Neural Networks Workshop: Training and Stochastic Gradient Descent

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Overview

Today we use and train Feed-Forward Artificial Neural Networks

Perceptron Review

[TODO: IMAGE OF PERCEPTRON AND SIGN FUNCTIO]

- Perceptrons are neural computation units which make *weighted* decisions:

$$p(\mathbf{x}) = \begin{cases} 1 \text{ if } \sum w_i x_i + b \geq 0 \\ 0 \text{ otherwise} \end{cases}$$
$$= \frac{\operatorname{sign}\left(\sum w_i x_i + b\right) + 1}{2}$$

- Perceptrons are not powerful enough, as seen last time with XOR.
- What if we want real valued output for tasks like predicting the temparature or stock prices?

Feedforward Neural Networks

[TODO: IMAGE OF FEED FORWARD NETWORK]

- Feedforward Artifical Neural Networks (ANNs) are the *continuous* extensions of perceptrons.
- ANNs can have many layers and different nodes which are *fully connected.*
- Generally, the more layers and nodes, the greater the computational power of the network!
- The intuition behind this model is that each neuron in the network makes a weighted decision like the perceptron. Many *stacked* decisions allows for extremely complex logic.

Blocks of Highlighted Text

Block 1

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Block 2

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Block 3

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Multiple Columns

Heading

1. Statement
2. Explanation
3. Example

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Table

Treatments	**Response 1**	**Response 2**
Treatment 1	0.0003262	0.562
Treatment 2	0.0015681	0.910
Treatment 3	0.0009271	0.296

Table: Table caption

Theorem

Theorem (Mass–energy equivalence)

$E = mc^2$

Verbatim

Example (Theorem Slide Code)

```
\begin{frame}
\frametitle{Theorem}
\begin{theorem}[Mass--energy equivalence]
$E = mc^2$
\end{theorem}
\end{frame}
```

Citation

An example of the `\cite` command to cite within the presentation:

This statement requires citation [Smith, 2012].

References

John Smith (2012)
Title of the publication
Journal Name 12(3), 45 – 678.

The End