Bayesian Neural Networks

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Abstract

Bayesian Neural Networks are...

Contents

1 Introduction

1.1 History

1987 The patent a 'Method of providing digital signatures' is filed by Ralph C. Merkle[**merkle-pater**

1999 The original patent expires.

2009 Bitcoin uses Merkle Trees for 'block header commitment.'[**friedenbach_alm_2017**]

2009 BitTorent uses Merkle Trees for data integrity[**bep30**].

2 Neural Network

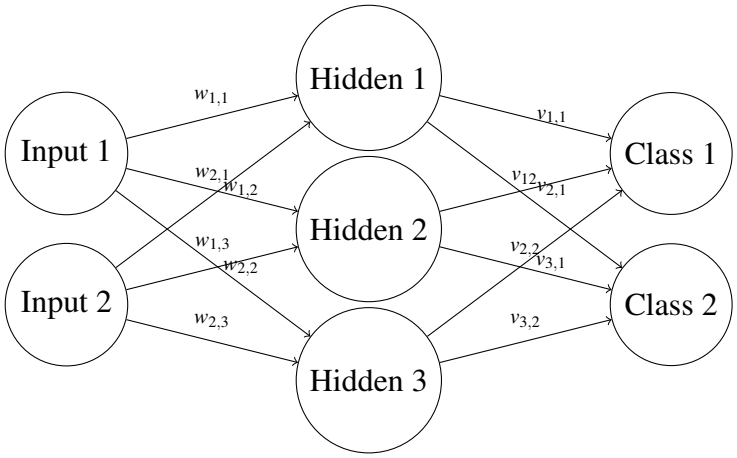


Figure 1: Example neural network

Neural networks....

Neural networks are made out of a series of neurons.

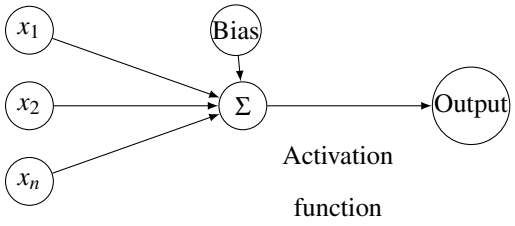


Figure 2: Neural network neuron

2.1 Convolutional Neural Networks

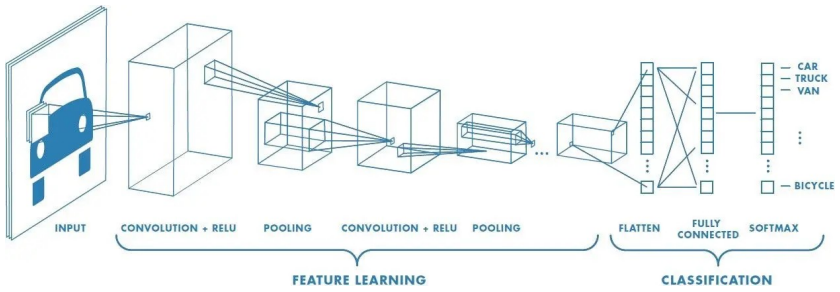


Figure 3: CNN pipeline [4]

Convolutional neural networks (CNN) are a type of neural network that is better suited for image recognition. Instead of reading the entire image a CNN slides over the image...

The result is that the neural network trains faster..

3 Bayesian Neural Networks

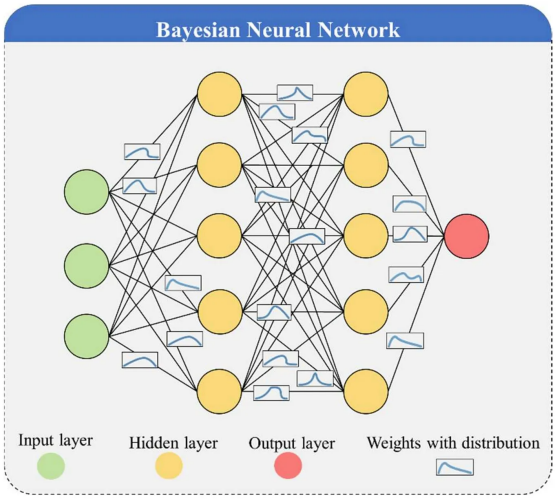


Figure 4: Example BNN [1]

Bayesian neural networks take the same principle as

Similar to a Neural network such as...

