

# Computer vision

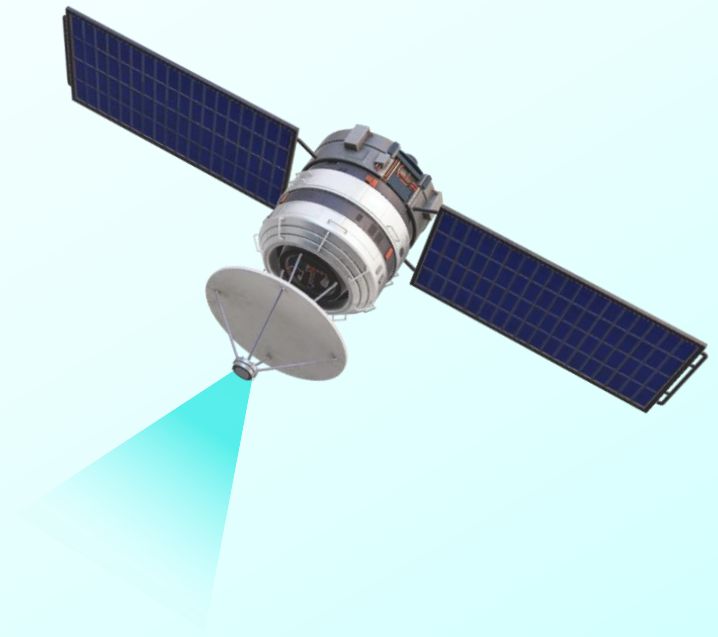
"ESTIMATING HOUSE AREA WITH SATELLITE  
IMAGE PROCESSING"

**Professor**

Dr. Patrick Glauner

**Student**

Mr. Tushal Kakadiya



# Introduction

- From a satellite's vantage point on earth, it is feasible to see and analyse the surface features, landscapes, and activities.
- There for we should take an advantage of that view in order to make the difficult task as simple as feasible

## Problem Definition

- Because there may be several obstacles on the ground level, calculating the total building area may be a challenging operation.
- Additionally, tackling an area with a complex building structure will take a lot of planning, effort, and time.
- But using the image processing capabilities of computer vision technology in machine learning, the borders of the structures (Buildings) could be quickly detected and measured from the top view images.

