Intel Image Classification

Introduction:

When machine learning and image classification get integrated, computers become capable of performing visual tasks that until recently could only be carried out by humans. Together, these technologies offer the potential for breakthroughs in automation, presenting new digital opportunities for companies in a variety of domains.

How do we, humans, recognize a forest as a forest or a mountain as a mountain? We are very good at categorizing scenes based on the semantic representation and object affinity, but we know very little about the processing and encoding of natural scene categories in the human brain. In this problem, we have a dataset of ~25k images from a wide range of natural scenes from all around the world.

Identifying natural scenes from all around the world is an interesting image classification problem. We are going to classify six different category images:

- Buildings
- Forest
- Glacier
- Mountain
- Sea
- Street

Problem at hand:

Our task is to identify which kind of scene can the image be categorized into.

Value to client:

Image recognition refers to technologies that identify places, logos, people, objects, buildings, and several other variables in images. Users are sharing vast amounts of data through apps, social media and websites. Additionally, mobile phones equipped with cameras are leading to the creation of limitless digital images and videos. The large volume of digital data is being used by companies to deliver better and smarter services to the people accessing it.

From the business perspective, major applications of image recognition are face recognition, security, surveillance, visual geo-location, object recognition, gesture recognition, code

recognition, industrial automation, image analysis in medical and driver assistance. These applications are creating growth opportunities in many fields.

By analyzing images of people, places, objects, scenes, and documents, machine learning for image classification promises new levels of automation in just about every industry. Healthcare, insurance, automotive, manufacturing, and financial services are among the industries in which automated image classification is most prolific. However, in reality it is likely that many more industries will be impacted by the technology as it matures.

Data Source:

www.kaggle.com/puneet6060/intel-image-classification

Methodology:

Building and training a Convolutional Neural Network that can classify the above mentioned categories of images correctly.

Data Wrangling

The data was downloaded from Kaggle.

The dataset contains around 25k images of size 150 x 150 distributed under 6 categories. The class names along with their indices are as follows:

- **buildings → 0**
- **forest → 1**
- **glacier → 2**
- **mountain → 3**
- **sea → 4**
- **street → 5**

The Train, Test and Prediction data is separated in each zip files. There are around 14k images in Train, 3k in Test and 7k in Prediction.

The directory structure is as follows:

Train set-

seg_train/
...seg_train/
.....buildings/
.....forest/
.....glacier/
.....mountain/
.....sea/
.....street/

Test set-

seg_test/
...seg_test/
.....buildings/
.....forest/
.....glacier/
.....mountain/
.....sea/
.....street/

Prediction set-

seg_pred/
...seg_pred/

Data Pre-processing:

We utilize Keras's **"ImageDataGenerator"** to perform image augmentation. **"ImageDataGenerator"** takes the path to a directory & generates batches of augmented data.

Our dataset has images placed under folders which has their respective class names. We use the **"flow_from_directory"** method that helps us to read the images from the folders and also determine the number of classes along with their names.

By performing the above method we find:

- Train set contains 14034 images belonging to 6 classes.
- Test set contains 3000 images belonging to 6 classes.

Exploratory Data Analysis

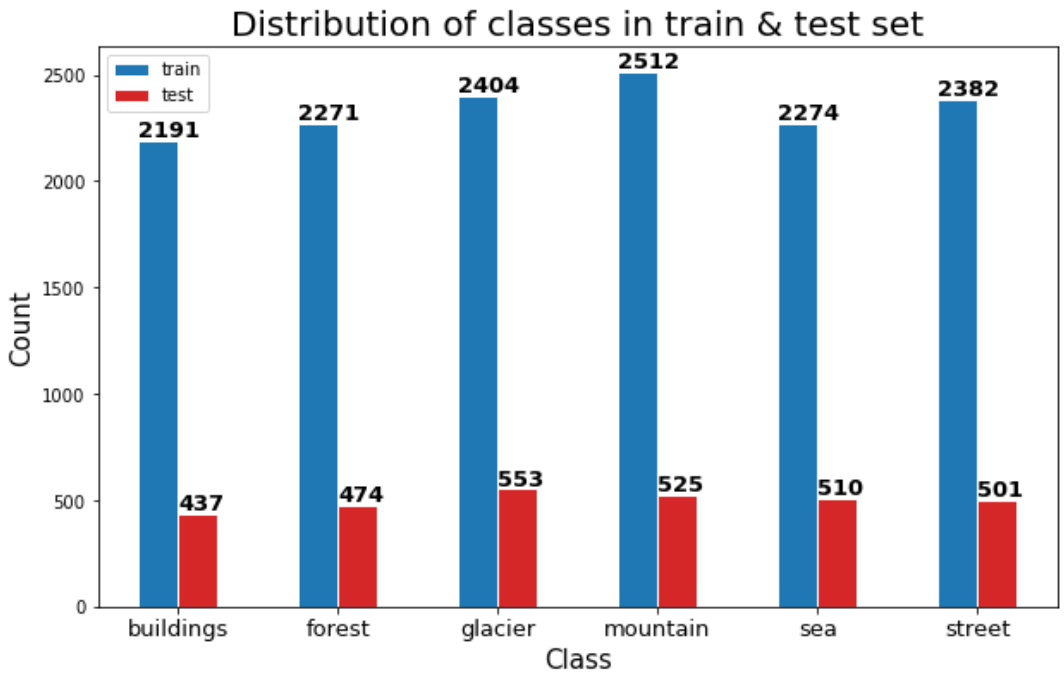
Let's explore the dataset here.

