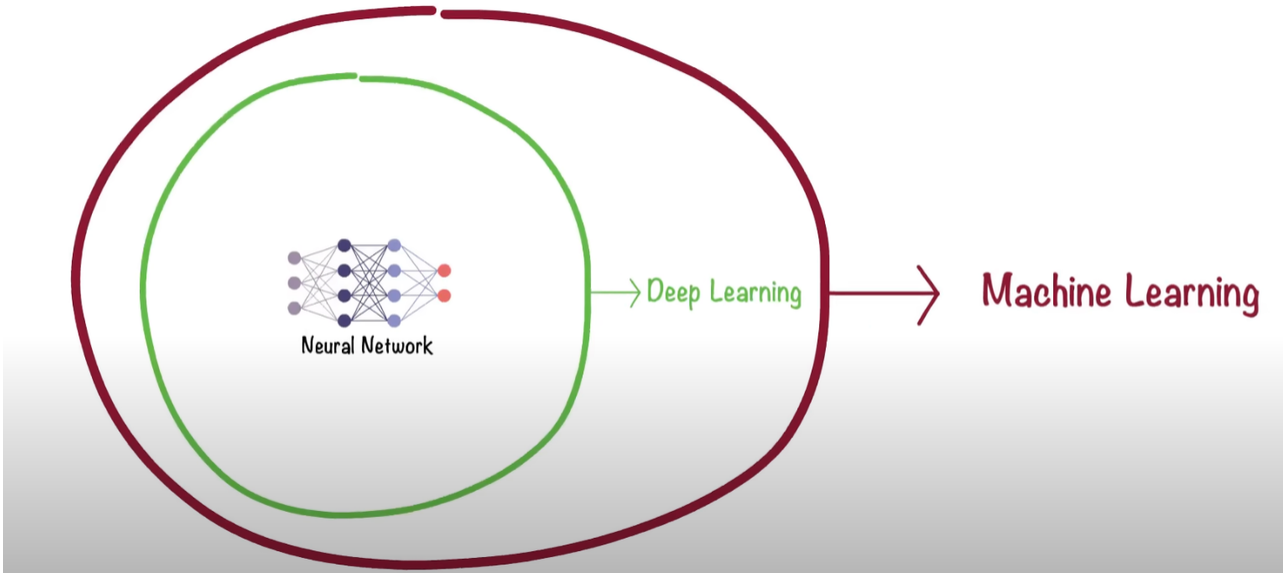
# DS124-Introduction to Neural Networks

أكاديمية طويق
Tuwaiq Academy

**By:** eng. Esraa Madhi

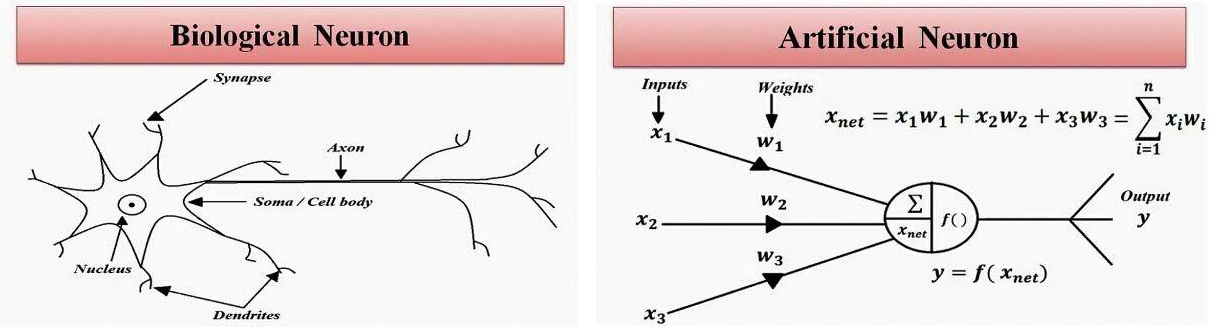


Neural networks can be used for both supervised and unsupervised learning, as well as for regression and classification tasks. Here's a brief overview:

