# Neural Network For Handwrites Recognition

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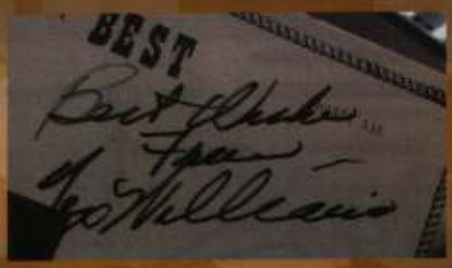
This title should be a "take-home" message, e.g. "Neural networks can be used to recognise handwriting."

## Definition and Engine of Recognition




Signature of country star, Tex Williams

Numbers of Recognition

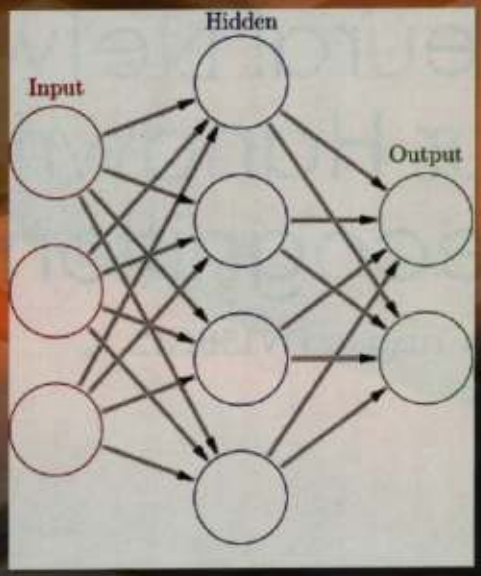

OCR software

## Artificial Neural Network

## Neural Networks as the Brain

- Basic Concepts
- Configuration
- Cost Function

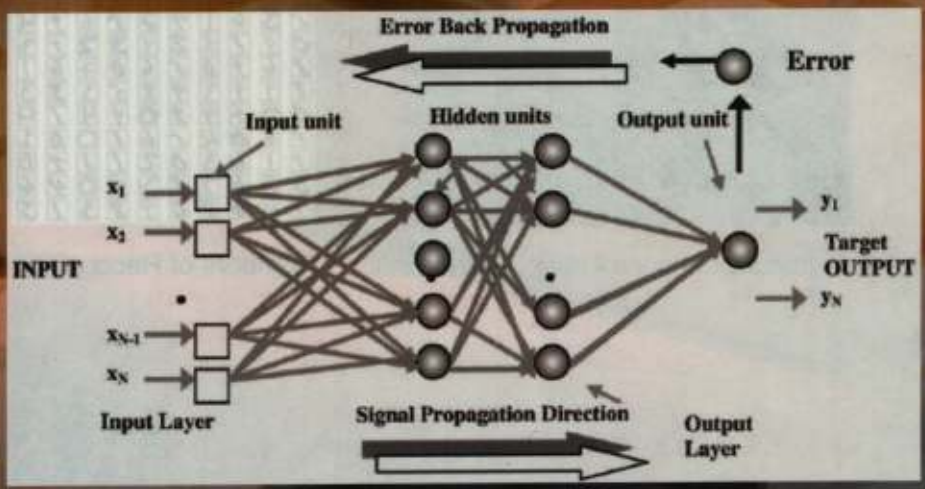
Each circular node represents an artificial neuron and an arrow represents a connection from the output of one neuron to the input of another




Take your time covering these two slides. Whether your presentation is understandable depends strongly on these slides.

