

Computer vision

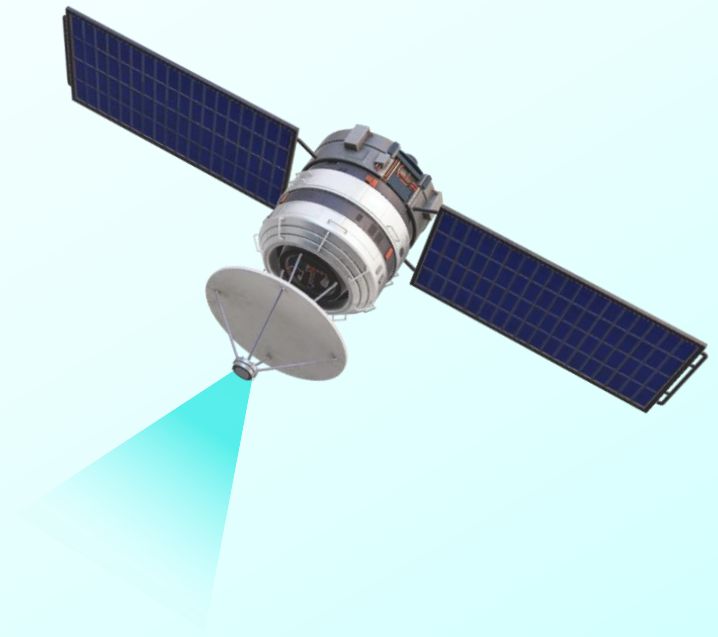
"ESTIMATING HOUSE AREA WITH SATELLITE
IMAGE PROCESSING"

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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.

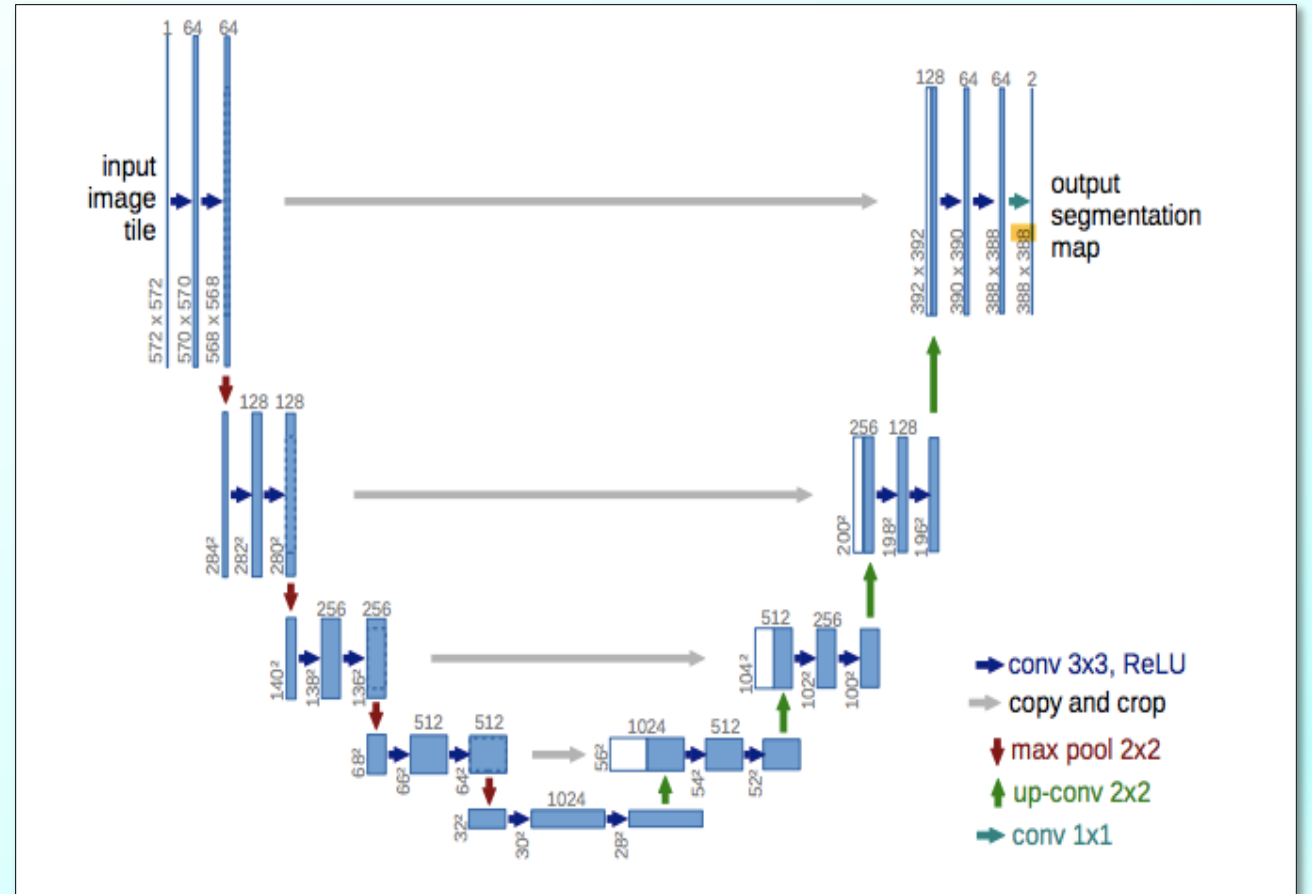
Methodology : U-Net architecture

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.