1. **Supervised Learning**
- **Regression**: Predicting a continuous output (e.g., house prices).
- **Classification**: Categorizing inputs into discrete classes (e.g., spam or not spam).
2. **Unsupervised Learning**
- Example: Auto-encoders in NLP

# From Human Brain to Neural Networks:

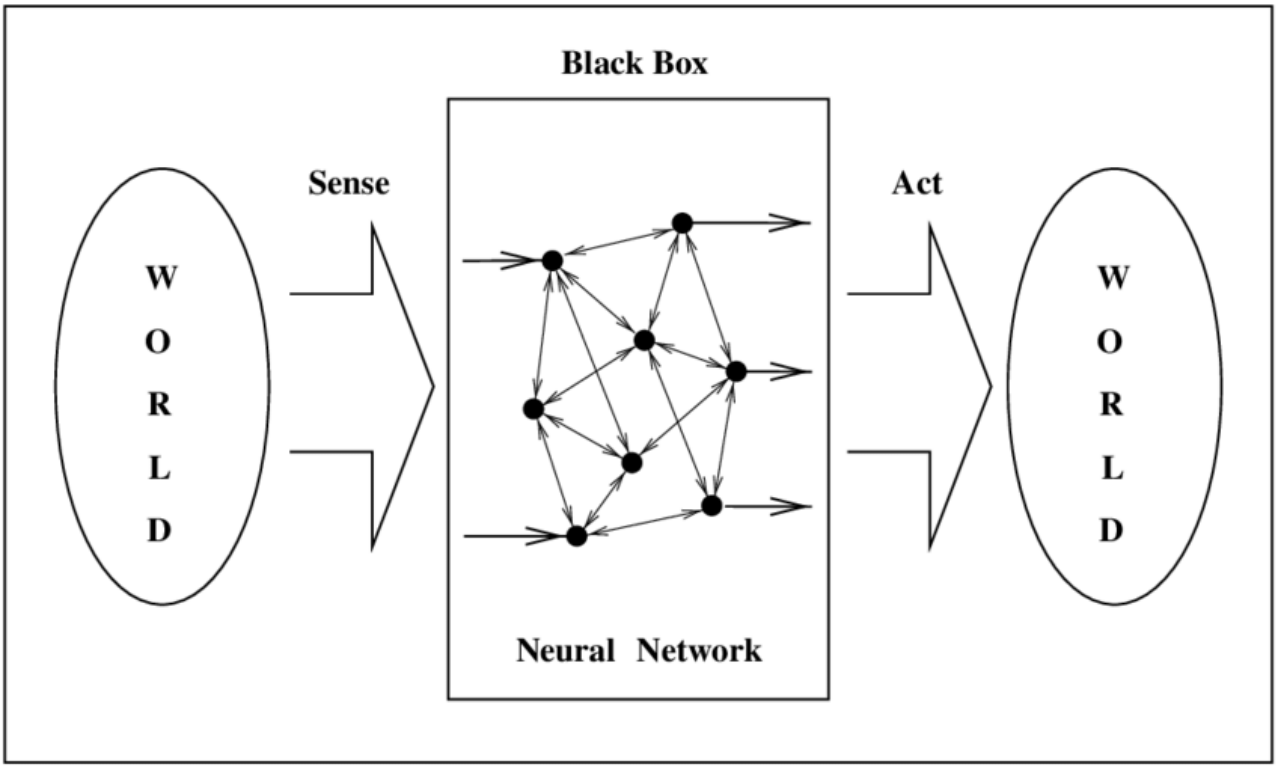
https://youtu.be/UuCTfDvdeoU

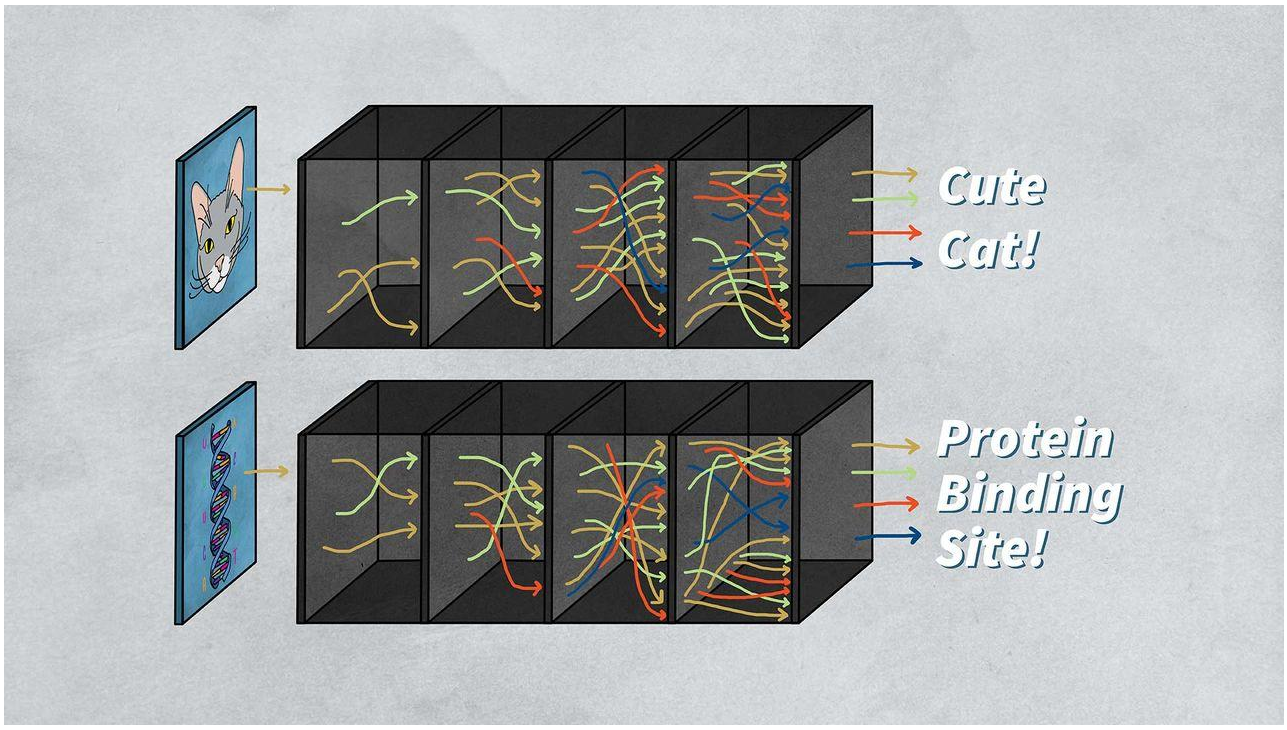