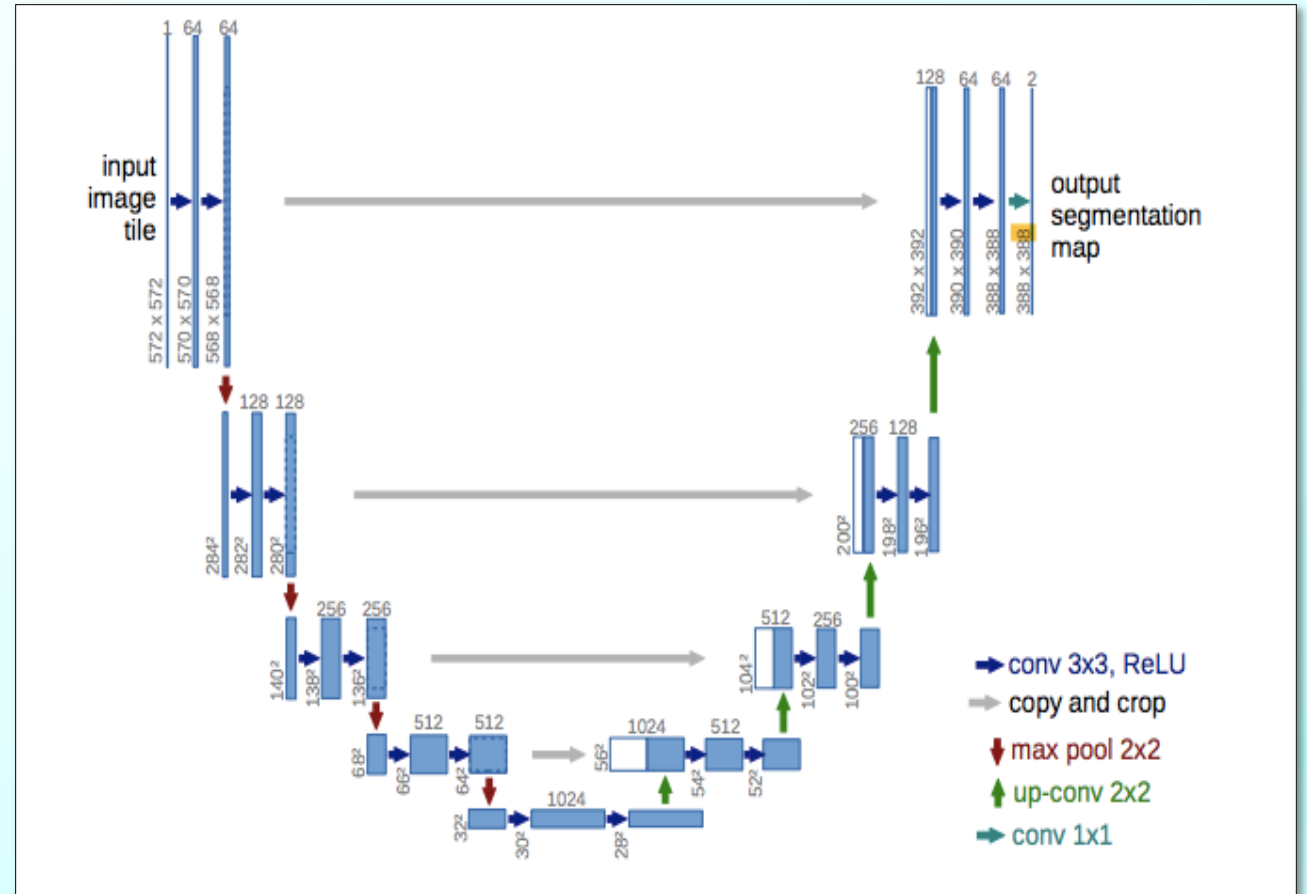
# Methodology : U-Net architecture

## Why U-Net?

- Popular for semantic segmentation task
- classify and segment of each pixel

## Pros

- skip connections between the encoder and decoder paths
- good capabilities to generalise between different domains.
- Better performance for small data
- Easy to implement.



