



**GROUP NO. 078**

# Development of an App for Semantic Segmentation using Deep Learning

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## Introduction

- There are many deep learning architectures that have been proposed in literature for semantic segmentation. It includes SegNet, UNet and its variants.
- Here, we propose to develop an App for semantic segmentation using deep learning model with improved performance.
- The use of aerial imagery datasets has become increasingly popular in recent years for a variety of applications. Visual comparisons of these datasets can provide valuable insights into the effectiveness of different image processing techniques.

## Objectives

- Development of an App for semantic segmentation using deep learning models with improved performance.

## Societal Impact

- Building information can further be used to research human activities, land use change, population estimation and prediction, disaster assessment, economic status assessment. Building extraction from remote sensing images has become an important way of acquiring information.

## Methodology

- The architecture of UNet, which copies low-level features to the corresponding high levels, creates a path for information propagation that allows signals to propagate between low and high levels more easily, facilitating both backward propagation during training and the compensation of low-level finer details to high-level semantic features.
- ResUNet is a hybrid architecture that combines the advantages of both UNet and ResNet architectures.
- The Attention UNet/Resnet is a modified version of the UNet/Resnet architecture that incorporates an attention mechanism to highlight the most important features during the encoding and decoding process and ability to improve the accuracy of image segmentation tasks.

## Experimental Results

- After trying different models, including Unet, ResNet, Attention Unet, and Attention ResNet, we calculated the Mean IoU for each model.
- The results indicated that Unet had the highest Mean IoU of 72.3%, followed closely by ResNet with 71.6%.
- Attention Unet had a Mean IoU of 70%, while Attention ResNet had a Mean IoU of 69%. We trained all models for 50 epochs to calculate the Mean IoU.