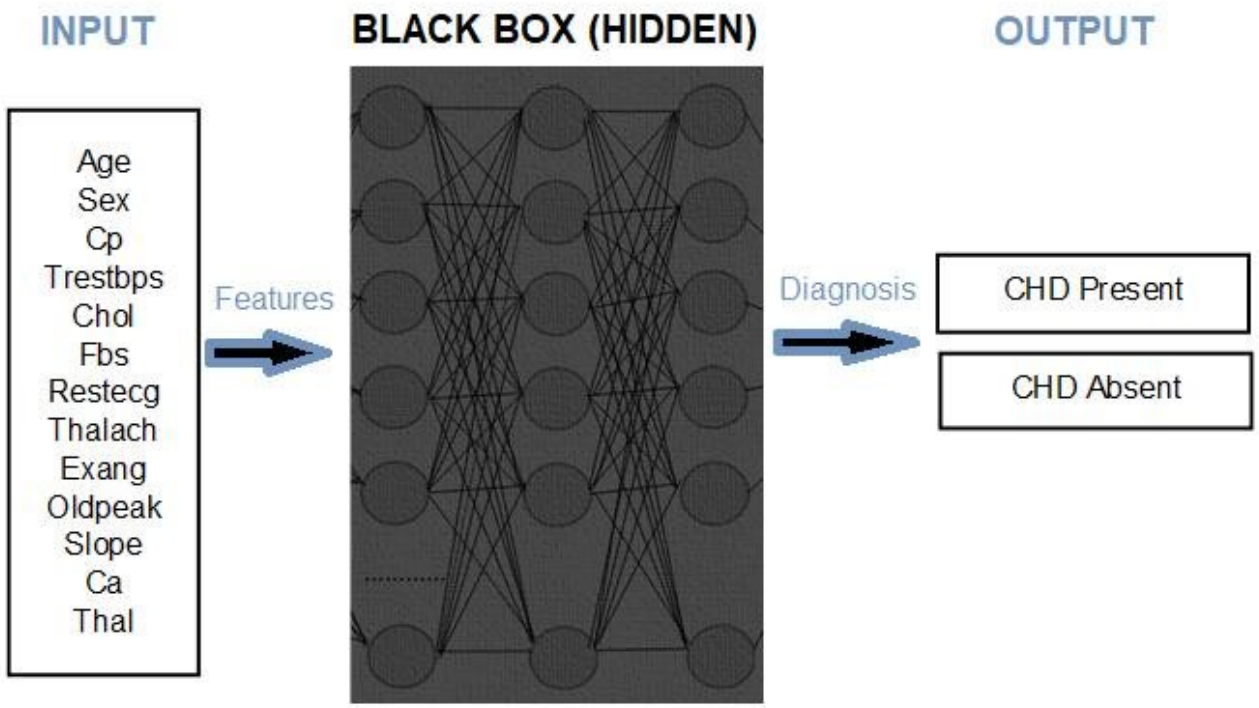

**Biological vs Artificial Neural Networks : A Comparison**

**Neural Networks**

# What is Neural Networks:

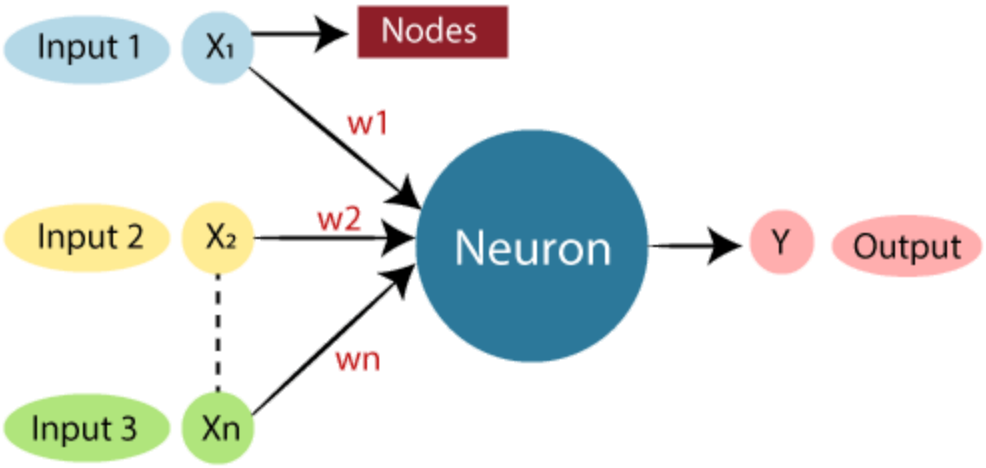



Cute
Cat!
Protein
Binding
Site!


