

Towards a framework for the democratisation of deep semantic segmentation models

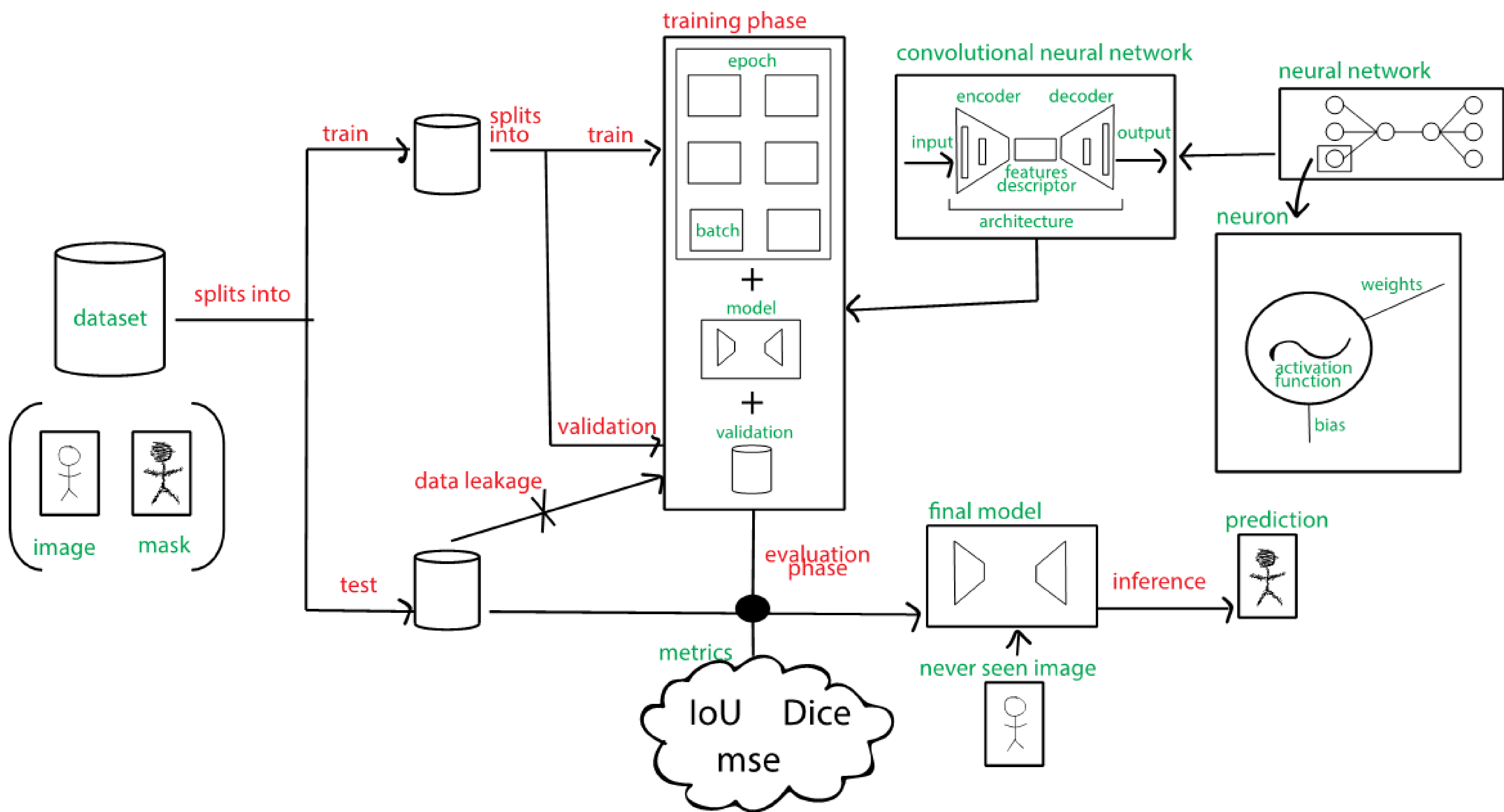
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Abstract

Semantic segmentation models based on deep learning techniques have been successfully applied in several contexts. However, non-expert users might find challenging the use of those techniques due to several reasons, including the necessity of trying different algorithms implemented in heterogeneous libraries, the configuration of hyperparameters, the lack of support of many state-of-the-art algorithms for training them on custom datasets, or the variety of metrics employed to evaluate semantic segmentation models. In this work, we present the first steps towards the development of a framework that facilitates the construction and usage of deep segmentation models.

