Harnessing Deep Learning in Bioimaging: The DeepImageJ Journey

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DeepImageJ is a user-friendly plugin that facilitates the use of pre-trained neural networks for image processing in ImageJ and Fiji. Seamlessly integrating with classical pipelines, such as ImageJ macros, deepImageJ serves as a vital bridge between AI model developers and life-science end-users. This facilitation promotes model sharing across research groups, impacting a broad spectrum of bioimaging domains. DeepImageJ is a founder partner of the Bioimage Model Zoo (BMZ), a community-driven AI model repository that aims to provide easy and standardized access to pretrained models.

Because the use of deepImageJ does not necessitate wide deep learning expertise or computer programming skills, it has also become an invaluable educational tool for the life-science community. Namely, it has been taught by the deepImageJ team in more than 20 courses since its first release in 2019 such as Frontiers in Neurophotonics Summer School 2023, EMBL-EBI 2023, NEUBIAS 2023, Mifobio 2021-2023. External experts have also contributed to its instruction.

However, based on our experience, new developers joining the deepImageJ community face several challenges when integrating their pre-trained models. A primary obstacle lies in effectively packaging models for deepImageJ following the BMZ format. We are keen on developing a training strategy to overcome these hurdles.

Balancing the demands of AI's cutting-edge features with user-friendly tools' stability requires our constant vigilance and continuous documentation improvement. Moreover, smoothing the complexity of these tools according to the varying computational comfort levels of researchers is a vital aspect of facilitating widespread adoption.

In this workshop, our aim is to join forces with fellow researchers to collaboratively tackle these challenges. By exchanging experiences and insights, our goal is to set forth best practices and standards, thereby amplifying the accessibility and efficiency of bioimage analysis education.