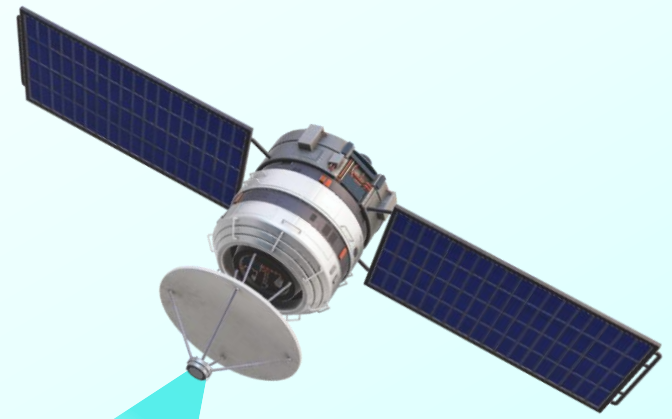# Computer vision

"ESTIMATING HOUSE AREAS 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.
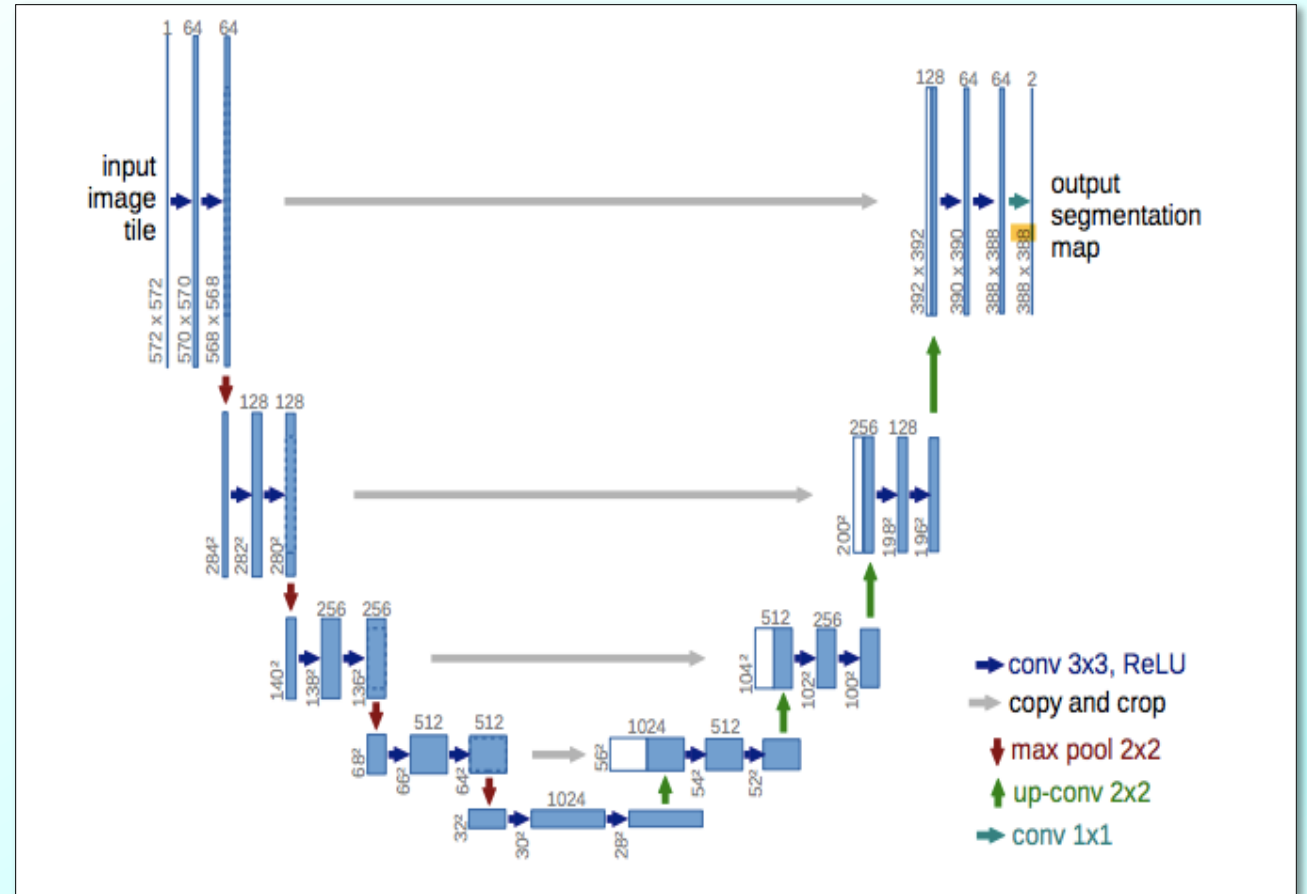
Methodology :- U-Net

Why U-Net?