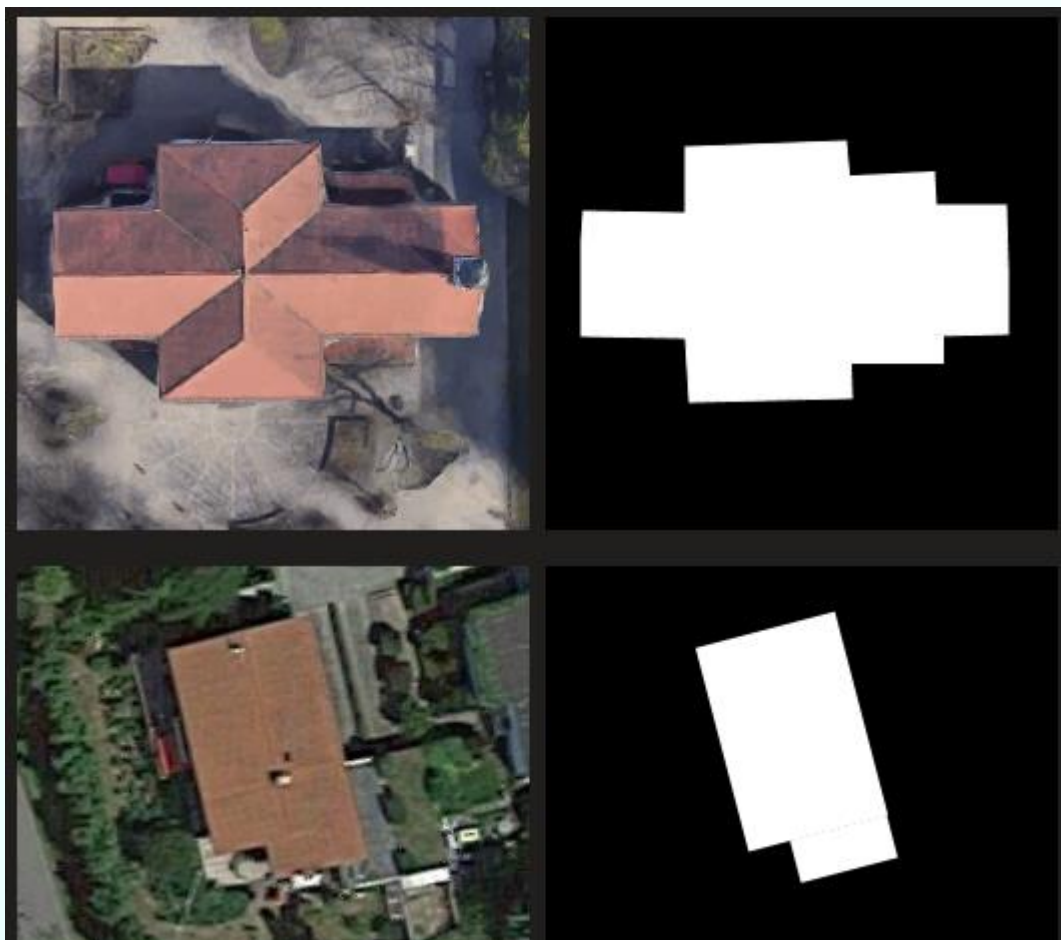
Data Collection

- Data for our model was obtained from Google Maps Satellite View using the snipping tool, with each picture being 256×256 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

