Contribution ID: **16** Type: **Poster**

Employing Deep Learning for automated evaluation of microscope recordings through the object detection model CeCILE

Thursday 21 March 2024 13:15 (1h 30m)

Automated detection and tracking of living cells in microscopy recordings by deep learning algorithms may considerably speed up and facilitate evaluation compared to manual post-processing. However, the performance of such algorithms on individual sets of cell data and their generalizability differ significantly. One approach is to use a deep learning object detection model, which identifies areas in images containing cell depictions, and sorts them into predefined classes based on morphological features. Such a model (CeCILE) was developed at the University of the Bundeswehr Munich by fine-tuning a pretrained model from the TensorFlow 2 Object Detection API on a custom dataset. The latter contains videos of unstained irradiated and non-irradiated cells of four cell lines obtained with phase-contrast microscopy. An application programming interface (API) provides an easy-to-use framework, but modification, addition and removal of code is challenging. Additionally, the Tensorflow Object Detection API is deprecated. Further development of CeCILE can therefore hardly be addressed directly within the model code. For example, CeCILE detects and labels cells only in individual video frames, neglecting their temporal dependence, which is especially important for tracking cell divisions. Therefore, CeCILE is currently under revision and being rewritten with another programming library, PyTorch, without a dedicated object detection API. This approach is expected to increase flexibility and user-friendliness while maintaining the localization and classification accuracy previously achieved with CeCILE. Also, the addition of further features will be attempted, for example to leverage the temporal information in the videos of the dataset. Overall, the approach contributes to achieve more goals more quickly with less data. This work will introduce the concept of deep learning-based object detection, give an overview of CeCILE's functionalities and insights into the current development. Additionally, results of applying CeCILE to data generated from experiments with spatially fractionated minibeams will be presented.

Primary author: STEPANEK, Laura (Universität der Bundeswehr München)

Co-author: REINDL, Judith

Presenter: STEPANEK, Laura (Universität der Bundeswehr München)

Session Classification: Postersession

Track Classification: Digitization and machine learning in Particle Minibeam Therapy