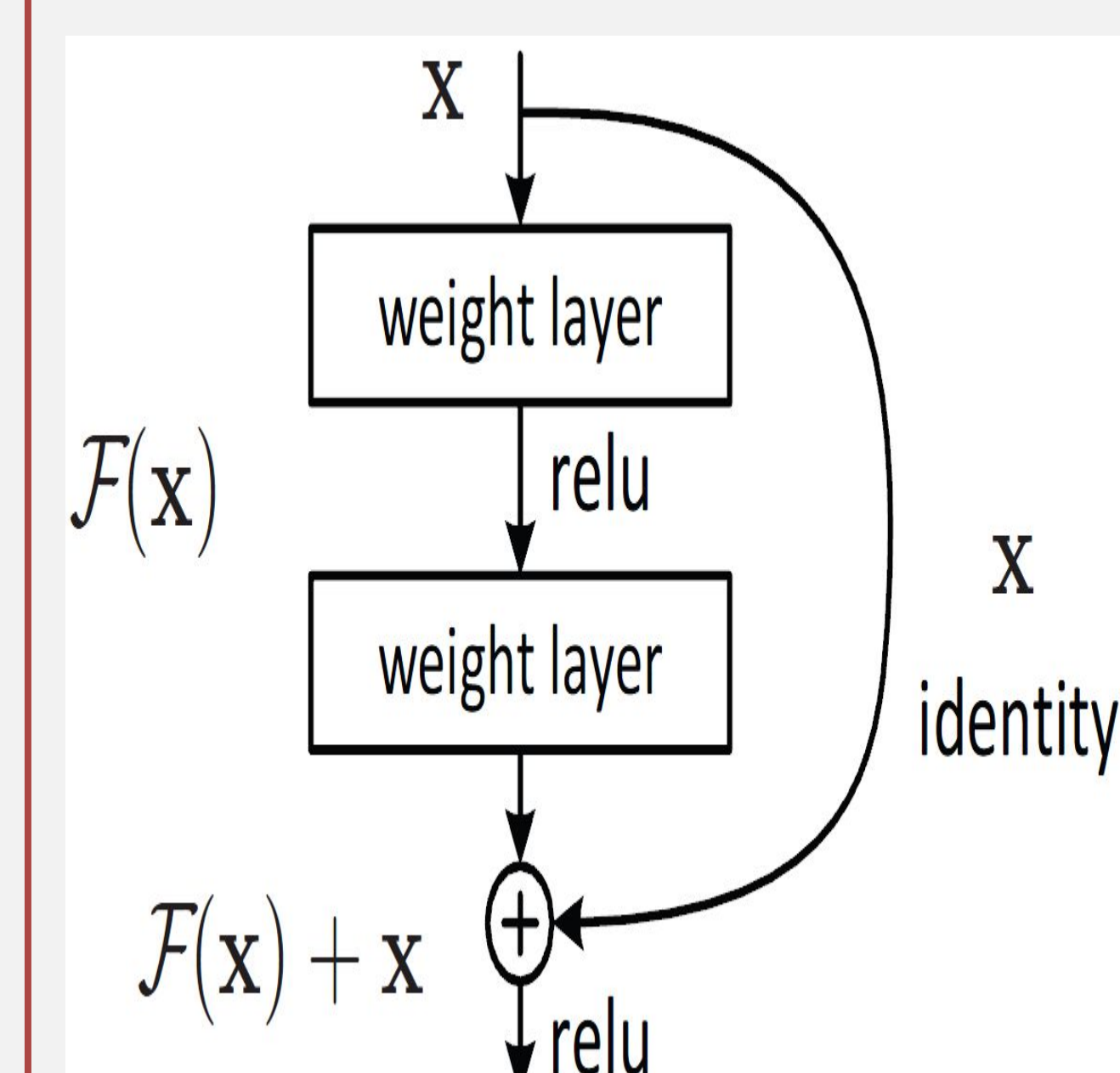


Fig. 1: Residual Block from ResNet

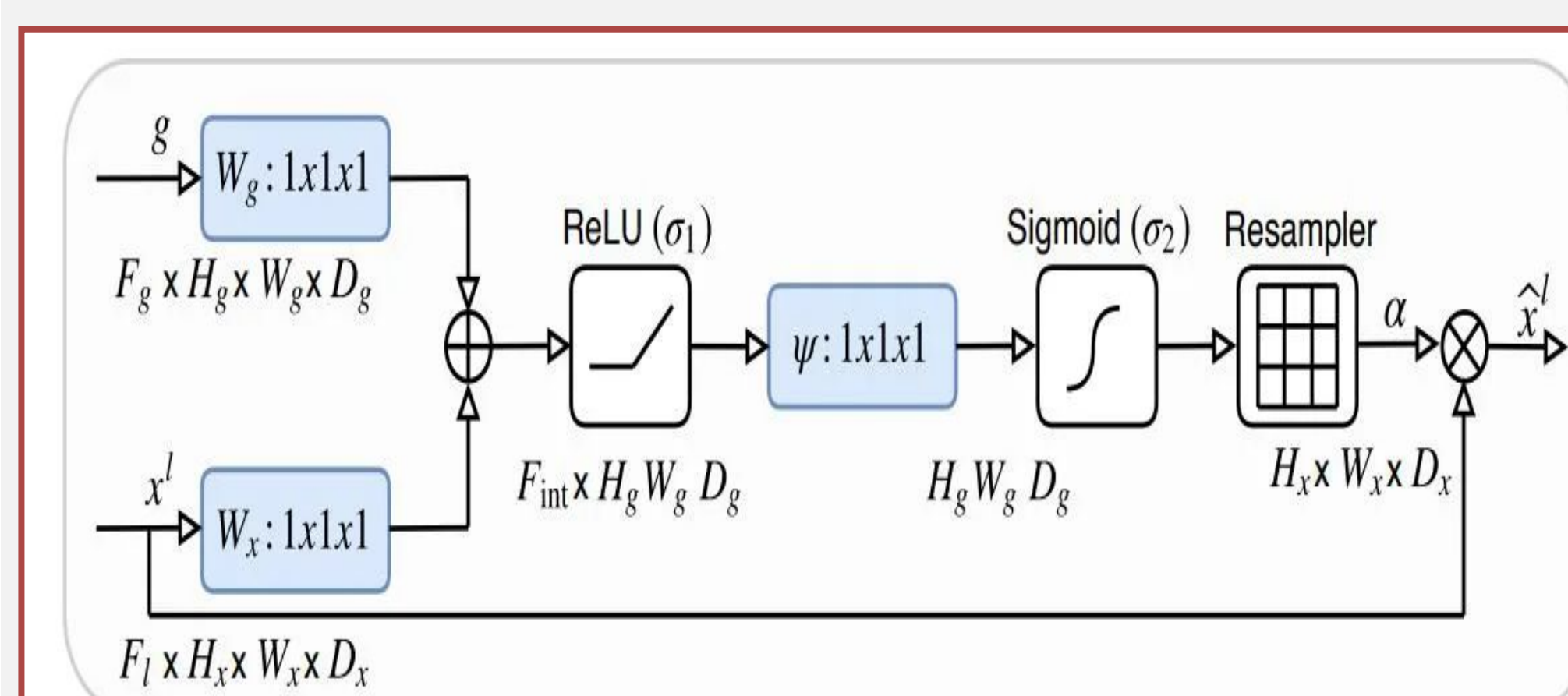
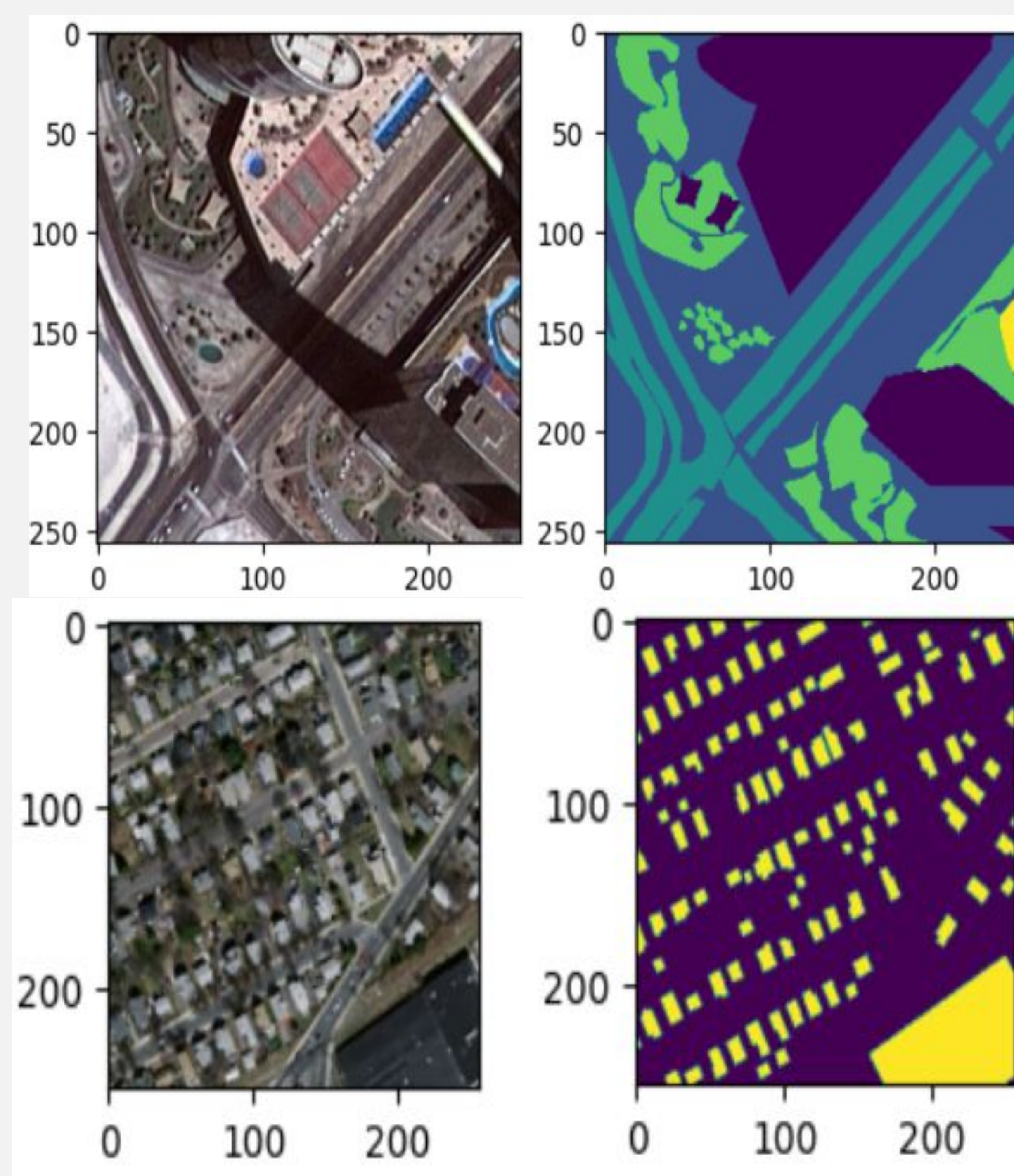


Fig. 2: Attention UNet Flow Chart



Method	Unet	ResNet	Attention Unet	Attention ResNet
Mean IoU	72.3	71.6	70	69

## Conclusions

- We are proposing this project of semantic segmentation using aerial or satellite images using CNN and UNet variation technologies. This project is currently ongoing and we are hopeful of making it a successful one.
- Our project will be unique in context of we plan to improve model accuracy and design an algorithm with the goal of training the model as accurately as possible.
- The primary constraint we are facing is the GPU constraint. We could have achieved much higher accuracy of our model if there was ample GPU available.

## Future Work

- We will implement our technology in multiclass dataset for classifying buildings amongst other objects like trees, roads, etc.
- Also, we will try to improve our model to achieve higher mean IoU or accuracy percentage.

## References

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