MASTER'S THESIS INTERNSHIP OFFER

Title: Interactive Segmentation from Agro-Ecological Data

Hosting organization: CYCLAIR

Lab: Xlim institute

Research Team: ICONES

Scientific pole: ASALI

Starting date (month/date): 1 mars 2023 can be redefined

Short description of the internship offer (up to 5 sentences):
The development of deep learning-based algorithms for semantic segmentation requires a huge amount of annotated data. Annotating data with segmentation masks is very time-consuming and therefore expensive. Therefore, CYCLAIR is looking to implement a method that increases the quality and the quantity of annotated data.

Objectives (up to 5 sentences):
- Study the literature review
- Implement the most promising techniques
- Analyse the performance of each technique and compare results

Description of the internship offer:
CYCLAIR develops technological products that enable a spectacular reduction in the volume of chemical inputs, while continuing to protect crops and ensure current yields, or even improve them. Towards this goal CYCLAIR is developing a set of robots that autonomously remove weeds to ensure the growth of crops.
One of the main challenges in this project is the image segmentation part. There are different causes for making this part complicated such as:

- The huge varieties of crops and weeds, which means in each new crop field we must do data acquisition and annotations for training a new model.
- Robots will have to work all through the year and during the entire day, thus the images should be segmented under different conditions such as rainy, sunny, morning, night.
- The shape of crops/weeds change a lot while they grow.
- As robots are working in nature there are diverse types of unexpected obstacles. With a rare amount of these images, it will be hard to train a supervised network.

This issue has been a hot research topic for a long time. Researchers propose different approaches to solve this problem. One of the recent methods used to simplify and speed up the annotation is called interactive segmentation. The main concept of interactive segmentation is to allow users to explicitly control the predictions using interactive input (scribbles, clicks ...) and quickly annotate the object-of-interest.

Another method that can be used for pre-segmentation is unsupervised semantic segmentation approaches. The unsupervised segmentation domain is another hot research topic. It aims to discover and localize semantically meaningful categories within image corpora without any form of annotation.

Useful papers:

[1] Sofiiuk et al., f-BRS: Rethinking Backpropagating Refinement for Interactive Segmentation, CVPR 2020
[3] Kontogianni et al., Continuous Adaptation for Interactive Object Segmentation by Learning from Corrections, ECCV 2020
[4] Lin et al., FocusCut: Diving Into a Focus View in Interactive Segmentation, CVPR 2022

At the end of this internship a thesis offer will be published which will address two problems:

1. Segmentation of unexpected obstacles
2. Anomaly detection on mechanical tools

Both problems can be classified under the domain of unsupervised segmentation.
Description of the research team:

The research activities of ICONES research team are organized around the modeling and the processing of color and spectral images and videos in the three following themes:

- Representation models of multivalued images
- Optical metrology
- Perception et quality assessment

The strength and the originality of our team comes from the wide spectrum of image based research topics covered by all of our members: from acquisition to quality assessment including analysis and processing. This global approach is unique compared to other French and European laboratories.

Expected skills of the applicant:

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PHD THESIS OPPORTUNITIES

PhD thesis opportunity after the Master course:

x Yes ☐ No

If yes, financing already obtained:

☐ Yes x No

If yes, what kind of funds:  Cliquez ou appuyez ici pour entrer du texte.
CONTACT & APPLICATION

› Surname and first name of the internship supervisor(s): David Helbert, Philippe Carré

› Email of the supervisor(s): david.helbert@univ-poitiers.fr, philippe.carre@univ-poitiers.fr

› Phone number of the supervisor(s):

› The application shall be sent to the email: Cliquez ou appuyez ici pour entrer du texte.

› Closing date for applications: Cliquez ou appuyez ici pour entrer une date.