INPUT
BLACK BOX (HIDDEN)
OUTPUT
Age
Sex
Cp
Trestbps
Chol
Fbs
Restecg
Thalach
Exang
Oldpeak
Slope
Ca
Thal
Features
Diagnosis
CHD Present
CHD Absent

# Basic Component of Neural Network:

- **What exist in the black box?**




**Is it that Simple?**

https://youtu.be/Yyx2k4od3qk

https://youtu.be/UiQyMSKez7k

# How Neural Networks work?

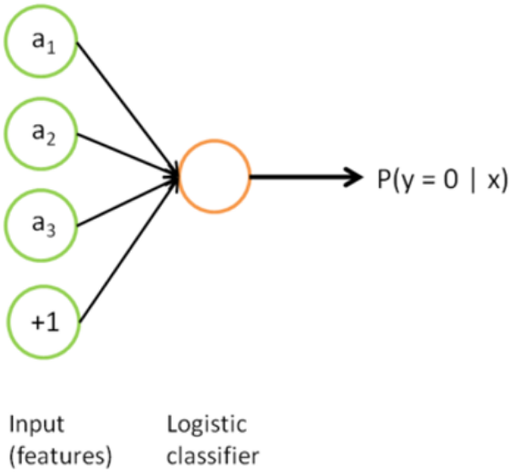
https://youtu.be/vbeanwfm0Q4

How to Get Result from Nodes:

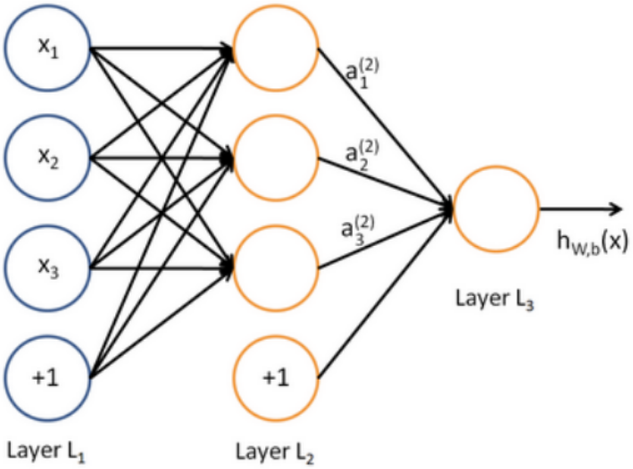
- Regression: https://jalammar.github.io/visual-interactive-guide-basics-neural-networks/
- Classification: https://jalammar.github.io/feedforward-neural-networks-visual-interactive/

## How it differs from logistic regression?

| Neural Network | Logistic Regression |
|---|---|
| It can be applied to both classification and regression problems. | It is appropriate for issues involving binary categorization. |
| Designed after the anatomy of the human brain | The results of linear regression are transformed using a logistic function. |
| It can recognize patterns in data and capture non-linear relationships. | It can only simulate linear decision boundaries. |
| It takes substantially more memory and processing power. | It uses less processing power and memory. |
| Implementation and training might be difficult. | Simple to use and train |
| It can need regularization and be prone to overfitting. | It may not need regularization and is less prone to overfitting. |




