Machine Learning

Home Work II

Venice Boat Classification

Master of Engineering in Computer Science

INTRODUCTION

MarDCT /Maritime Images for Classification data set which has contains a training set and test set using the deep learning concept with (CNN) in our project in order to get high performance and good accuracy .
Deep Learning is becoming a very popular subset of machine learning due to its high level of performance across many types of data. A great way to use deep learning to classify images is to build a convolutional neural network (CNN). The Keras library in Python makes it pretty simple to build a CNN.
Computers see images using pixels. Pixels in images are usually related. For example, a certain group of pixels may signify an edge in an image or some other pattern. Convolutions use this to help identify images.

Boat Types Are many boats travelling daily through the canals in Venice fit categorically into 24 types. It is important to categorize them this way as they serve different purposes and contribute differently to pollution. The first two types are reserved for cargo boats, large and small respectively. Similar to delivery trucks on the highway, these cargo boats travel the same routes over and over again delivering items throughout the city. For considerations of traffic analysis, they are linked together in a class named cargo. The third type of boat, taxis, accounts for significant portion of inner canal boat traffic. Due to the extremely high level of tourism in Venice, taxis are kept permanently busy traveling back and forth between the airport and hotels. The economy of Venice relies heavily on the canal system as it is the primary method of tourist transportation and sightseeing.7 Their business is increased more so by the greatly reduced speed of alternate travel methods. Taxis are particularly notorious for travelling quickly with large payloads and averaging a higher noise output than other boat types. Taxis belong to the public transportation class.

Taxi boat

Cargo boat

FEATURES

The training set contains images from 24 different categories of boats navigating in the City of Venice (Italy). The .RAR file contains a folder for each category. The jpeg files inside the folders are named according to the date, hour, and system track number. The folder "Water" contains false positives.
The test set contains images with ground-truth annotations in the format <image-name>;<category> for example 20130412_044827_56976.jpg; Alilaguna,The annotations are contained in the file ground_truth.txt.

Procedure

A- We split our dataset into training set and test set folders, so we can ease the the data preprocessing in order to reduce the computational complexity. After splitting the dataset we will start building our network, here we will be adding 3 convolutional layers, we will apply max pooling for each layer, and we will add 3 fully connected layers. In the hidden layers we will be using the ReLu activation function. In the output layer, we will use the softmax activation function, because we have more than 2 classes.

B- we will train our network and test it in order to check the accuracy between the training set and test set.

C-Using our model to make predictions.

D-Performance

i- After 3 epochs, we have gotten to 96.64% accuracy on our validation set. That’s a very good start! we have now built a CNN!.
ii- After training the model, here’s the test loss and test accuracy:

Test loss: 0.27543345655779356

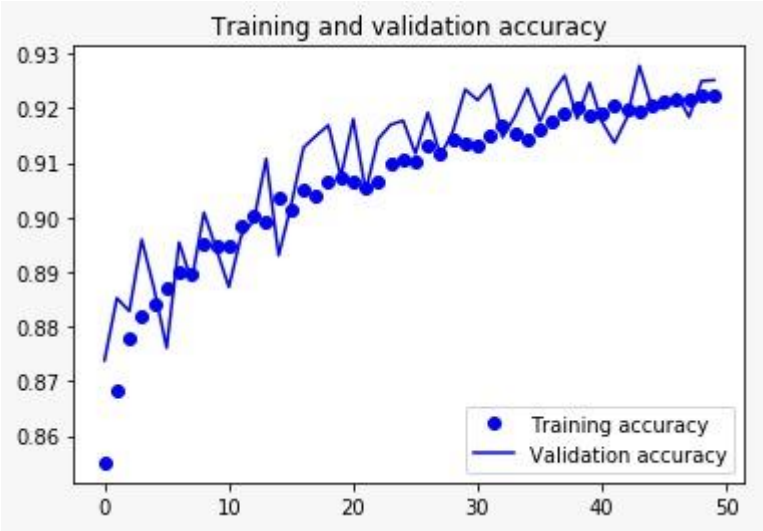
Test accuracy: 0.9042

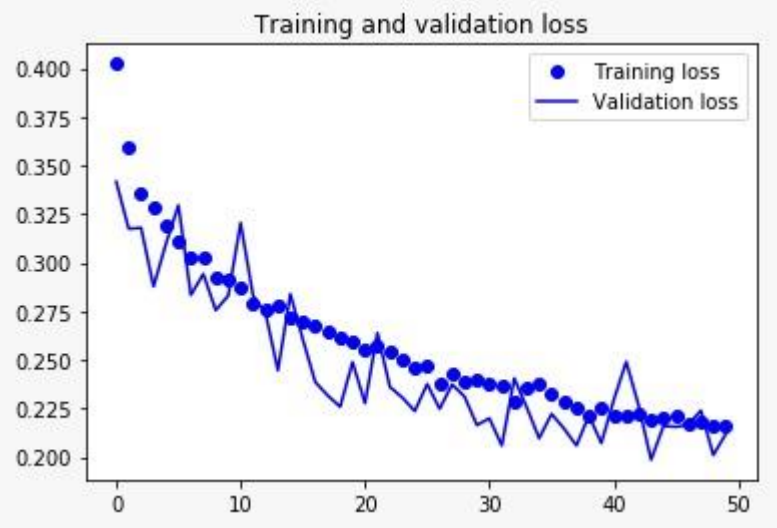
iii-After applying data augmentation, here's the test loss and test accuracy:

Test loss: 0.1776999668269291

Test accuracy: 0.9263

iiii-For visual purpose, we plotted the training and validation accuracy and loss:





Classifier&Problem

Used classifier Convolutional Neural Networks (CNNs) is the most popular neural network model being used for image classification problem (specific 24 class).

LIBRARIES

The following open source libraries were used during the experiment.

1. Numpy- for reading data and building matrices.
2. Keras- libraries and packages & utilities (pandas,shutil,ceil,os).
3. Matplotlib- for plotting

RESULTS

The classifier was tested on the Images Classification . The result for this problem performed better by using Convolutional Neural Networks (CNNs).

CONCLUSION&SUMMARY

The goal of this project is to train a classifier using A Convolutional Neural Network (CNN) architecture that classifies the type of boat in the image with different categories of boats navigating in the City of Venice (Italy).
The training dataset contains 4.774 images and the test dataset contains 1.969 from 24 different categories.
The use of publicly available data set is the appropriate way to compare the relative merits of existing methods and to develop and assess new robust solutions. In this paper, we focus on the maritime domain and we describe the generation of boat classification data sets, containing images of boats

automatically extracted by the ARGOS system, operating 24/7 in Venice (Italy). We will be using Keras to build our Convolutional Neural Network(CNN). This network will be used to classify 24 categories of different boats, which can be seen in Venice, it is clear that the problem is very challenging, mostly because of the unique water scenario that does not hide any of the difficulties that are encountered by a real system. Although the Venice environment is very particular, not reproducible in other cities, boat classification provides for interesting scientific challenges for computer vision, pattern recognition and machine learning. We thus hope that the availability of this data set would foster the development ofnovel and robust solutions, that can then be applied also toother more general problems related to vehicle classification.

The aim of MarDCT is to provide visual data that can be used to help in developing intelligent surveillance system for the maritime environment. The data sets are divided according to the type of Ground Truth in classification for images.