Popular for semantic segmentation task. It classify and segment each pixel of an input image.

U-Net incorporates skip connections between the encoder and decoder paths.

It has good capabilities to generalise between different domains.

It performs well with small data and 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 between area of the roof and other land. Where white mask is for roof and black for land.

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.

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 ~ 96%

- Loss ~ 0.08

- Validation accuracy is ~ 93%

- Validation loss ~ 0.17%
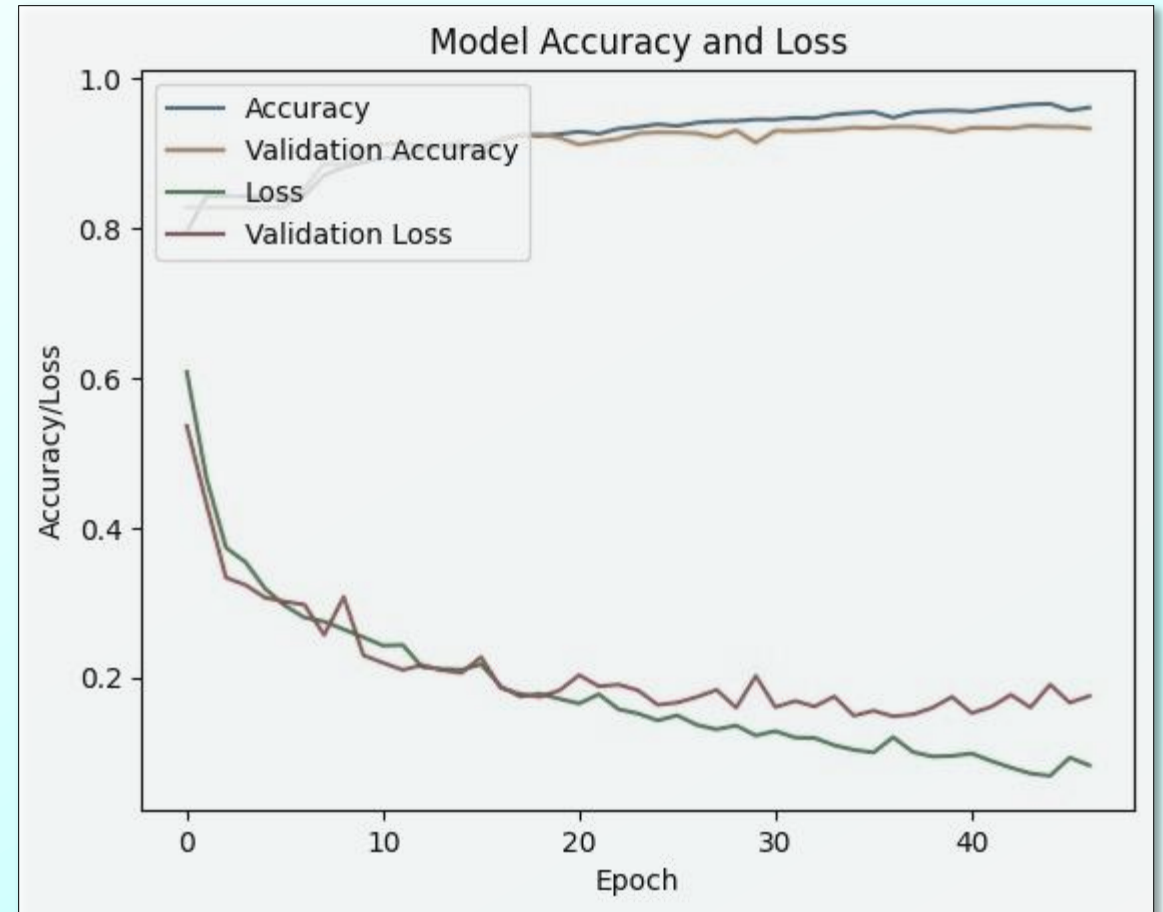
Conclusion

- We found that estimating house roof area using U-net based segmentation is successfully achieved with good performance.

- To enhance more features with this architracture 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

Thank You