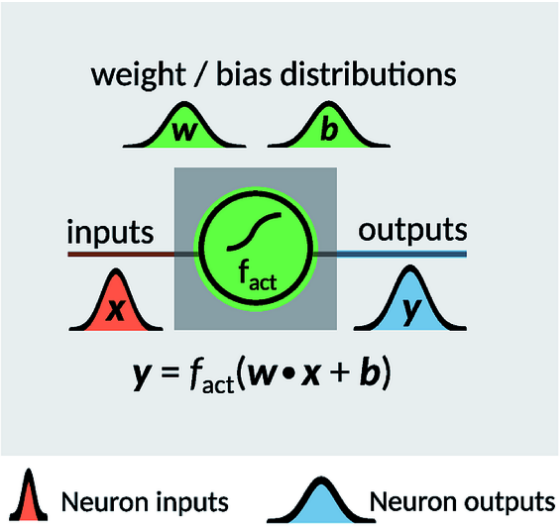


Figure 5: Example BNN Neuron [2]

3.1 Bayesian Conolutional Neural Networks

Same principle...

4 Simulation

We use a BCNN implementation from Github based on work from ... [6] [5]

4.1 CIFAR-10

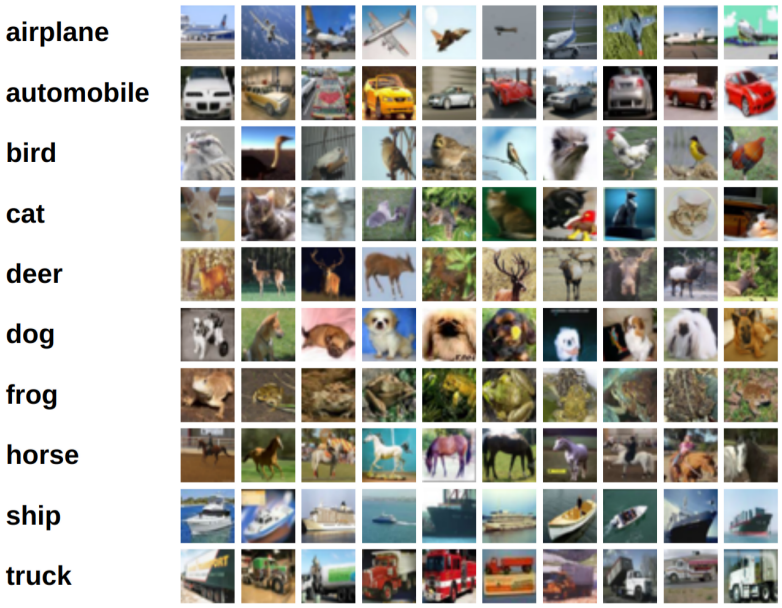


Figure 6: Example CIFAR-10 images [3]

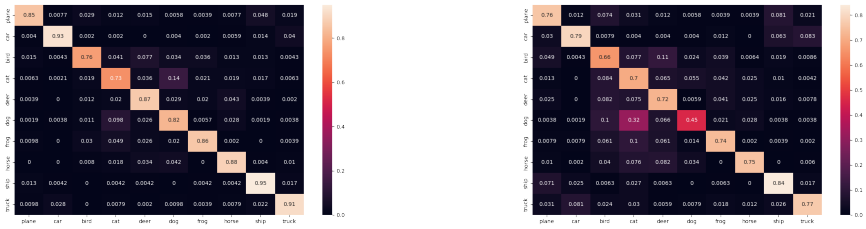
The CIFAR-10 dataset...

4.2 Hyperparamaters

We used the following hyperparamaters for training

Hyperparameter	**CNN**	**BCNN**
Epochs	500	500
Learning Rate	....	May be higher (0.01 - 0.1) due to simpler structure
Regularization	L1/L2 weight decay or Dropout common to prevent overfitting	Can benefit from Dropout, but weight decay might be less crucial
Optimizer	Adamw	Adamw

4.3 Results



(a) CNN (b) BCNN

Figure 7: Confusion matrices

5 Closing

References

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