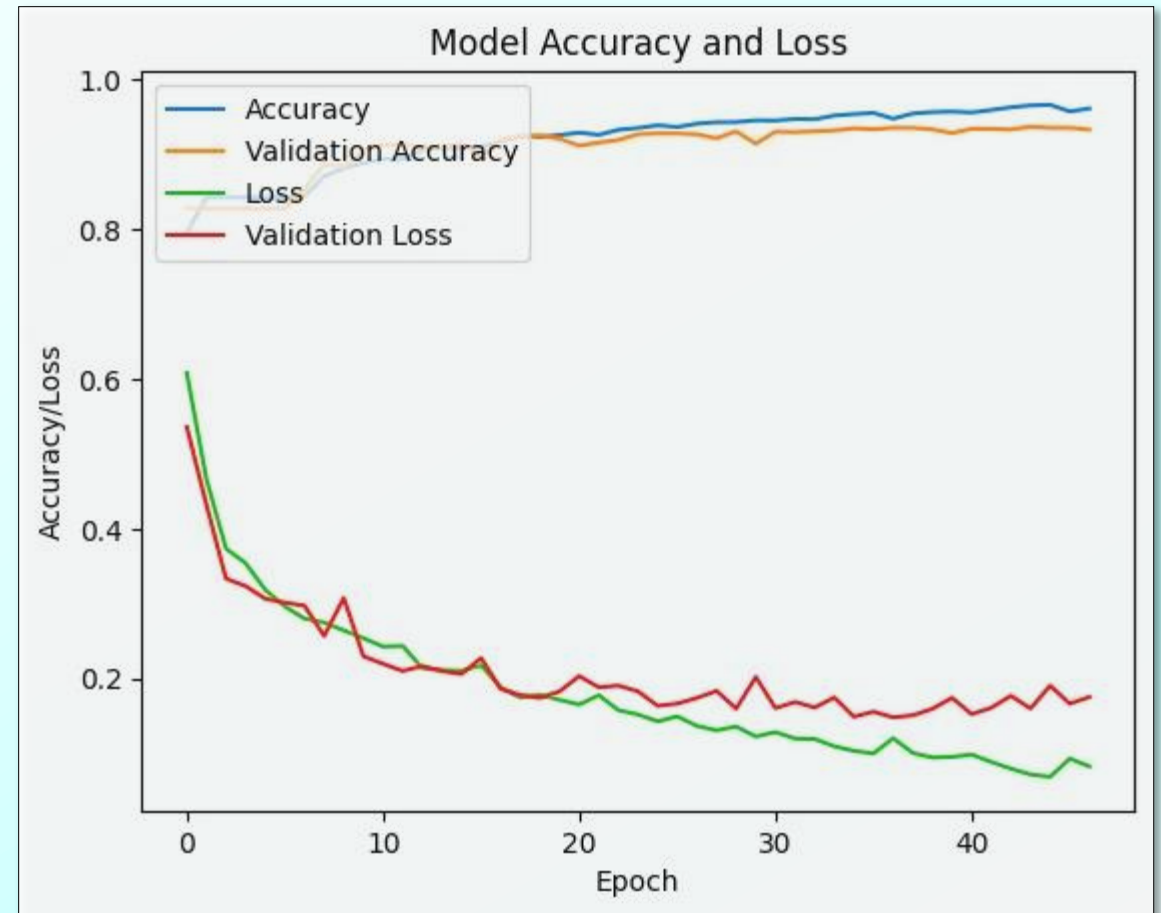
- Convolutional 2D.
- Down sampling
- Up sampling
- Max Pooling
- Drop-Out
- Input/ Output
- Relu, Activation function used in all layers apart from output.
- Output layer has sigmoid activation function.
- Output layer has single channel matrix which gives black and white image as output.
- “Same” Padding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

Hyper Parameter & Tunning

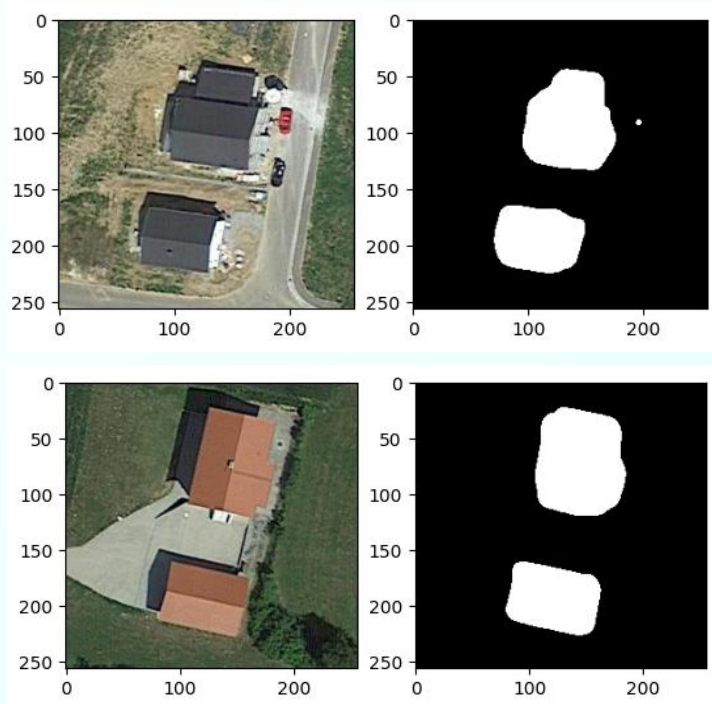
- Batch size : 5
- Learning rate : 3×10^{-5}
- Loss Type : Binary cross entropy
- Number of epochs : 40
- Early stopping strategy : Respective to Validation loss
- Model Complexity

Training and Evaluation

- Model accuracy achieved is $\sim 96\%$
- Loss ~ 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