Model creation steps



Framework usage

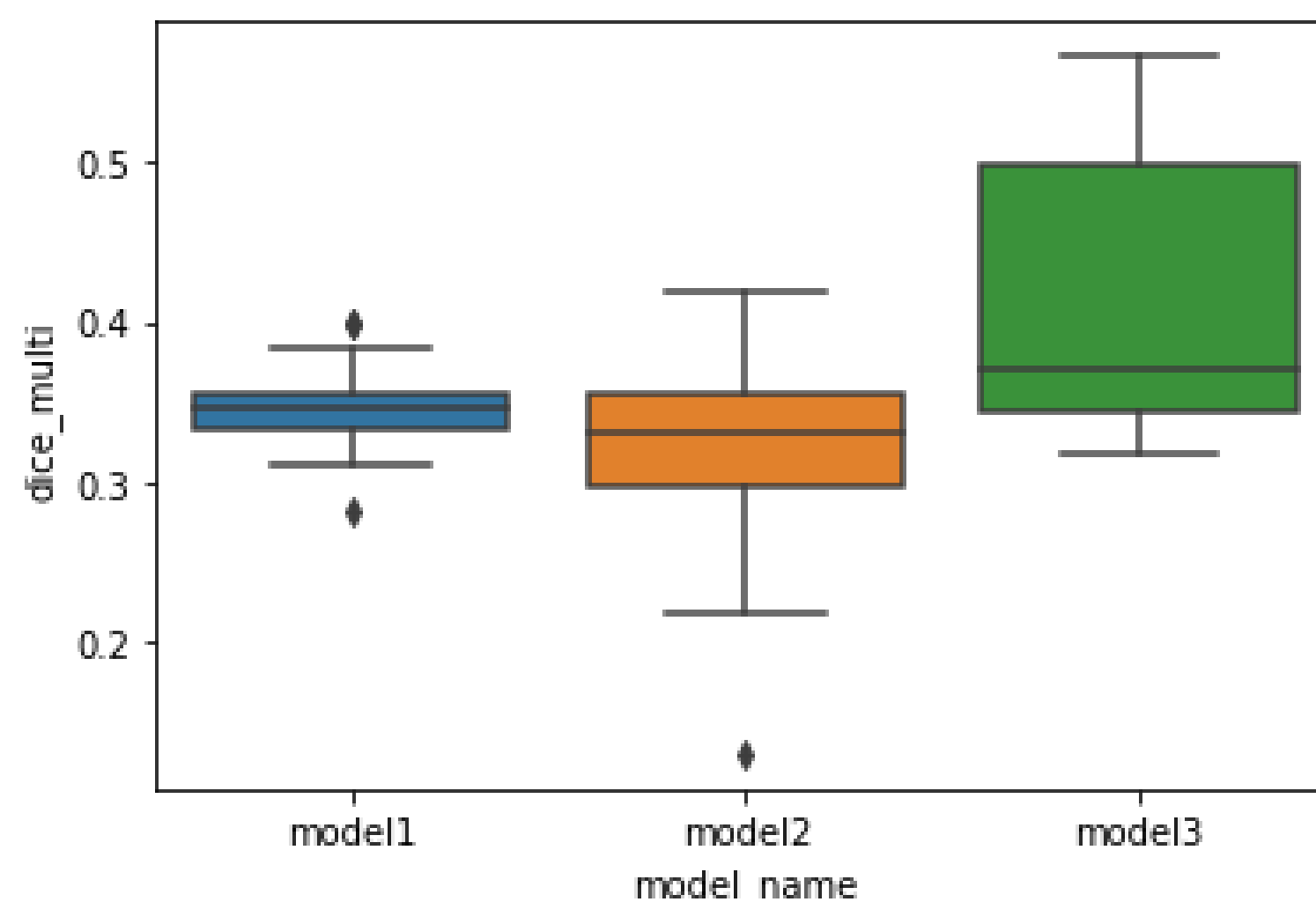
```
dataset_manager = SegmentationManager.build_default_dataset("dataset", img_prefix = "color_", mask_prefix = "gt_")
transform_manager = SegmentationManager.build_default_transformation(["default"])
validation_manager = SegmentationManager.build_default_validation(mode = "kfold")
sm = SegmentationManager(dataset_manager, transform_manager, validation_manager)
```

```
sm.multiple_train([
    ("model1", ARCHITECTURE.UNET, BACKBONE.RESNET18, WEIGHTS.NONE, 1e-3, "semtorch"),
    ("model2", ARCHITECTURE.UNET, BACKBONE.RESNET34),
    ("model3", ARCHITECTURE.DEEPLABV3_PLUS, BACKBONE.MOBILENET_V2)
], batch_size = 4, mode = "fine_tune", n_epochs = 5, n_freeze_epochs = 1)
```

```
sm.summary()
```

```
sm.plot_train_valid()
```

	model_name	fold	valid_loss	dice_multi
0	model1	test	0.540679	0.352730
1	model2	test	0.520797	0.417553
2	model3	test	0.412336	0.478929



See the demo in the GitHub repository

Conclusions and further work

We have presented an on-going work to facilitate the use and construction of semantic segmentation models using deep learning techniques. This is achieved by providing a high-level API that provides access to several semantic segmentation libraries. As further work, there are several remaining tasks to tackle. First of all, we aim to include in our framework other libraries, and provide a mechanism to easily extend it in the future. Moreover, it would be interesting to incorporate techniques like Bayesian optimisation methods to select the best hyperparameter configuration for each semantic segmentation algorithm. Finally, another important challenge that will be faced in the future is how to reduce the time required to train semantic segmentation models. This issue can be alleviated by the usage of multiple GPUs or distributed training in a cluster of computers, but this feature should be provided to users in a transparent manner.