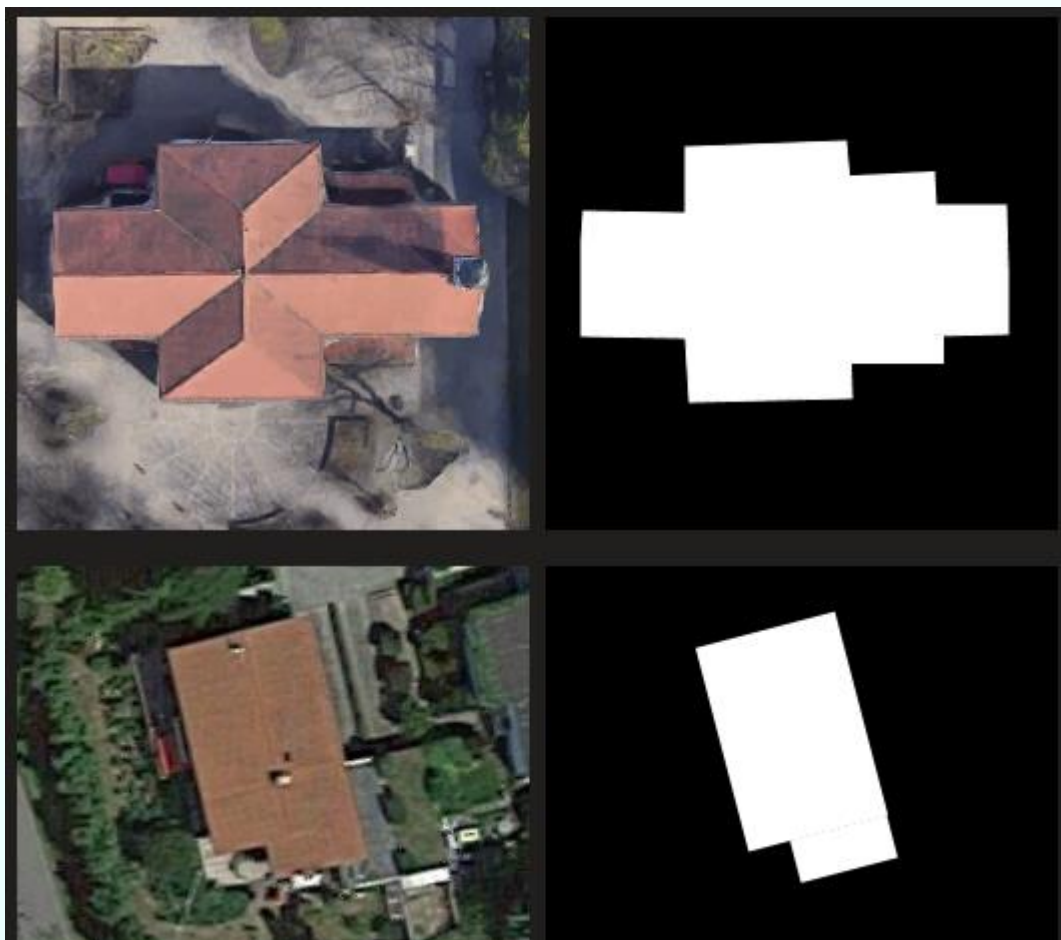
## Data Collection

- Data for our model was obtained from Google Maps Satellite View using the snipping tool, with each picture being  $256 \times 256$  pixels in size.
- Each image have been masked in black and white for differentiation where white mask is for roof and black for land or the objects.

# Preprocessing

- Image reading – Original image in RGB & masked image in Grey scale.
- Image resizing with pillow - image preprocessing library.
- Converted images into Numpy array.
- Data were splitted in train(80%) and test(20%) data using Sci-kit learn.

# Preprocessing





## Layers of model Architecture

- Convolutional 2D.
- Down sampling
- Up sampling
- Max Pooling
- Drop-Out
- Input/ Output
- Relu, Activation function used in all layers apart from output.
- Output layer has sigmoid activation function.
- Output layer has single channel matrix which gives black and white image as output.
- “Same” Padding method is used in all layers.
- Number of hidden layers are 9.

