

Surveying informal settlements in the Gauteng province using Machine learning

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Abstract

One of the good ways in which the government can provide better services to its people is through surveying informal settlements, which is why an improvement is always needed on the techniques of surveying them. Fortunately in this project through DSI-NICIS NEPTTP funding the classification of informal settlements were improved through surveying all kinds of dwellings instead of only focusing the areas which were known to be consisted of informal settlements.

Problem Statement

A good deal of projects in surveying informal settlements were conducted on the areas which are known to be consisted of informal settlements[1].

Since informal settlement tend to happen anywhere, this pose a question to the areas which are not known to be informal settlements.

In this project, informal settlements were surveyed in all forms of dwellings using sentinel-2 dataset and convolutional neural network

Methodology

Data

- Converting dataset from raw to “False color infrared” format
- Choosing the perfect ground size using SVM and CNN, for which 210 square meter were chosen

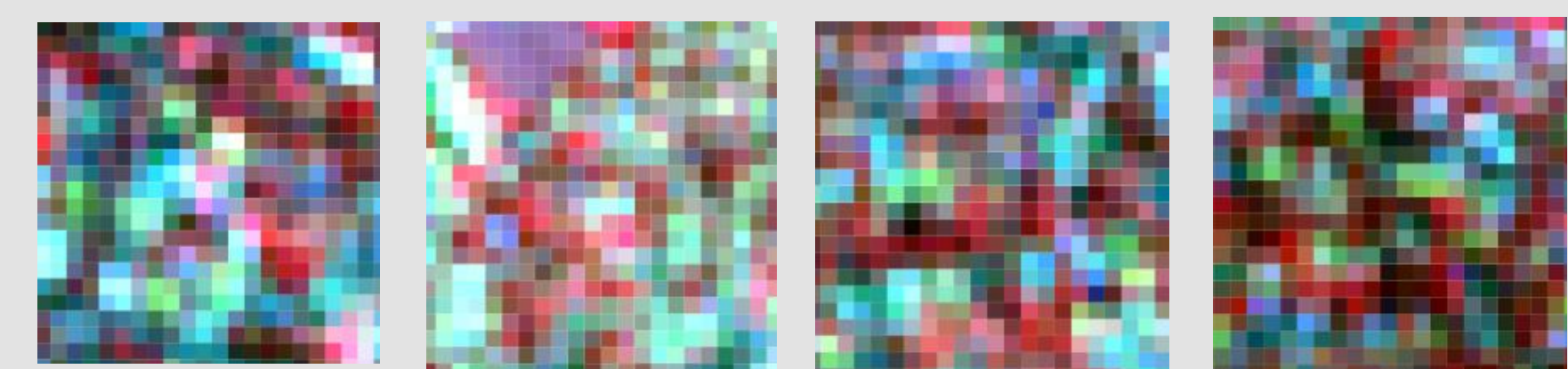
Converted dataset



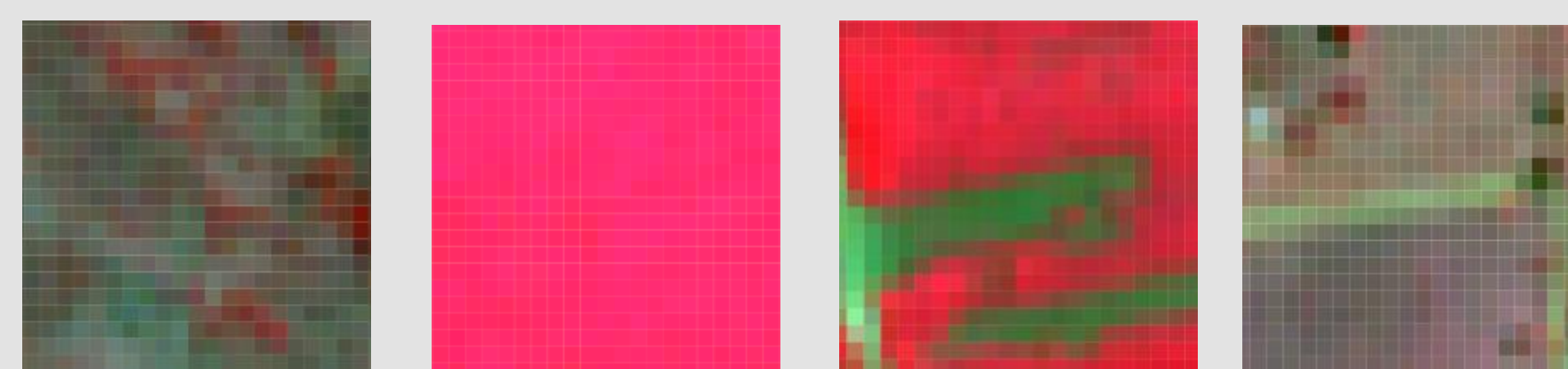
Informal settlements



Middle class settlements



Formal settlements



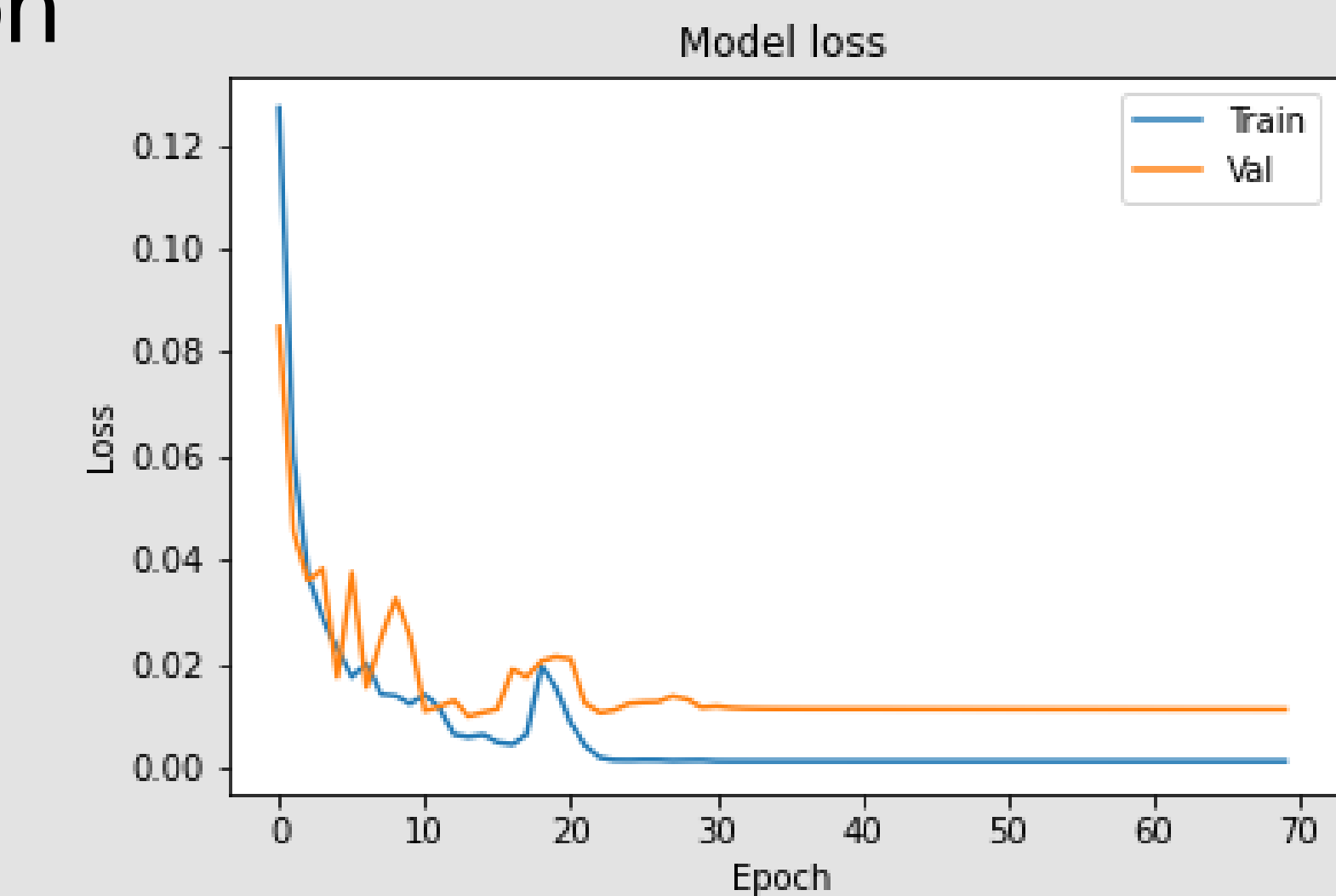
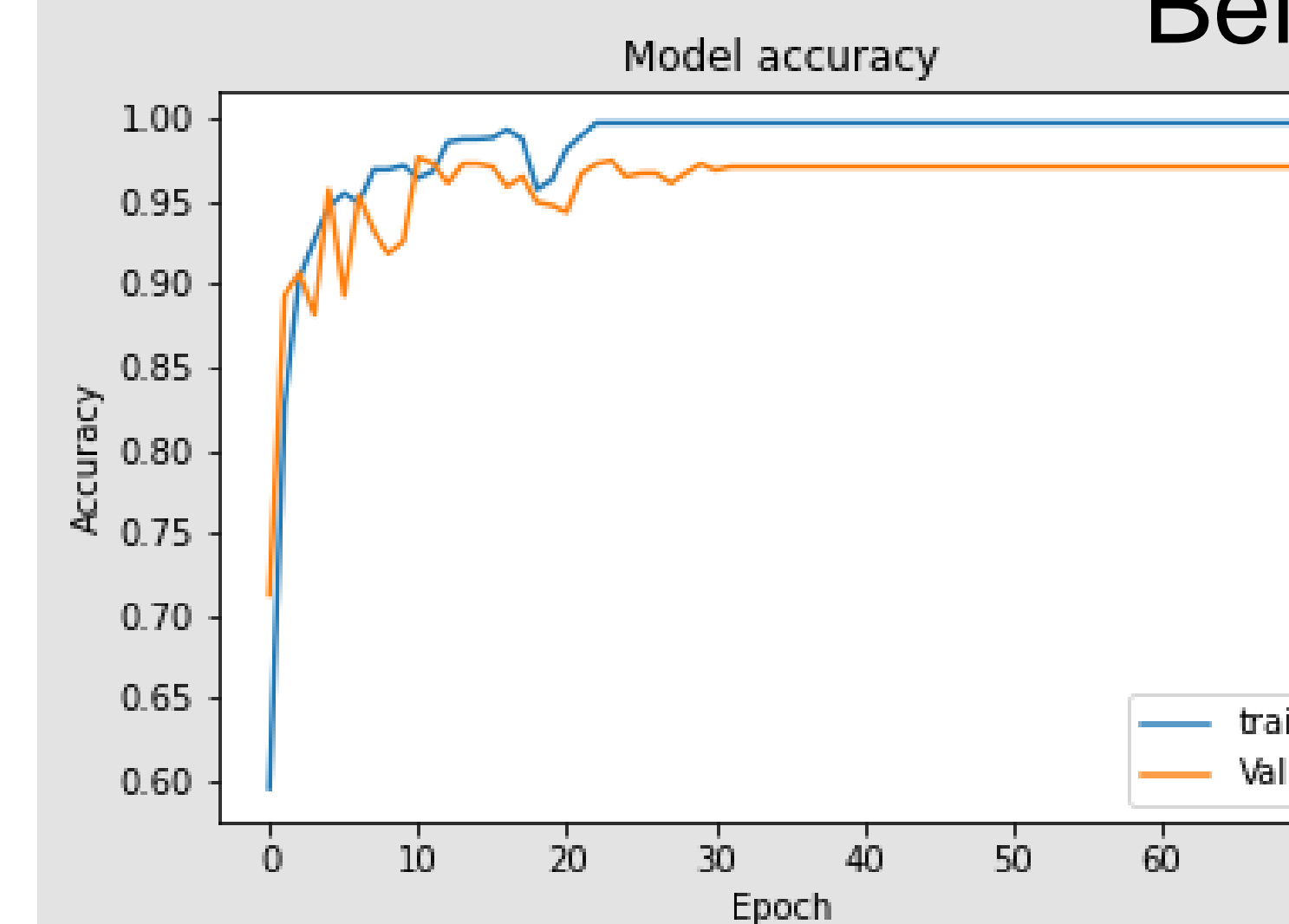
No house

