

CENG 428: Neural Networks
Take Home Exam Q1

1 1st Question

1.1 Reason to Choose 1st Problem

I choose this problem because actually we don't have a large training dataset, so we can use general pre-trained models. But in the second problem we need more specialized model.

Also in the first problem, we simply classify some DSM patches into some categories, but in second problem there is detailed image generation, so first problem seems more solvable

1.2 Architecture

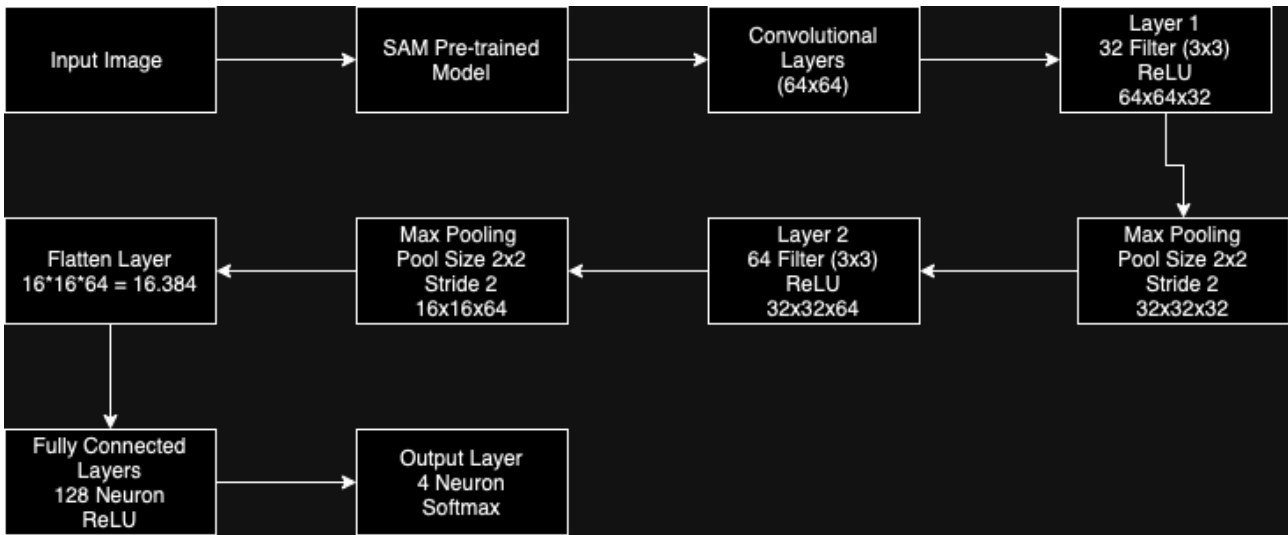


Figure 1: Model Architecture

Input: DSM image

Pre-Trained Model: We don't have much training data, so we need to use a pre-trained model. We can use some general CNN like ResNet or AlexNet, but I want to use a more specific model. The Segment Anything Model breaks down complex data into smaller, understandable parts. Adapting the Segment Anything Model (SAM) for our classification task means leveraging its capabilities to understand and segment spatial features.

Optimizer: We use the Adam optimizer because it efficiently adjusts learning rates for different parameters, often leading to faster convergence during training.

Loss Function: There is a multi-classification problem, so I used the cross-entropy function.

Output: There are 4 categories: Terrain, Building, Vegetation, Unknown.

1.3 Assumptions and Limitations

→ We have training data. To address that issue, we can use data augmentation, synthetic data generation and also transfer learning.

- We have 4 different classification categories:
- Terrain: Ground surfaces
 - Building: Man-made structures
 - Vegetation: Areas covered with plants
 - Unknown: Areas with pixel resolution with 0.5 meters