Deep Learning Final Project Proposal - Team 3

Topic: Multi-organ Segmentation on Abdominal CT

Problem Selection: Biomedical image segmentation is a crucial task in medical research, aiding in various applications such as disease diagnosis and drug discovery. Segmenting neuronal structures can contribute to understanding brain functions and neurological disorders.

Dataset: The dataset we used is 'btcv data' (can download from: https://www.kaggle.com/datasets/nguynhilonguetdhcn/btcv-data), which is commonly used in academic and is enough to train a deep network.

Deep Network: We will use U-Net as our network (standard form). U-Net is a type of convolutional neural network (CNN) that was designed for biomedical image segmentation. The network is structured in a way that it can work effectively with fewer training samples and still produce precise segmentations, which is a common scenario in medical imaging applications.

Framework: PyTorch would be suitable frameworks for implementing the U-Net architecture due to its popularity, extensive documentation, and strong support for deep learning operations. Additionally, frameworks like Keras provide high-level abstractions that simplify model development.

Reference Materials: The original paper - U-Net paper by Ronneberger et al. (2015) for a detailed understanding of the architecture and its applications in biomedical image segmentation. The github notebook - Biomedical Image Segmentation with U-Net

Performance Evaluation: Metrics including Intersection over Union (IoU), Dice coefficient, pixel accuracy, and mean absolute error will be considered when we train our model. They are common metrics for evaluating the performance of biomedical image segmentation models.

Project Schedule:

Week 1: Data collection and preprocessing, including data augmentation if necessary.
Week 2: Implementat initial U-Net architecture, and training the model
Week 3: Continue working on model like fine-tuning hyperparameters and start Streamlit demo
Week 4: Write the final report and prepare for the presentation