required to label an image
- Comparison with state-of-the-art tools (like CVAT)

