Segmentation on Kvasir-SEG

Project Description

This project involves the application of image segmentation techniques to identify and delineate polyps from gastrointestinal tract images. Students will work with the Kvasir-SEG dataset, which contains 1000 annotated images of polyps, a common precursor to colorectal cancer.
You're provided with an article[1], to compare your results with.
In evaluating your project, we will consider both the performance metrics you achieve and the sophistication of your approach and models. We encourage you to explore various models, techniques, and methodologies in order to deepen your understanding and showcase your expertise. Remember, the goal is not just to obtain good results using baseline or basic models, but rather to demonstrate your understanding of the underlying principles and apply more advanced techniques where appropriate.

Dataset Details

- **Name:** Kvasir-SEG
- **Size:** 46.2 MB
- **Content:** 1000 polyp images with corresponding ground truth masks
- **Resolution:** Varies from 332x487 to 1920x1072 pixels
- **Format:** JPEG images and JSON for bounding box coordinates
- **Availability:** Open-access for research and educational purposes
- **Link:** https://datasets.simula.no/kvasir-seg/

Project Phases

1. **Dataset Familiarization**
   Explore the Kvasir-SEG dataset Understand the structure of images and corresponding masks Analyze the JSON files for bounding box information.

2. **Preprocessing**
   Implement image preprocessing techniques (e.g., resizing, normalization). Understand and apply techniques for handling varying resolution images.

3. **Model Selection and Implementation**
   Research and select appropriate deep learning models for image segmentation (e.g., U-Net, Mask R-CNN) Discuss the rationale for model selection.
   - *Suggested Architecture:* Consider implementing the architecture from the research paper, "Double Encoder-Decoder Networks for Gastrointestinal Polyp Segmentation."This architecture has demonstrated high accuracy in polyp segmentation on the Kvasir-SEG dataset and can serve as a strong reference or starting point for your project.

[1] Double Encoder-Decoder Networks for Gastrointestinal Polyp Segmentation

4. **Training and Validation**
   Train the model on the Kvasir-SEG dataset Validate the model using appropriate metrics (e.g., Intersection over Union, Dice Coefficient).

5. **Results and Analysis**
   Analyze the performance of the model Discuss any challenges faced during training and how they were overcome Compare the model's performance with that of the provided paper.

6. **Documentation and Reporting**
   Document the entire project, including the steps taken, methods used, and code implementation.

Additional Guidance

- Make sure your code is in .ipynb format.
- Along with your code, please include a report file that thoroughly analyzes your results and compare them with the results presented in the paper.
- Use appropriate visualizations and statistics to support your analysis and conclusions.