**Logistic Regression**




**Neural Network**

https://youtu.be/Ls1dJqZtl7w

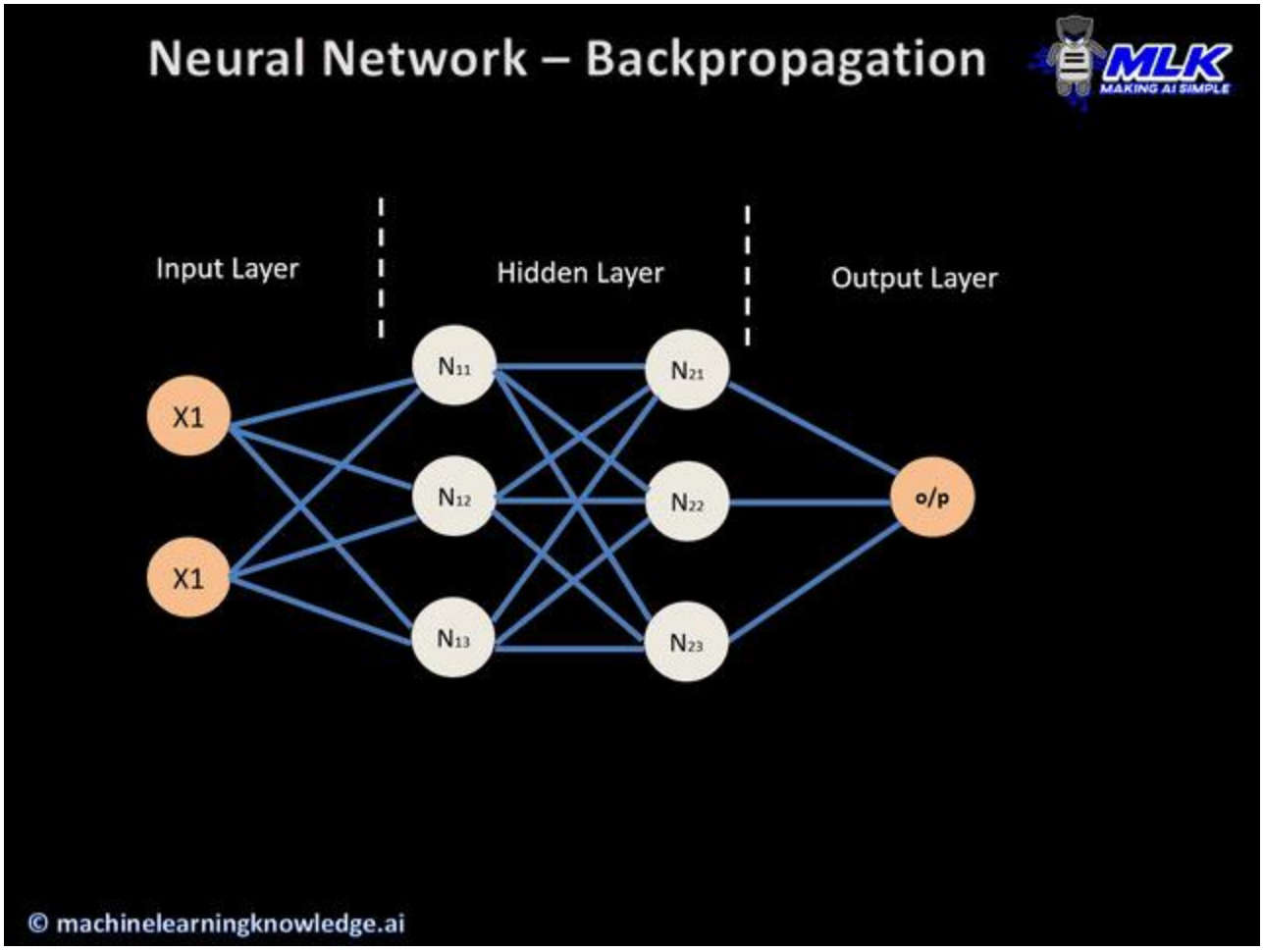
https://youtu.be/RkxThL4V2d4

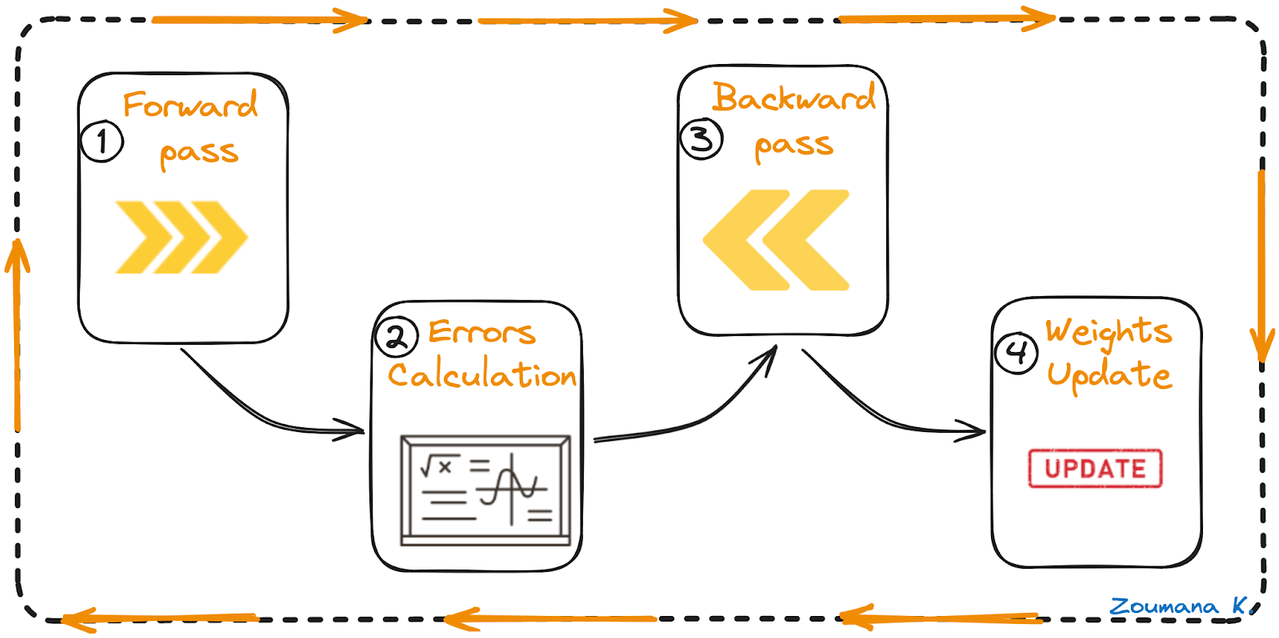
https://youtu.be/SRAFVJ5UbB0

https://youtu.be/rEDzUT3ymw4

## NN Training: Feed-Forward propagate & Backpropagation:

https://youtu.be/sLsCN9ZL9RI






- https://hmkcode.com/ai/backpropagation-step-by-step/
- https://mattmazur.com/2015/03/17/a-step-by-step-backpropagation-example/
- https://medium.com/datathings/neural-networks-and-backpropagation-explained-in-a-simple-way-f540a3611f5e
- https://youtu.be/_9qHQA30hys
- https://xnought.github.io/backprop-explainer/
- https://medium.datadriveninvestor.com/artificial-neural-network-nn-explained-in-5-minutes-with-animations-9a80f49ab190
- https://medium.com/datathings/neural-networks-and-backpropagation-explained-in-a-simple-way-f540a3611f5e
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- https://hmkcode.com/ai/backpropagation-step-by-step/
- https://www.youtube.com/watch?v=S5AGN9XfPK4
- https://www.youtube.com/watch?v=gyW5gQnsm3w
- https://www.datacamp.com/tutorial/mastering-backpropagation
- https://xnought.github.io/backprop-explainer/

## Demo:

- Tensorflow demo

https://youtu.be/Tsvxx-GGITg

## Neural Network Architectures

- It depends on input type, output type , problem type

https://www.v7labs.com/blog/neural-network-architectures-guide#:~:text=model%20was%20built.-,Standard%20Neural%20Networks,-The%20Perceptron


The Essential Guide to Neural Network Architectures • www.v7labs.com

- Most interesting one is Transformers

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# Resources:

- https://medium.com/@esraa.sabry.mohamed
- https://www.bouvet.no/bouvet-deler/explaining-recurrent-neural-networks
- https://medium.com/swlh/a-gentle-introduction-to-backpropagation-and-implementing-neural-network-animation-f6b6da9d46d5
- https://www.youtube.com/watch?v=Ilg3gGewQ5U
- https://www.analyticsvidhya.com/blog/2021/05/beginners-guide-to-artificial-neural-network/
- https://youtu.be/jmmW0F0biz0?feature=shared
- https://youtu.be/bfmFfD2RIcg?feature=shared
- https://towardsdatascience.com/nothing-but-numpy-understanding-creating-binary-classification-neural-networks-with-e746423c8d5c
- https://youtu.be/CqOfi41LfDw?feature=shared