www.ijprems.com
editor@ijprems.com

INTERNATIONAL JOURNAL OF PROGRESSIVE RESEARCH IN ENGINEERING MANAGEMENT AND SCIENCE (IJPREMS)
Vol. 01, Issue 01, Oct. 2021, pp: 22-25

e-ISSN : xxxx-xxxx
Impact Factor : xxxx

# LANDMARK RECOGNITION USING CNN

**Ratnesh Tiwari [*1], Prabha Tomar[*2]**

[*1] Student, Dept. of CSE, Capital College Engineering College, Orissa, India.

[*2] Guide, Dept. of CSE, Capital College Engineering College, Orissa, India.

## ABSTRACT

In the present time the identification of the landmark through any medium is beneficial for the one who not aware about the area or a place. Landmark recognition is a difficult challenge in the field of image classification due to the number of architectural design of different landmarks. The paper purposes an approach of classification based on different features of landmarks, famous places, buildings and monuments. The model is train over the landmarks from different parts of world. The dataset is collected over the internet, cropped to remove different factors that affect the training. Experiments have been conducted on various features extraction and the Convolutional Neural Networks (CNN) model. The results have shown us the performance of combination of model and feature extraction using Deep Convolutional Neural Networks (DCNN) method while accruing the accuracy of 88.3%, using VGG-16 extracted features over 40 classes.

**Keywords:** Convolutional Neural Networks, Deep Convolutional Neural Networks, Landmark recognition.

## I. INTRODUCTION

Most of the photos taken will travelling to tourist place are posted on social networking platforms on daily base. It has resulted in huge amount photos to available online. The touristic landmarks are easily recognizable of a well known sites and architecture as in Fig.1.There are more than 1000 tourist places around the globe which have many architecture and monuments. Manually identifying the image in large scale is Time consuming and not traceable, therefore automatic content based solution is required. The main challenge is there no precise definition of what is and what not a landmark. With many Landmarks it is hard for single person to keep track of their detail all the time. With the vast amount of images over the internet which is easily be accessed.

**Figure 1:** Landmark image from dataset.

There is no large database with a fair amount of landmarks to train a model. An image with a small portion of a particular landmark is difficult to identify and. So we will only consider the images of the landmarks taken from outside as well as from the distance along with the different directions. Most of the previous model have high false positive rate when it comes to different views of Landmarks.

## II. METHODOLOGY

### Feature Extraction using VGG16 model

The feature extracted from VGG16 is show in figure 2. VGG16 model is a series of convolutional layers followed by fully connected layers. Excluding last 3 Fully Connected layers from the model and training over data set gave 512 feature vectors then to Convolutional Neural Network (CNN).

**Figure 2:** Feature extracted using VGG16

### Feature Extraction using ResNet50

ResNet50 is a 50 layers deep CNN. It needs lot of memory to extract feature to make it easier. Image dataset was divided into many small batches and then used ResNet50 for feature extraction. The feature extracted from ResNet50 as in figure 3. These features were saved in a pickle file. Then used for classification with the CNN.

www.ijprems.com
editor@ijprems.com

INTERNATIONAL JOURNAL OF PROGRESSIVE RESEARCH IN ENGINEERING MANAGEMENT AND SCIENCE (IJPREMS)
Vol. 01, Issue 01, Oct. 2021, pp: 22-25

e-ISSN : xxxx-xxxx
Impact Factor : xxxx

**Figure 3:** Feature extracted using ResNet50

**Feature Extraction as Edge Detection**

A brief introduction to Edge detection is shown in figure 4. It uses an algorithm that searches for change in pixel intensity across the image that is converted to grayscale. It converts 3 channel of image to single channel which can be used as a feature. Dimension of the image remain unchanged then to Convolutional Neural Network (CNN).

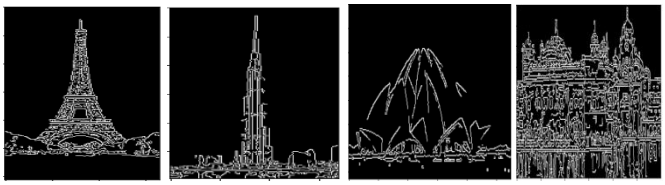

**Figure 4:** Feature extracted using Edges

The images in the dataset were clicked from different views and at different time of day. Model was trained on 40 classes. The dataset was divided into 70:20:10, for training, validation and test, i.e. 105 photos per class for training and 40 photos per class for validation and 20 per class for testing. The dataset were collected from different sources.

This section is a description of data used for the best testing performance. Moreover, the different experimental scenarios and their outcomes were compared for the testing the performance. Fig. 5gives the idea of the model used for testing purpose. Jupyter Notebook with tensorflow and cuda were used for faster deep learning experiments. We used system with Intel i5 processor along with Nvidia 1050 Ti gpu.

**Description of Data-set**

The manually acquired dataset consists of 40 folders for 40 landmarks with each folder having 105 different images per landmark. The naming of each folder is done according to name of the landmarks name. Most of them are famous landmark all over the world.

**Experimental scenario**

Different approaches were used for the experiment. Firstly, default filter for CNN is used with different layers of convolution without dropout, pooling and dense layer. Gray scale images and RGB images are used to evaluate the best possible architecture for the classification as shown in figure 5. Features extracted using VGG16, ResNet50 and Edge as a feature.

