CS6301 MACHINE LEARNING

PROJECT PROPOSAL

CIFAR-10 RECOGNITION ENGINE USING CNNs

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Abstract:

Image classification is an active research area and has been studied in popular applications such as driverless vehicles and emergency robots. We propose a convolutional neural network (CNN)-based architecture using the CIFAR-10 Dataset, which has a total of 60000 images. These images are divided into training and test sets, each with 50000 and 10000 images, respectively.

CIFAR-10 Dataset Description:

CIFAR-10 is a labeled dataset consisting of numerous images of 32x32 dimensions classified and labeled into 10 different classes. The target classes are:

1) Airplane
2) Automobile
3) Bird
4) Cat
5) Deer
6) Dog
7) Frog
8) Horse
9) Ship
10) Truck

The classes are completely mutually exclusive. There is no overlapping between classes; that is, there is no image that can be classified into two target classes.
There are 60000 images with 10000 images in each class, making this a very large dataset to work on and use for training.

CNN Architecture

CNNs have a relatively simple architecture which consists of successive layers organized in a hierarchical fashion. Each layer involves convolutions with learned filters followed by a pointwise non-linearity and a downsampling operation called “feature pooling”.

The CNN architecture has been diagrammatically depicted below:

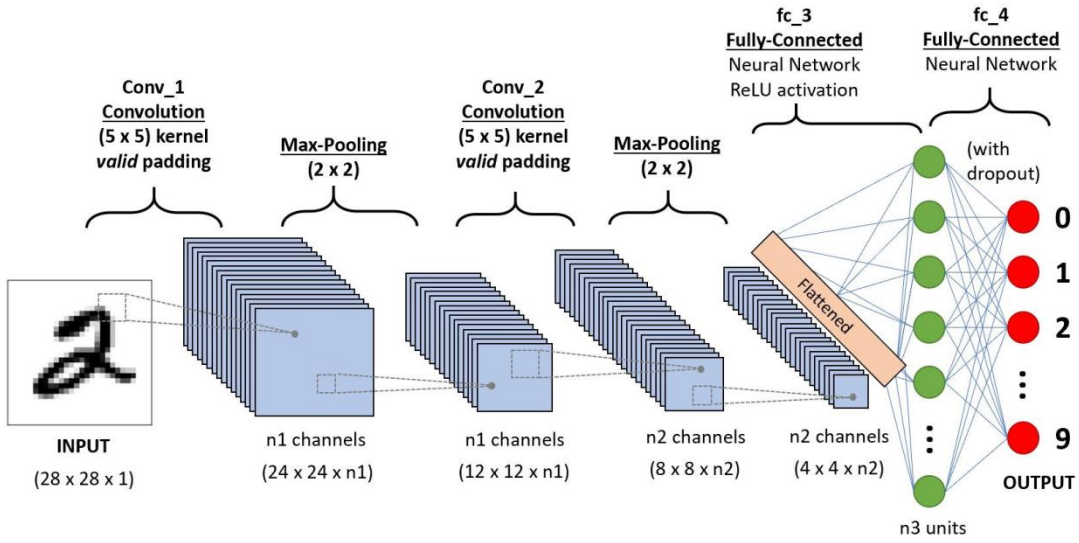

Fig 1: CNN Architecture for recognizing handwritten digits

They are great for capturing local information (e.g. neighbor pixels in an image or surrounding words in a text) as well as reducing the complexity of the model (faster training, needs fewer samples, reduces the chance of overfitting). They also preserve the quality of the model while reducing the number of parameters.

To avoid the persistent problem of overfitting, the model has incorporated a dropout layer at the end of our fully connected layer.

Our proposed architecture is as follows:

- Convolutional Layer 1
- Max Pooling Layer 1
- Convolutional Layer 2
- Max Pooling Layer 2
- Fully Connected Layer
- Dropout Layer

References

1) Sharma, Neha & Jain, Vibhor & Mishra, Anju. (2018). An Analysis Of Convolutional Neural Networks For Image Classification. Procedia Computer Science. 132. 377-384. 10.1016/j.procs.2018.05.198.

2) çalık, Caner & Demirci, M. Fatih. (2018). Cifar-10 Image Classification with Convolutional Neural Networks for Embedded Systems. 1-2. 10.1109/AICCSA.2018.8612873.