CPIS363 Final Project

Image Segmentation

Objective:

This project aims to create a Python-based image segmentation solution for a chosen domain, implementing and evaluating one or more deep learning models for accurate segmentation.

Tasks:

1- Stick to the same assignment group
2- Choose one of the ideas listed below
3- Fina appropriate data set for this project
4- Apply image segmentation using CNN or any other DL architecture or framework
5- Present your findings during the class

Deliverables and guidelines:

- The submission should be a single Python file (or Jupyter Notebook) that includes:
    - Data loading and preprocessing steps.
    - Model building, training, and evaluation.
    - Code for predictions on new images and model evaluation metrics.
- Name your file using the following naming convention: GroupID-Project Idea. Inside the file, list group members' names and KAU IDs.
- Share your Python file with me using my KAU email:malraegi@kau.edu.sa
- You are also encouraged to use version control (e.g., GitHub) for collaboration and to submit a link to their repository along with the final Python file or notebook.
- Prepare short presentation for the project's final presentation.

Rubric (Total: 20 Marks):

Criteria	Marks	Description
Data Preprocessing	4	Effective data loading, augmentation, and preparation steps, tailored to chosen dataset and model.
Model Architecture & Training	4	Appropriate model choice (e.g., U-Net, DeepLab, Mask R-CNN), training with sufficient depth and clarity.
Segmentation Results	2	Clear segmentation output with visual examples of results on test images; comparison with ground truth.
Evaluation Metrics	2	Use of appropriate metrics (IoU, Dice coefficient, etc.) to evaluate model performance.
Code Clarity & Documentation	3	Well-documented, readable code with explanations for each section, and minimal errors.
Presentation	5	Orgnized presentation, that is delivered by all group members, good eye contact and use of appropriate visula aids.
Total	20	

AppendixA: Options for the Final Project

1. **Biomedical Image Segmentation:**
    - Segment and classify regions in brain MRI scans (e.g., tumor segmentation).
    - Segment organs or pathological regions in CT or X-ray images.

2. **Satellite Image Segmentation:**
    - Segment urban areas, vegetation, water bodies, and roads from satellite images.
    - Detect and classify deforestation zones or burned areas in forest images.
3. **Autonomous Driving Dataset:**
    - Segment different classes on road images, including cars, pedestrians, and lanes.
    - Scene segmentation with road signs, vehicles, and infrastructure as categories.
4. **Agricultural Image Segmentation:**
    - Segment crop fields and classify different types of crops in drone or satellite images.
    - Detect and segment diseased parts of plants.
5. **Medical Lesion or Skin Cancer Detection:**
    - Segment and classify lesions in dermoscopy images to detect signs of skin cancer.
    - Segment different stages or types of lesions.
6. **Smart Agriculture:**
    - Segment crop and weed regions in field images to support precision agriculture.
    - Identify and track growth stages, classify crop health, and locate areas needing attention.
7. **Industrial Inspection:**
    - Segment defects or damages on production-line items or surfaces (e.g., cracks on metal surfaces).
    - Inspect and classify faulty components on PCBs or identify anomalies in manufactured products.