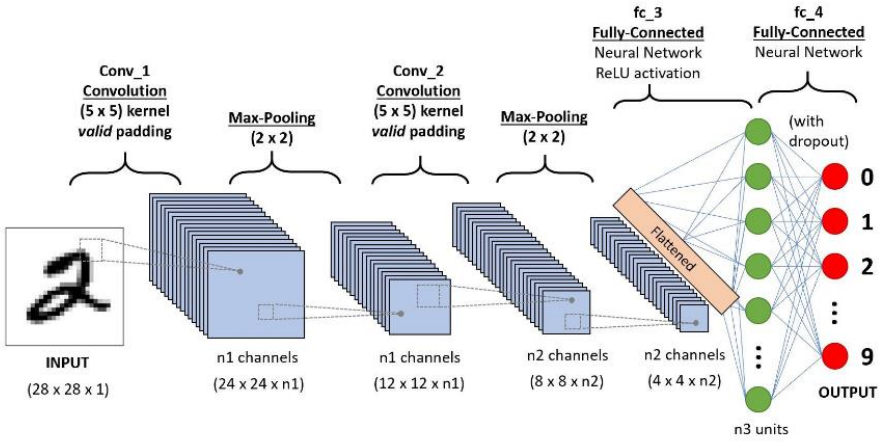


**Figure 5:** CNN Architectural Representation

## III. MODELING AND ANALYSIS

The images in the dataset were clicked from different views and at different time of day. Model was trained on 40 classes. The dataset was divided into 70:20:10, for training, validation and test, i.e. 105 photos per class for training and 40 photos per class for validation and 20 per class for testing. The dataset were collected from different sources.

www.ijprems.com
editor@ijprems.com

INTERNATIONAL JOURNAL OF PROGRESSIVE RESEARCH IN ENGINEERING MANAGEMENT AND SCIENCE (IJPREMS)
Vol. 01, Issue 01, Oct. 2021, pp: 22-25

e-ISSN : xxxx-xxxx
Impact Factor : xxxx

This section is a description of data used for the best testing performance. Moreover, the different experimental scenarios and their outcomes were compared for the testing the performance. Fig. 5gives the idea of the model used for testing purpose. Jupyter Notebook with tensorflow and cuda were used for faster deep learning experiments. We used system with Intel i5 processor along with Nvidia 1050 Ti gpu.

**Experimental scenario**

Different approaches were used for the experiment. Firstly, default filter for CNN is used with different layers of convolution without dropout, pooling and dense layer. Gray scale images and RGB images are used to evaluate the best possible architecture for the classification as shown in figure 5. Features extracted using VGG16, ResNet50 and Edge as a feature.

## IV. RESULTS AND DISCUSSION

Different approaches were used to classify landmarks with different number of layer's in CNN. This model was tuned for the hyper parameter. While tuning the model rmsprop had better result as compare to other optimizer. These features were given to CNN model for training. Finally, Deep Convoluted Neural Networks were used. DCNN has given us the good accuracy of 88.3% using fully connected layer-06 for recognition of landmarks on 40 classes.

**Table-1:** A comparison of various features with deep CNN Features for 40 landmarks

| Method | Accuracy% |
|---|---|
| RGB + CNN | 72.24 |
| Edges features + CNN | 58.92 |
| ResNet50 + CNN | 76 |
| VGG16 + CNN | 88.3 |

A graphical representation in figure 6 has made from the result of Table 1.

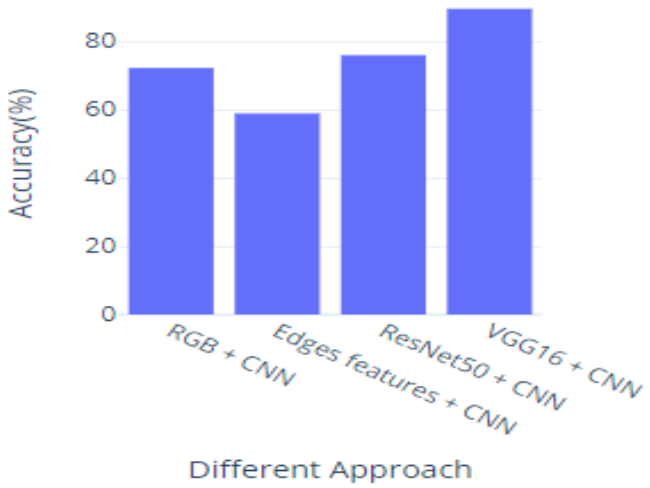


**Figure 6:** Bar graph showing the accuracy

## V. CONCLUSION

This paper provides the work for recognizing landmark from images. The proposed framework relies on the feature extracted from VGG-16 and mostly uses DCNN for the recognizing purposes. It was able to reach the better accuracy of 88.3% in comparison with others. The experiments performed proved the importance of using DNN representation for recognizing the images of landmarks. It showed how the accuracy can be increase with the use of DCNN

## VI. REFERENCES

[1] Y.T., Zhao, M., Song, Y., Adam, H., Buddemeier, U., Bissacco, A., Brucher, F., Chua, T.S. and Neven, H., Zheng, "Tour the world: building a web-scale landmark recognition engine," IEEE Conference on Computer Vision and Pattern Recognition, p. 7, June 2009.

[2] M. and Conrad, S., Rischka, "Landmark Recognition: State-of-the-Art Methods in a Large-Scale Scenario," LWA, p. 7, 2014.

[3] A. and Tyantov, E., Boiarov, "Large scale landmark recognition via deep metric learning," In Proceedings of the 28th ACM International Conference on Information and Knowledge Management, p. 9, November 2019.

[4] Filippo, and Jörg Conradt Galli, "Landmark Recognition with Deep Learning," NEUROSCIENTIFIC SYSTEM THEORY, p. 20, 2016.

[5] P. and Gavrilova, M. Bhattacharya, "A survey of landmark recognition using the bag-of-words framework," In Intelligent computer graphics , p. 21, 2012.