SUMMER INTERNSHIP REPORT

ON

"CONVOLUTION NEURAL NETWORK"

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CONVOLUTIONAL NEURAL NETWORKS

The recognition and classification of the diversity of materials that exist in the environment around us are a key visual competence that computer vision systems focus on in recent years. Understanding the identification of materials in distinct images involves a deep process that has made usage of the recent progress in neural networks which has brought the potential to train architectures to extract features for this challenging task.

Convolutional neural networks (CNNs) are widely used in pattern- and image-recognition problems as they have a number of advantages compared to other techniques.

A convolution neural network takes an image expressed as an array of numbers, applies a series of operations to that array and, at the end, returns the probability that an object in the image belongs to a particular class of objects.

By stacking multiple and different layers in a CNN, complex architectures are built for classification problems. Four types of layers are most common: convolution layers, pooling/subsampling layers, non-linear layers, and fully connected layers.

- Convolutional Layer – Used to detect features
- ReLU Layer – Introducing non-linearity to the system
- Pooling (Downsampling) Layer – Reduces the number of weights and controls overfitting
- Fully-Connected Layer – Standard Neural Network used for classiffication

Basically, in the end, Convolutional Neural Network uses standard Neural Network for solving classiffication problem, but it uses other layers to prepare data and detect certain features before that.

Why CNN?

While neural networks and other pattern detection methods have been around for the past 50 years, there has been significant development in the area of

convolutional neural networks in the recent past. This section covers the advantages of using CNN for image recognition.

- Ruggedness to shifts and distortion in the image
- Fewer memory requirements
- Easier and better training

The Future of CNNs

Among the promising areas of neural networks research are recurrent neural networks (RNNs) using long short term memory (LSTM). These areas are delivering the current state of the art in time-series recognition tasks like speech recognition and handwriting recognition. RNN/auto encoders are also capable of generating handwriting/ speech/images with some known distribution.

Deep belief networks, another promising type of network utilizing restricted Boltzman machines (RMBs)/auto encoders, are capable of being trained greedily, one layer at a time, and hence are more easily trainable for very deep networks.

Conclusion

CNNs give the best performance in pattern/image recognition problems and even outperform human in certain cases. Convolutional neural networks have developed so well that they have formed a relatively mature technology and method in many aspects. If we can further accelerate the training speed of the network and improve the performance and the versatility of the models, we can greatly improve the technical level of convolutional neural networks in image recognition and they can be applied in more different fields.