INDIAN INSTITUTE OF REMOTE SENSING

Indian Space Research Organization

Department of space, Government of India

DOCUMENTATION

"Implementation of ANN/CNN and concepts of Deep Learning in Image-Classification in Remote Sensing"

June-July, 2018

Under the guidance of

Dr. Anil Kumar
Head PRSD, Scientist/Engineer 'SG'
PRSD/IIRS/ISRO

Submitted By:
Mohit Meena (Roll no: 15103069)
Vishal Gautam (Roll no: 15103047)
Rahul Kumar (Roll no: 15103049)

INTRODUCTION:

The image classification is done on the given BIL-image dataset “apex12bands” of 8 bands, 12 bands and 17 bands using the concepts of ANN/CNN and deep learning. The implementation is done on the Python 3 using the editor Anaconda. The image is classified into 7 clusters namely grasslands, building1, building2, bright forest, dull forest, river and road. Encouraging results of 94.21% accuracy is achieved as a result of fuzzy classification.

REQUIREMENTS: Knowledge of ANN/CNN, Basics of Deep leaning, python 3
MODULES: TensorFlow, Keras, GDAL, numpy, learning, matplotlib
SOFTWARE USED: Anaconda, Jupyter notebook.

EXPLANATION:

The image classification is done on the dataset provided and has been tested against different bands i.e. 8, 12 and 17 bands.
The dataset was imaged in the vicinity of Baden, Switzerland on a clear day, with the sensor mounted on a Dornier DO-228 aircraft.

Image Interpretation includes:

1. Training the classifiers
2. Testing the dataset

The classes were identified from the interpretation from the image provided. Regions of Interest were collected, verified with the data providers and used for classification and accuracy analysis.

Given below are the Identified Classes from the input given using soft classification methods stored in the array named path

path = ["grass_17", "build1_17", "build2_17", "Bright17", "Dull17", "river_17", "road_17"]

Sequence of Implementation

- Import the libraries and their modules: numpy, matplotlib, gdal, keras Read the BIL file for input
- Define the training data and read the data from BIL file
- Define xtest,ytest,path and initial values for all the classes to be classified on the basis of model being run.
- Calculate all the clicks and store in clicks{ } array. Swap little-endian and Big-Endian.
- Calculate the length of all values.
- Define the training data.
- Print xtest, xtrain, ytest, ytrain.
- Define the model: model = Sequential().
- Add the convolution, MaxPooling and dense (fully-connected) layers

```
#  model.add(Dense(num_pixels, input_dim=num_pixels,
kernel_initializer='normal', activation='relu'))
        model.add(Conv1D(2 ** 2,2, activation="relu", padding='same',
input_shape=[12, 1]))
        model.add(Conv1D(2      **      3,      2,      activation="relu",      padding='same'))
        model.add(Conv1D(2      **      4,      2,      activation="relu",      padding='same'))
        model.add(MaxPooling1D(2))
        model.add(Conv1D(2      **      5,      2,      activation="relu",      padding='same'))
        model.add(Conv1D(2 ** 6, 2, activation="relu", padding='same'))
        # model.add(MaxPooling1D(2))
        model.add(Conv1D(2 ** 7, 2, activation="relu", padding='same'))
        model.add(Conv1D(2 ** 8, 2, activation="relu", padding='same'))
```

- Run the model as many times as epochs is defined in batch size.
- Predict the model.
- Save images in specified folders : images are saved in .tiff format

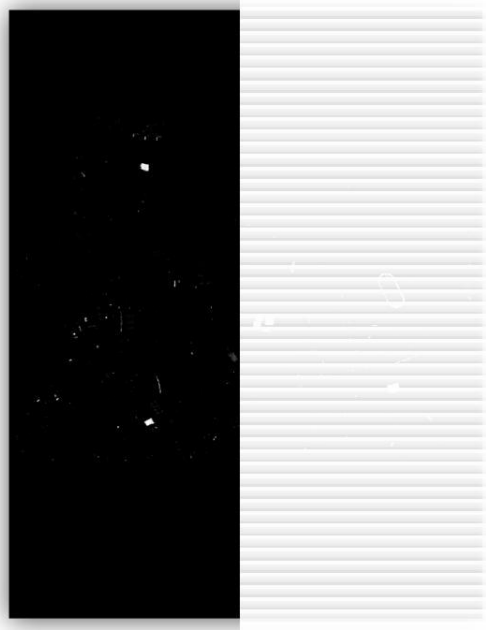
OUTPUT:

