Lab5: Image segmentation (MONAI)

XXXXXXX AI for Digital Health (2025/2)

Objective

- Create segmentation model
- Use the **MONAI API** to build deep learning model (UNet)
- Apply **Dice Similarity Coefficient (DSC)** for performance evaluation

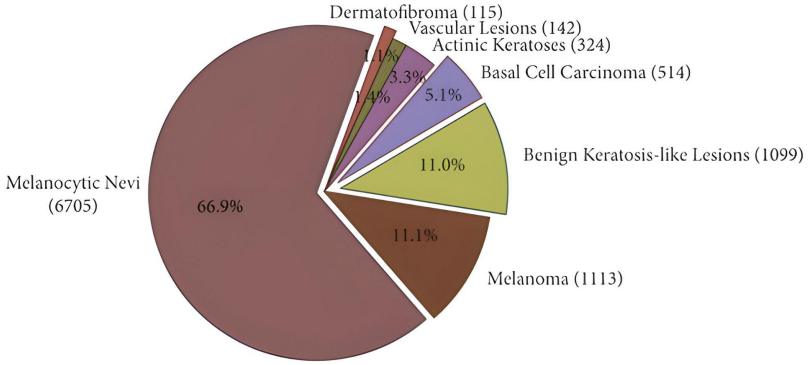
Pytorch VS MONAI

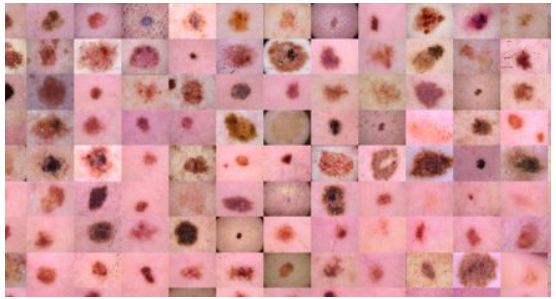
PyTorch is a general-purpose framework for deep learning, while MONAI is built on PyTorch but adds specialized functions for medical imaging tasks, such as

- **Data Loading:** CacheDataset supports big data and caching
- **Transforms:** monai.transforms supports 3D medical volume
- **Networks:** build-in models, such as UNet and SegResNet
- **Inferers:** sliding_window_inference enable inference 3D volumes by 2D models

Dataset: Skin Cancer MNIST (HAM10000)

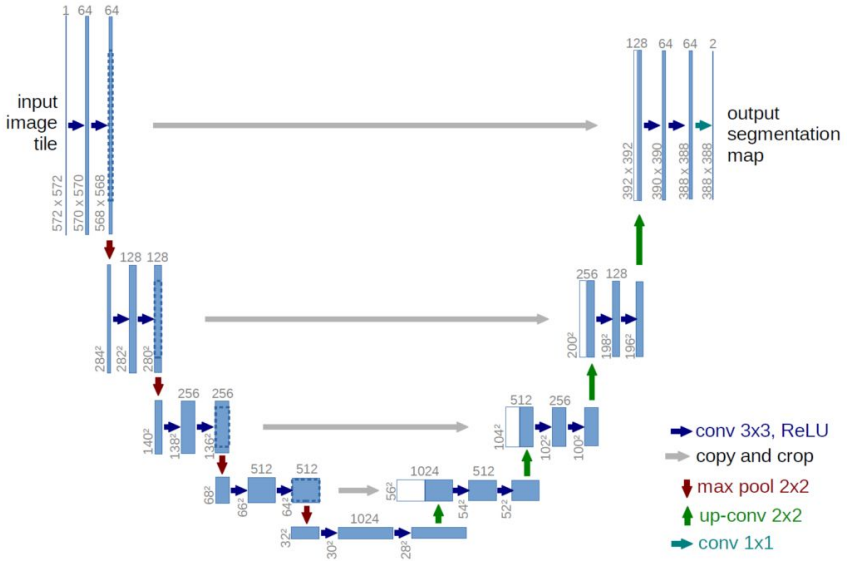
- The dataset consists of 10015 images with 10013 labeled objects belonging to 7 skin cancer classes.
- The data contains image in JPG format and documents in JSON format
- In the experiment, we reduced the amount of data and formatted it to simplify the experiment.





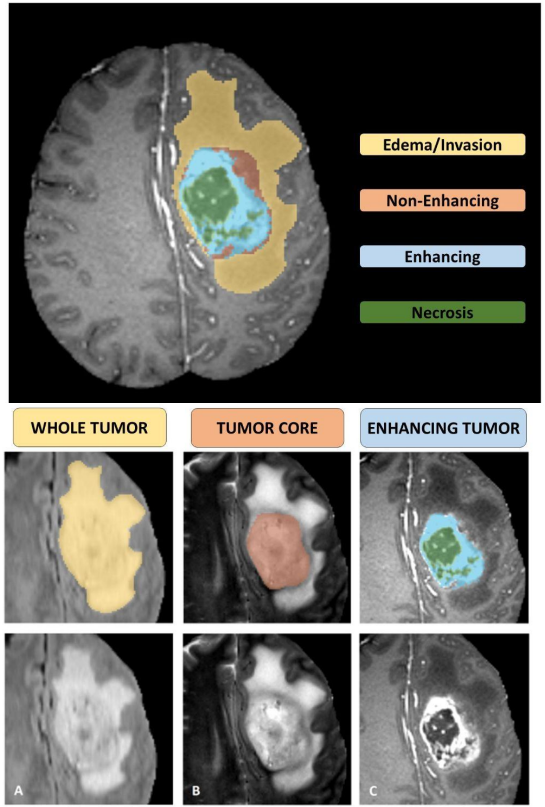
Exercise1: 2D segmentation (Skin Cancer)

1) Setup
2) Load Data & Set Transforms
3) Define Model & Set Hyper Parameter
4) Train Model
5) Inference & Evaluate & save



Dataset: Brain Tumor Segmentation 2020 Dataset (BraTS2020)

- BraTS 2020 is dataset for brain tumor segmentation, consisting of T1, T1ce, T2, FLAIR with tumors, which contains image in nii.gz format
- BraTS 2020 includes **369 training cases**, with further validation/test subjects provided for evaluation.
- In the experiment, we reduced the amount of data and formatted it to simplify the experiment.



Exercise1: 3D segmentation (Brain Cancer)

1) Setup
2) Load Data & Set Transforms
3) Define Model & Set Hyper Parameter
4) Train Model
5) Inference & Evaluate & save