Exploring PyTorch by implementing and refine a deep learning model tailored for medical image segmentation

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Tumor Segmentation Using PyTorch

- Dividing a medical image into multiple segments, which each segment represents a different object/structure. Goal -> to provide a precise and accurate representation of the object(s) of interest within an image -> purpose of diagnosis

Objectives and Contributions

Implementing and refining the U-Net model for tumor segmentation using PyTorch

Enhancing understanding of how PyTorch can be optimized for medical imaging tasks

Potential to aid other researchers in developing more efficient and accurate models for medical diagnostics

Progress and Roadmap of Project

- **Dataset selected:** Computed Tomography (CT) of the Brain **(Brain scans for cancer, tumor, and aneurysm detection and segmentation)**

Outline:

- **Model training:** (U-Net Architecture - Convolutional Neural Network)
  U-Net architecture has also been used in diffusion models for iterative image denoising
- Evaluation of model performance

Technical Overview

- **U-Net Architecture:**
  - Unique encoder-decoder structure
  - Crucial for detailed and high-level image feature extraction
  - Improves tumor segmentation accuracy
- **Role of Skip Connections:**
  - Bridges encoder and decoder segments
  - Helps retain critical spatial information
  - Addresses information loss common in deep neural networks
- **Utilizing PyTorch:**
  - Building, testing, and training U-Net model
- **Optimization Strategies:**
  - Using PyTorch's diverse loss functions and optimizers
  - **Optimizer:** Adam (torch.optim.Adam)
  - **Loss function:** Binary Cross-Entropy Loss (nn.BCEWithLogitsLoss)

Thank You