

Toward more collaborative deep learning project management in plant phenotyping

Herearii Metuarea¹ and David Rousseau¹

¹LARIS, Université d'Angers, IRHS INRAe

October 31, 2023

Abstract

Deep learning is a central tool in plant phenotyping. Proficiency in artificial intelligence and programming remains essential for designing a deep learning model. The reuse of deep models can be challenging for non-coding end-user such as plant biologists. Currently, very few tools facilitate collaboration between computational infrastructure, non-coding end-users, and deep learning project manager. Consequently, this limits the deployment of multi centric large scale deep learning initiatives (such as the notable exception of the Globally Wheat Challenge) in plant phenotyping. We propose the scheme of Fig. 1 to allow non-coding end-users to test existing deep learning models with a homemade software capable of running any segmentation, classification or object detection deep learning model. This software is an open source plugin coined MANINI (<https://github.com/hereariiim/manini>) which runs under the north American initiative NAPARI (<https://napari.org/>). The plugin also enables the manual correction of the inference. The corrected inferences can then be used to retrain or fine-tune the model on a large-scale infrastructure (in our case the European Grid Infrastructure EGI) via the DEEPaaS API. The resulting new model is then accessible on a public repository. We illustrate the interest of this scheme on various plant phenotyping use cases.

ORCID: [0000-0002-7935-1609]



NAPPN Annual Conference Abstract:

Toward more collaborative deep learning project management in plant phenotyping

Herearii Metuarea, **David Rousseau**

Université d'Angers, LARIS, IRHS INRAe, France

ORCID: [<http://orcid.org/0000-0002-7935-1609>]

Keywords: Deep learning, open source, collaborative, grid infrastructure, plant phenotyping

Deep learning is a central tool in plant phenotyping. Proficiency in artificial intelligence and programming remains essential for designing a deep learning model. The reuse of deep models can be challenging for non-coding end-user such as plant biologists. Currently, very few tools facilitate collaboration between computational infrastructure, non-coding end-users, and deep learning project manager. Consequently, this limits the deployment of multi centric large scale deep learning initiatives (such as the notable exception of the Globally Wheat Challenge) in plant phenotyping. We propose the scheme of Fig. 1 to allow non-coding end-users to test existing deep learning models with a homemade software capable of running any segmentation, classification or object detection deep learning model. This software is an open source plugin coined MANINI (<https://github.com/hereariim/manini>) which runs under the north American initiative NAPARI (<https://napari.org/>). The plugin also enables the manual correction of the inference. The corrected inferences can then be used to retrain or fine-tune the model on a large-scale infrastructure (in our case the European Grid Infrastructure EGI) via the DEEPaaS API. The resulting new model is then accessible on a public repository. We illustrate the interest of this scheme on various plant phenotyping use cases.

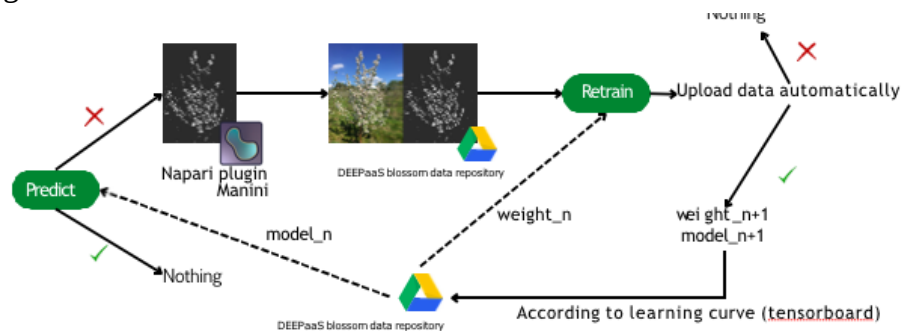


Figure 1 : collaborative deep learning project with non-coding end-user in the loop via our Napari plugin Manini and DEEPaaS API.

David, E., et al (2021). Global Wheat Challenge 2020: Analysis of the competition design and winning models. *arXiv preprint arXiv:2105.06182*.