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# Practices on Visual Computing I - Template for Project Idea

## Project Name

Building damage assessment with generative models: semi-supervised learning and strong out-of-domain generalization

### Description

This project aims to develop a building damage assessment model with generative model using generative model to classify building damages based on satellite images in the aftermath of natural disasters. Current building damage assessment models based on satellite images mostly based on semantic segmentation which are suffering from label-intensive and limited generalization ability problems. Namely, the training of the model needs dense pixel-level labeling, which is very time consuming and expensive to obtain (require highly-skilled experts), in order to do semantic segmentation. Training is usually on disaster events from xBD data set, while needs to be used in other disaster events, which may have different resolutions or other properties, different preprocessing methods as the satellite images for different natural disaster are usually from different satellite.

The main idea of this project is that a generative model that can generate realistic images should know how to generate the corresponding pixel-wise labels as well, as they are just capturing semantic information already present in the image itself. To this end, this project aims to develop a generative model that could model the joint image-label distribution and synthesizes both satellite images and their semantic segmentation masks to classify building damage levels.

Students are expected to be marvel at semantic segmentation, and generative models in order to develop the model to achieve the above-mentioned research tasks: strong domain adaptation ability and less label-intensive.

Some useful references are listed as below:

Li, D., Yang, J., Kreis, K., Torralba, A., & Fidler, S. (2021). Semantic segmentation with generative models: Semi-supervised learning and strong out-of-domain generalization. In *Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition* (pp. 8300-8311).

Kaur, N., Lee, C. C., Mostafavi, A., & Mahdavi‐Amiri, A. (2023). Large‐scale building damage assessment using a novel hierarchical transformer architecture on satellite images. *Computer‐Aided Civil and Infrastructure Engineering*.

### Datasets

The xBD data set is publicly available at https://xview2.org/ dataset. Students can use this famous dataset to train the model.

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### Contributor of the Project Idea

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