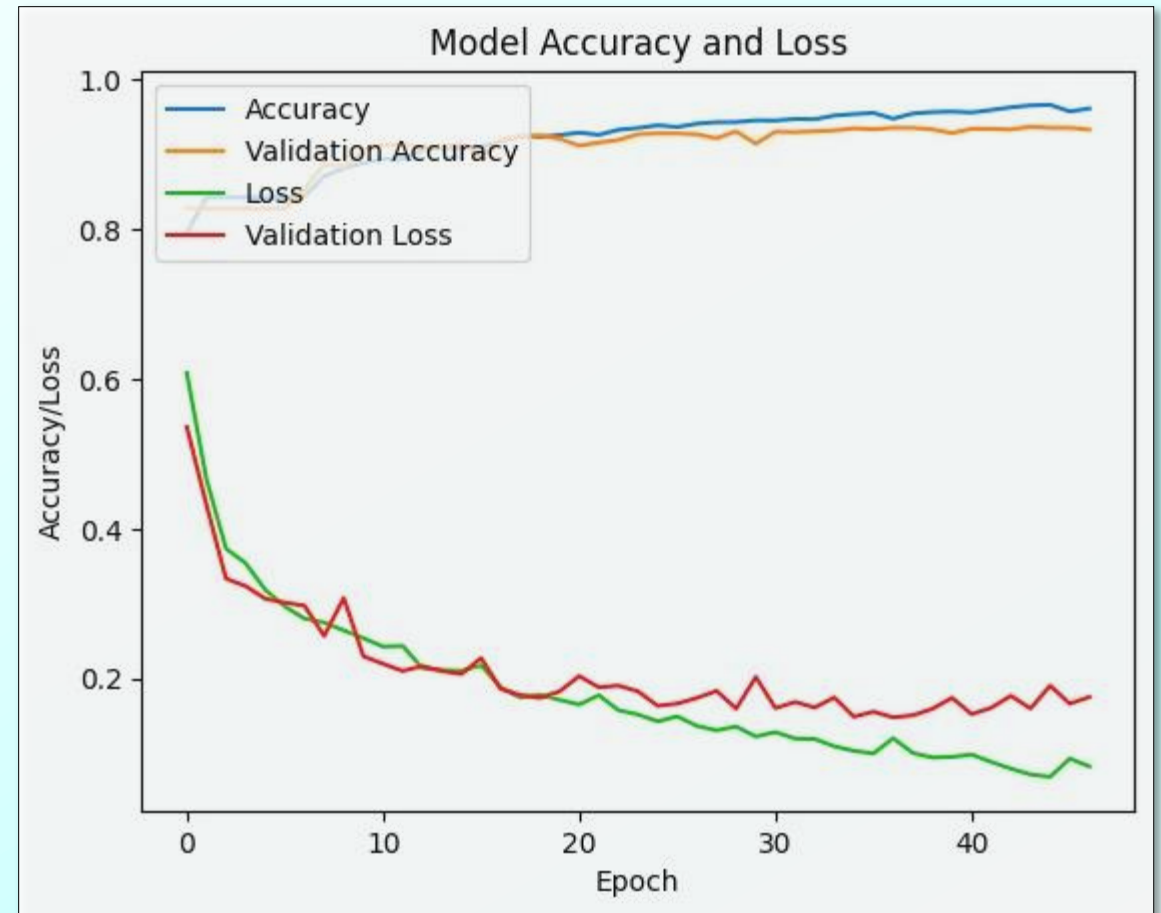


# Hyper Parameter & Tunning

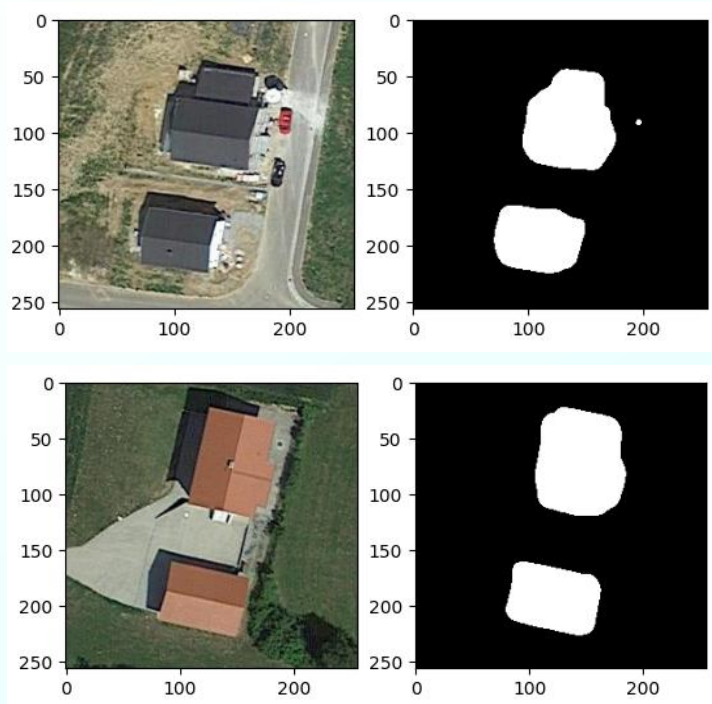
- Batch size : 5
- Learning rate :  $3 \times 10^{-5}$
- Loss Type : Binary cross entropy
- Number of epochs : 40
- Early stopping strategy : Respective to Validation loss
- Model Complexity

# Training and Evaluation

- Model accuracy achieved is  $\sim 96\%$
- Loss  $\sim 0.08$
- Validation accuracy is  $\sim 93\%$
- Validation loss  $\sim 0.17\%$



# Result



## Conclusion

- We found that estimating house roof area using U-net based segmentation is successfully achieved with good performance.
- To enhance more features with this architecture could be done using semantic segmentation.
- Due to hardware limitations, More feature couldn't be extracted from the limited layers of the model. But finetuning is achieved.

## References

- Snapping / Masking tool :- Snagit
- Images:- Google maps
- <https://www.tensorflow.org/>
- <https://scikit-learn.org/stable/>



Thank You