For Soft Classification:

Road class

Dull-For est class

Building_1 class



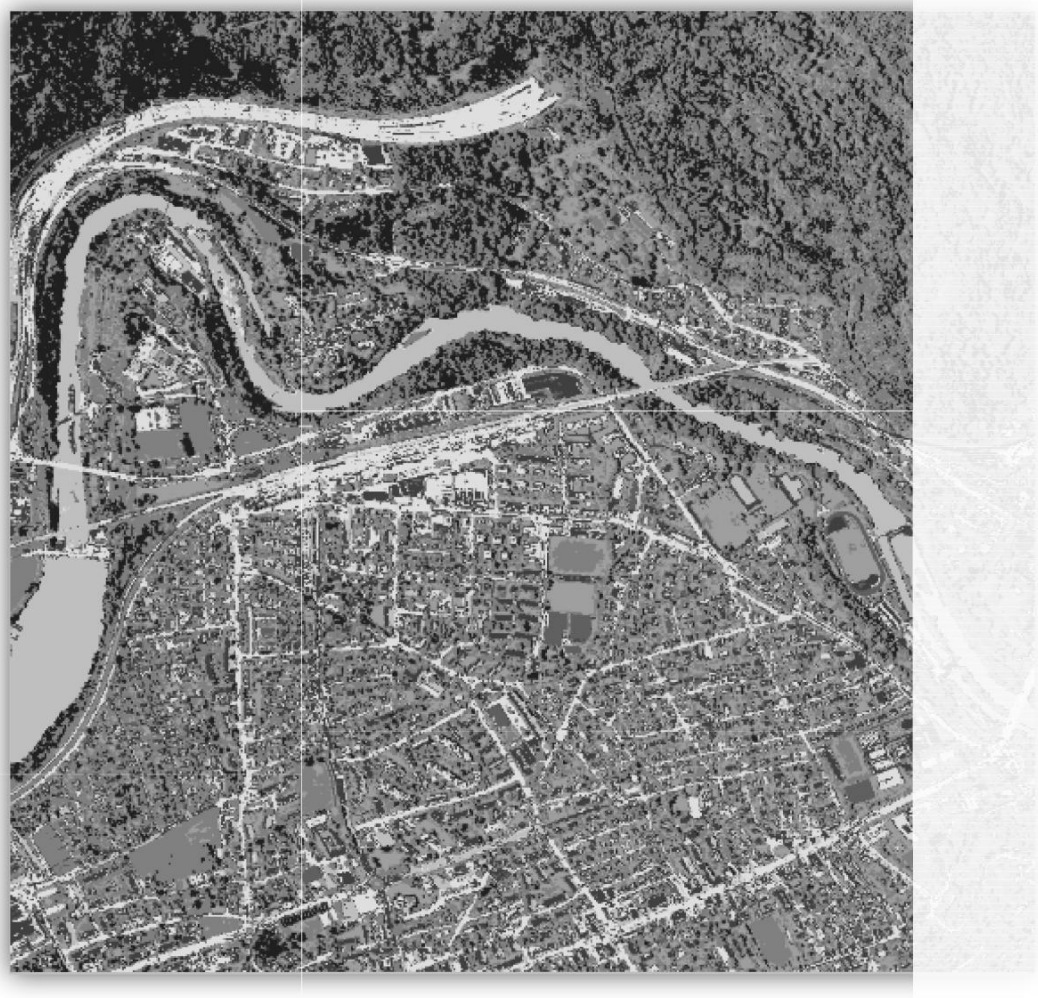
Building _2 class

Bright forest class

Grassland class

River class

For Hard Classification:



Hard classification of the image

CONCLUSION:

On running this project the given i mage dataset “apex12 bands” of 8 bands,12 bands and 17 bands is classified based on the files defined in the path array i.e. Roads, dull forest, building_1, building_2, bright forest, grassland s and river.

The classification is done on the basis of soft and hard classification and resulting images are saved in the defined folders in .tiff format.