Team Project Status Update Form

Complete as a team and designate a team lead to submit to the group assignment link in Module 4.

Team Information

Team Number: 3
Team Members [Full Names]:

- Swapnil Patil
- Christopher Akeibom Toh
- Nelson Arellano Parra

Team Leader/Representative: Swapnil Patil
Team GitHub Link: https://github.com/swapnilprakashpatil/aai521_3proj
If you are using any cloud services in addition to GitHub to host and transfer data, provide the link.
We may use Azure or Streamlit Community Cloud.

Project Description

- Project Title: Flood Detection Using Multiclass Segmentation
- Short Description/Project Objectives:
  Each year, natural disasters such as hurricanes, tornadoes, earthquakes and floods significantly damage infrastructure and result in loss of life, property and billions of dollars. As these events become more frequent and severe, there is an increasing need to rapidly develop maps and analyze the scale of destruction to better direct resources and first responders.
  To help address this need, the Flood Detection Challenge using SpaceNet 8 dataset will focus on infrastructure and flood mapping related to hurricanes and heavy rains that cause route obstructions and significant damage. The goal of SpaceNet 8 is to leverage data and computer vision algorithms and apply them to a real-world disaster response scenario, expanding to multiclass feature extraction and characterization.

  SpaceNet Dataset Flood Detection Project aims to answer these questions:
  - How have algorithms that extract buildings and roads improved, and how can top algorithms can be leveraged?
  - What is the impact on performance for a multiclass feature extraction challenge, i.e., buildings and roads?
  - How accurately can roads obstructed by flood waters be characterized by pre-event road detections and post-event satellite imagery?
  - How Gen AI models can help denoise, add coloration, inpainting and improve resolution and help run models to detect flood areas.

Project Dataset

- Selected Dataset: [Name/Link] https://spacenet.ai/sn8-challenge/
- Description of Your Selected Dataset (data source, number of images, dimension of images, size of dataset, etc.):
  - Training – Pre Event (801) + Post Event (881)
  - Testing – Pre Event (406) + Post Event (488)

Description and Requirements

- **What is the task, and why does it matter?** Detect flooded vs non-flooded roads and buildings from pre-/post-event satellite images so responders can quickly assess damage and plan safe routes during real flood disasters like Germany 2021 and Hurricane Ida.

- **How were the data measures, how raw is this dataset? For example, what type of camera(s) were used, have the photos been cropped or edited before you started using them?**
  Imagery comes from Maxar optical satellites (pansharpened RGB, ~0.3–0.8 m resolution), tiled into 1300×1300 GeoTIFF patches with manually drawn building/road labels and flood attributes; radiometry and tiling are preprocessed but pixels are essentially raw satellite observations.

- **Has this dataset been used a lot in the past for computer vision, either papers, applications, competitions and similar uses?**
  Yes. This dataset has been used in SpaceNet 8 competition.

- **What is the feature extraction plan?**
  We will use U-Net + ResNet and HRNet to extract features from RGB tiles.

- **Is there any bad data, cropped image…? (This is not a hard stop, there are several ways we can handle this problem)**
  Yes. The dataset includes label noise, cloud cover, varying look angles, and occasional occlusions or misaligned tiles. Once model comparison is completed, we will also run these noised and blurred images through hugging face based pre trained Gen AI models to denoise, coloration, inpainting and rerun the models on these images to understand how Gen AI models can play a big role in flood detection.

Team Responsibilities

What are the contributions and areas of responsibility of each team member for the project?

Member 1 (Swapnil Patil)	Member 2 (Christopher Akeibom Toh)	Member 3 (Nelson Arellano Parra)
- Image Inpainting: Fill in missing or damaged parts of images seamlessly. - UI App for these Gen AI techniques - Project Selection & Setup - Model Resnet + U-Net - Apply Gen AI Dataset and comparison pipeline - Notebook Content Updates - Final Report Few Pages - Presentation 3 slides	- Image Denoising: Remove noise from images while preserving important details. - EDA and Pre-Processing - Model Number 1: ResNet - Validation and Performance Metrics - Final Report Few Pages - Presentation 3 slides	- Image Super-Resolution: Enhance the resolution of low-resolution images. - Image Colorization: Automatically colorize black and white or grayscale images. - Model HRNet - Hypertuning Model - Modeling Results and Findings - Final Report Few Pages - Presentation 3 slides

Comments/ Roadblocks:

None