Implementation of the Model

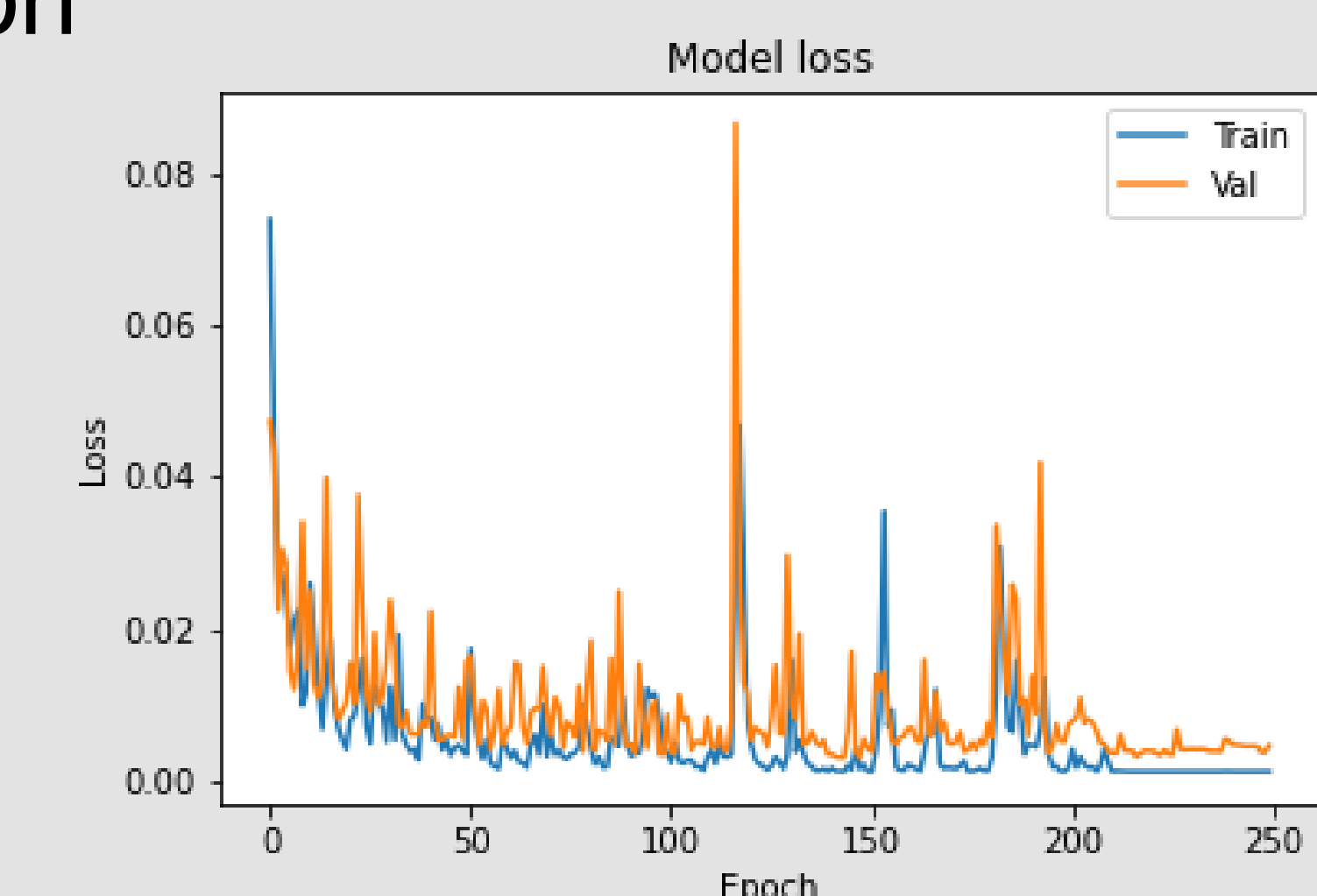
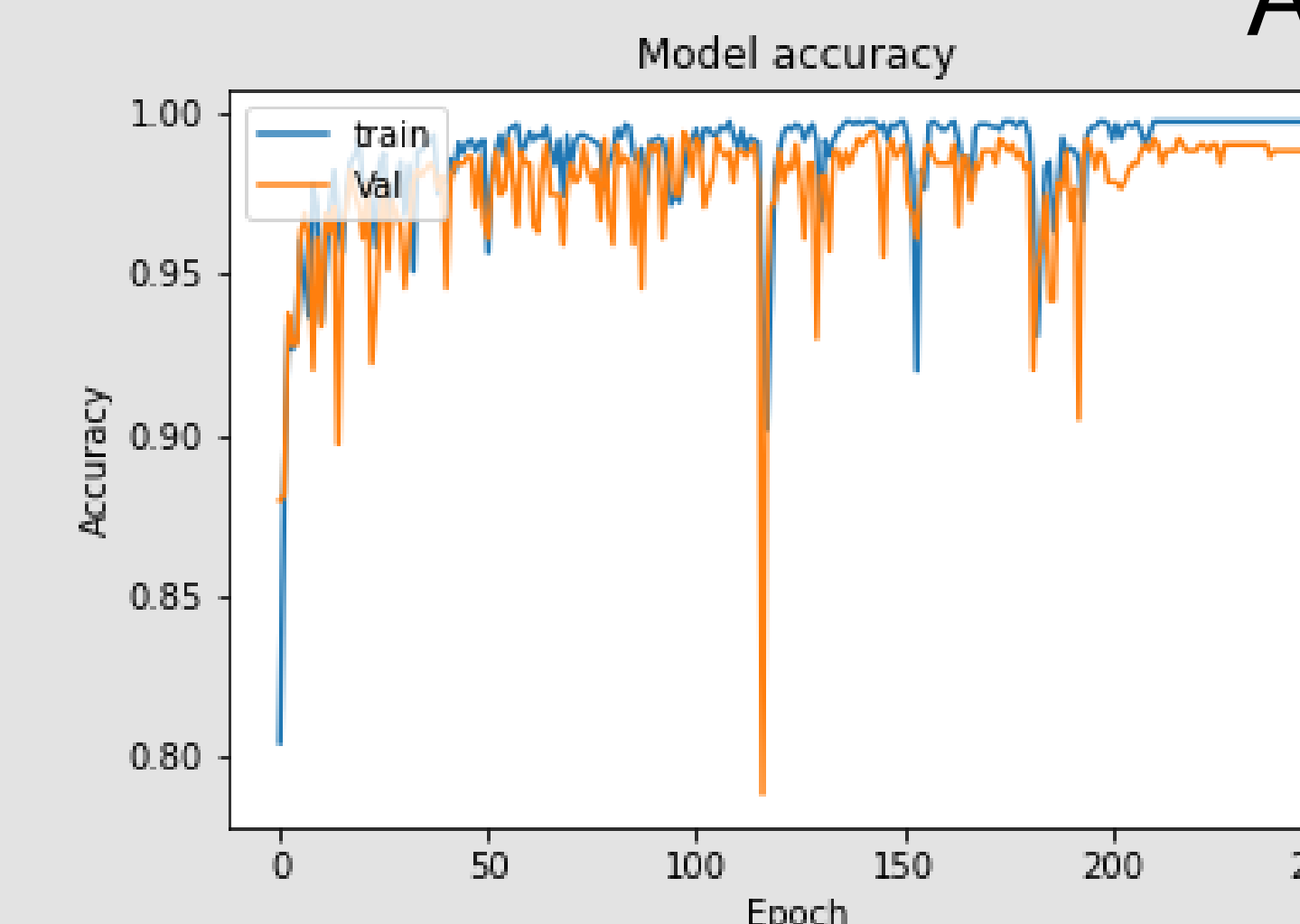
- Target size : 210X210 dimensional
- Four dataset classes(namely Informal settlements, Formal settlements, Middle class settlements, and No house) were created
- Sequential model API (CNN model) were implemented

Results

Before Augmentation



After augmentation



Conclusion

- A model for surveying informal settlements in four different kinds dwellings were implemented successfully
- The model achieved 97.09% validation accuracy and 99.75% training accuracy with validation loss and training loss of 0.0112 and 0.0013
- Augmentation resulted in 5148 dataset, the performance improved and become 99.03% in validation accuracy and in training it remained the same. The validation loss and training loss improved and become 0.0047 and 0.0012

References

1. Kuffer, Monika, Karin Pfeffer, and Richard Sliuzas. "Slums from space—15 years of slum mapping using remote sensing." *Remote Sensing* 8, no. 6 (2016): 455

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