**PROJECT REPORT ON PLANES DETECTION IN SATELLITE IMAGES**

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**Abstract:**

Aircraft detection for remote sensing images, as one of the fields of computer vision, is one of the significant tasks of image processing based on deep learning. Recently, many high-performance algorithms for aircraft detection have been developed and applied in different scenarios. However, the proposed algorithms still have a series of problems; for instance, the algorithms will miss some small-scale aircrafts when applied to the remote sensing image.

**OBJECTIVE:**

The main objective of this project is to develop methods for detecting airplanes using satellite radar data and high spatial resolution images in the visible spectral range.

**CHALLENGE:**

Build an algorithm to automatically identify whether a remotely sensed target is an aeroplane or not. The algorithm had to be extremely accurate because lives and billions of dollars in energy infrastructure are at stake.

**Environment and tools:**

1. scikit-learn
2. numpy
3. keras
4. pandas
5. matplotlib

**DATA:**

The dataset I have used is named as -planesnet.json .

<https://drive.google.com/file/d/1XDdl8Qn7p301E1l2wg7ttvJ0ezKiVWI4/view?usp=sharing>

It has

**APPROACH:**

 The performance of deep learning models is proportional to the amount of training data. More the data, the better the performance.  
Models like FRCNN require huge amounts of training data to produce good results. However, there are very few (if not none) datasets for object detection which have ample training data.  
In this dataset also we have lot of images, which are enough to produce good results.

**CONVOLUTIONAL NEURAL NETWORK:**

A C**onvolutional Neural Network (CNN)** is a Deep Learning algorithm which can take in an input image, assign importance (learnable weights and biases) to various aspects/objects in the image and be able to differentiate one from the other. The pre-processing required in a CNN is much lower as compared to other classification algorithms. While in primitive methods filters are hand-engineered, with enough training, ConvNets have the ability to learn these filters/characteristics.

Convolutional neural networks are distinguished from other neural networks by their superior performance with image, speech, or audio signal inputs. They have three main types of layers, which are:

* Convolutional layer
* Pooling layer
* Fully-connected (FC) layer

### **Convolutional Layer:**

The convolutional layer is the core building block of a CNN, and it is where the majority of computation occurs. It requires a few components, which are input data, a filter, and a feature map

### **Pooling Layer:**

### Pooling layers, also known as downsampling, conducts dimensionality reduction, reducing the number of parameters in the input. Similar to the convolutional layer, the pooling operation sweeps a filter across the entire input, but the difference is that this filter does not have any weights. Instead, the kernel applies an aggregation function to the values within the receptive field, populating the output array. There are two main types of pooling:

* **Max pooling:** As the filter moves across the input, it selects the pixel with the maximum value to send to the output array. As an aside, this approach tends to be used more often compared to average pooling.
* **Average pooling:** As the filter moves across the input, it calculates the average value within the receptive field to send to the output array.

### **Fully-Connected Layer:**

The name of the full-connected layer aptly describes itself. As mentioned earlier, the pixel values of the input image are not directly connected to the output layer in partially connected layers. However, in the fully-connected layer, each node in the output layer connects directly to a node in the previous layer.

**RESULTS:**

The model is able to achieve the accuracy of 89.03 percent.

# Conclusions:

Ever since the inception of deep learning in computer vision, tasks like object detection have become comparatively easier and efficient.  
The deep learning models provide better accuracy, less time consumption, less complexity, overall better performance than the earlier computer vision approaches.

We were able to detect planes from satellite images correctly with great accuracy.