

CIFAR-10 Image Recognition

EE4305 Introduction to Fuzzy/Neural Systems

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1 Introduction

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The CIFAR-10 dataset contains 60000 images bla bla.^[1]

Objectives of this project are: bla bla

Structure of the report is as follows: bla bla

2 Literature Review on Neural Networks

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This section gives a literature review on the broad topic of neural networks. Section 3 gives a more specific review on neural network designed to classify the CIFAR-10 dataset. The significance and applications will be reviewed in section 2.1 while recent trends and accomplishments are discussed in section 2.2.

2.1 Significance and Applications of Neural Networks

This subsection will illustrate the significance and applications of neural networks.

One of the most important applications of neural networks is computer vision. Ever since

The significance of neural networks lies in the fact that they are able to achieve very high performance on tasks which are very difficult with other techniques.

2.2 Recent Trends and Accomplishments

Recent trends and accomplishments of neural networks are discussed in this subsection. Since neural networks are such a broad topics, only two recent accomplishments are looked at in detail: The AlphaGo computer program and adversarial examples. AlphaGo is a great example to illustrate recent trends and is also considered one of the biggest accomplishments of deep neural networks up to date. Adversarial examples can easily fool very different kinds of neural networks and are therefore a great example to show that enthusiasm maybe should be insulated.

AlphaGo is a computer program developed by DeepMind, a company owned by Google. It uses deep learning and is able to beat the world champion. This gained considerable media coverage since it is a feat experts thought would still be a decade away [CITE]. The game Go is considered the most complex board game, with a number of legal positions of in the order of magnitude of 10^{170} [2].

[3] [4]

Interesting development: Adversarial examples

Adversarial examples are a recalcitrant problem. It is a potential security problem. Studying them can im^[5] [6]

3 Literature Review on the CIFAR-10 dataset

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4 MLP Classifier

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4.1 Data Preprocessing and Augmentation

- Normalization

The input data is normalized to lie within the range [0,1].

- Mean subtraction

To further normalize the data, a the mean is subtracted on a per-pixel basis.

- Data augmentation

Experience shows that a larger training data set increases network performance

4.2 Network Structure

- Basic structure

Since this is a classification problem, parts of the network structure are fixed. The last layer consists of 10 nodes and a in a "softmax" configuration. PICTURE of basic structure.

- Number of hidden layers/nodes

Parameter search over 1-3 hidden layers, 1-500 neurons

4.3 Optimization of Further Network Parameters

- Different learning rates
- Different optimization methods

5 CNN network

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6 Conclusion

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