We can ask ourselves:

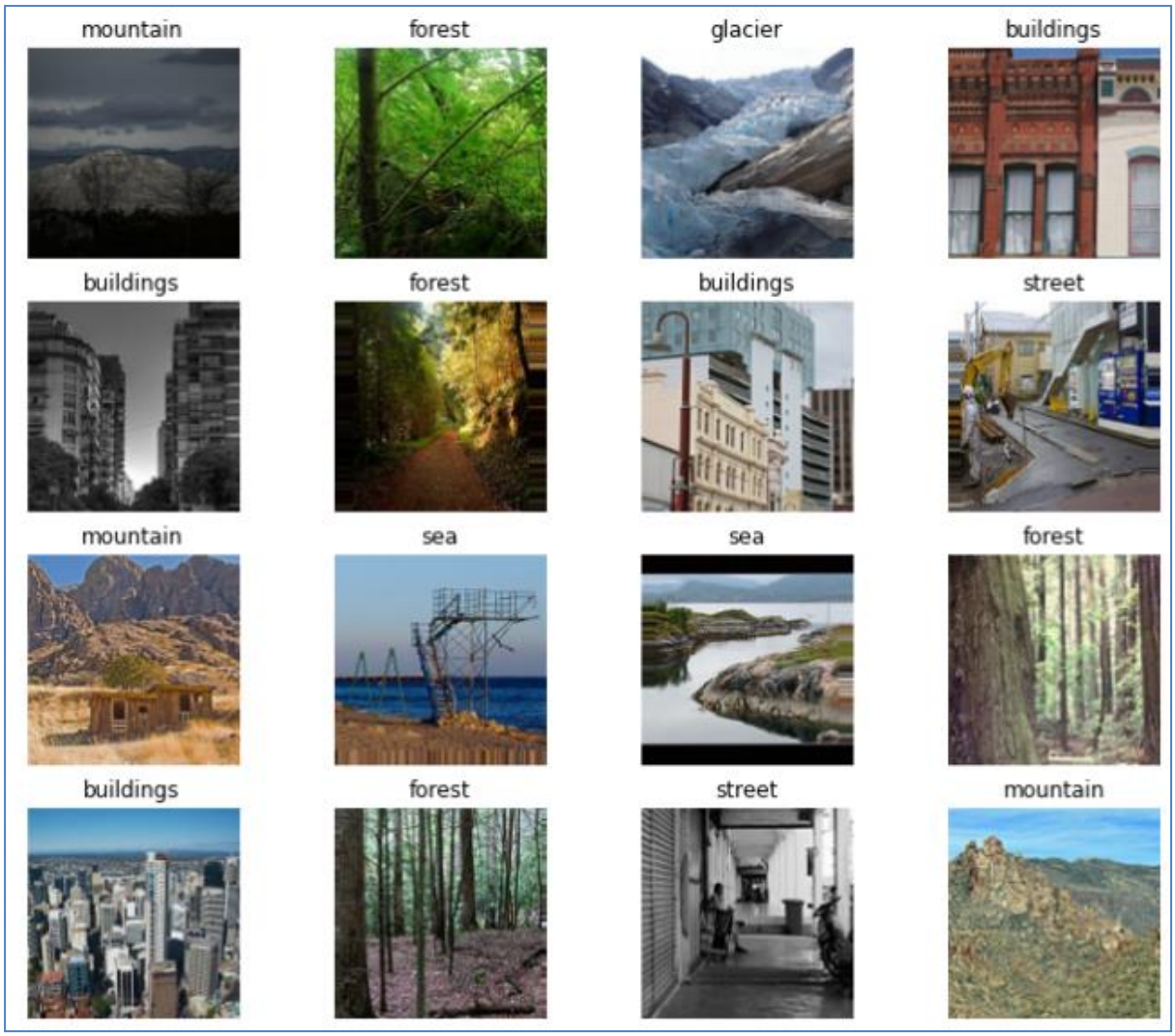
- **How many training and testing examples do we have ?**
  - We already know the number of images our dataset contains.
    Number of training images: 14034
    Number of testing images: 3000

- **What is the shape of the images ?**
  - Shape of training images: 150 x 150 x 3
    Shape of testing images: 150 x 150 x 3

- **What is the distribution of the images in 6 different classes?**
  - Let's visualize the distribution of the images in 6 classes in both the training and test set.



Let's see some of the images along with the class names from the train set:



Here we can see the 6 classes distinctly classified as the images are already labelled in the train set. At the end we will see how our CNN model predicts the classes for unseen and unlabelled images from the prediction set.