## Neural Networks and Common Algorithm

1. Backpropagation, is a common method of training artificial neural networks
2. Optimization method such as gradient descent

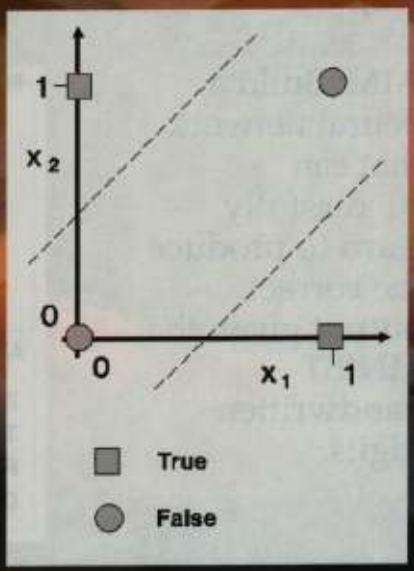


Take-home message: "A neural network can be trained to solve an XOR problem".

# A simple example of Neural Network: XOR problem

- A neural network that can learn to produce the correct output given the XOR problem.

| Given this input | | Produce this output |
|---|---|---|
| $x_1$ | $x_2$ | $y$ |
| 0 | 0 | 0 |
| 0 | 1 | 1 |
| 1 | 0 | 1 |
| 1 | 1 | 0 |




Put the XOR table on here too.

# Successfully Trained XOR problem

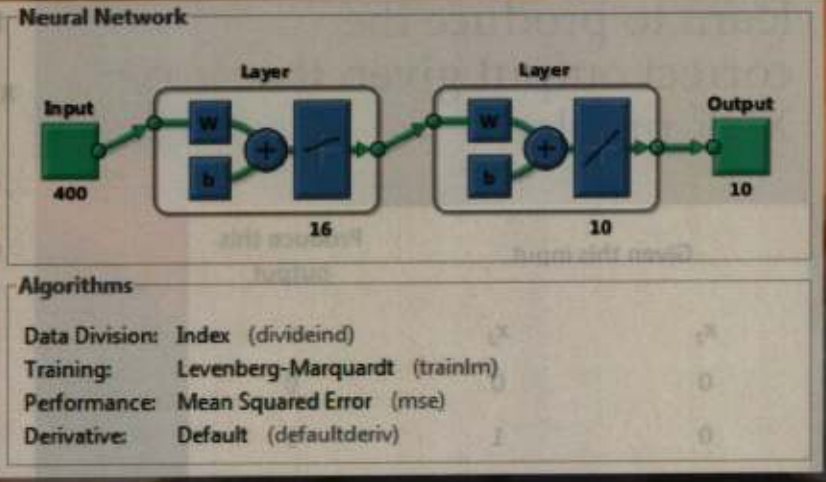
| Iterations | Result of 0,0 | Deviation J |
|---|---|---|
| 1000 | 0.47689 | 0.69423 |
| 68000 | 0.026558 | 0.037856 |
| 100000 | 0.019090 | 0.025859 |

- Network guesses small numbers (close to 0) for the first and last XOR examples and high (close to 1)
- Result is more accurate when Iterations is larger.
- Successfully trained!

take-home message.

# Handwritten Digits Recognition

- AIM: Build a neural network that can successfully learn to produce the correct output given the MNIST handwritten digits.




# Trained Handwritten Digits Recognition

| Accuracy | Samples | Hidden Neruons |
|---|---|---|
| 23.3% | 120 | 4 |
| 66.7% | 120 | 16 |
| 95.5% | 5000 | 25 |

```
TRAINLM, Epoch 0/200, MSE 0.902926/0, Gradient 600.48/1e-010
TRAINLM, Epoch 21/200, MSE 0.0738405/0, Gradient 0.0262333/1e-010
TRAINLM, Validation stop.

SIMULATION...

Training Set Accuracy: 23.333333
>>
```

not needed

- Training set accuracy is around 63% with the small sample (120) and small hidden neurons (16).
- While, larger sample (5000), and more hidden neurons (25) yields 95%.
- Sucessfully Trained!

remove title.


Overall, this is becoming a nice presentation. Just remember

- speak slowly
- don't rush the start (explain the fundamental concepts clearly)
- don't assume the audience are specialists

* Your mission with this presentation is to make people think "That's interesting - I'd like to know more".