Exercise Session 9

Foundation Models in Science

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Overview

Background Information. This exercise mainly discusses Foundation Models for Science. One prominent example of DINOv2 pre-trained Vision Foundation Models for Science is the area of (Histo-)Pathology.
Histopathology is the microscopic examination of tissue samples to study the manifestations of disease. It is widely used in medical diagnosis to identify abnormalities such as cancer, inflammation, and infections. One of the fundamental staining techniques in histopathology is Hematoxylin and Eosin (H&E) staining. This method uses two dyes: hematoxylin and eosin. Hematoxylin stains cell nuclei a purplish-blue color, highlighting DNA and nuclear structures, while eosin stains the cytoplasm and extracellular matrix various shades of pink or red. The color contrast provided by H&E staining allows pathologists to easily differentiate cellular components and assess tissue architecture and pathological changes effectively. H&E staining is valued for its simplicity, cost-effectiveness, and ability to provide detailed visualization of tissue structure, making it the gold standard in histopathology laboratories globally.
Some examples of histopathology models are:

- UNI: Good read to understand the training procedure, datasets and especially the clinical utility of pathology FMs.
- Virchow: Scaling models in terms of data and model size.
- Phikon-v2: Also another Histopathology FM trained on large databases. As this one is fully open-source on HuggingFace, we will be using this model in the following exercise.

Task 1. FMs in Science: Histopathology Vision FM.

See IPython notebook.
Note: This exercise will prepare you for assignment 2!
