

“Please can you give an  
Introduction to Artificial  
Intelligence or maybe  
just Neural Nets?”

- STANISLAW  
BIBER (2022)

“YES” - BY WILL LEENEY

## #1 HOW DO NEURAL NETWORKS WORK?

How do they pass information? How do they change? What sort of flavours do they come in?



what am I going to learn about?

## #5 HOW CAN I FIND OUT MORE?

Where can I find more information?  
Has someone done this before? Where should I start looking?



## #2 HOW I TRAIN A NEURAL NETWORK?

What am I trying to achieve? What steps should I undertake?



## #4 WHY SHOULD I CARE ABOUT AI?

What is AI being used for? What should it be used for?



## #3 HOW DO I MAKE IT BETTER?

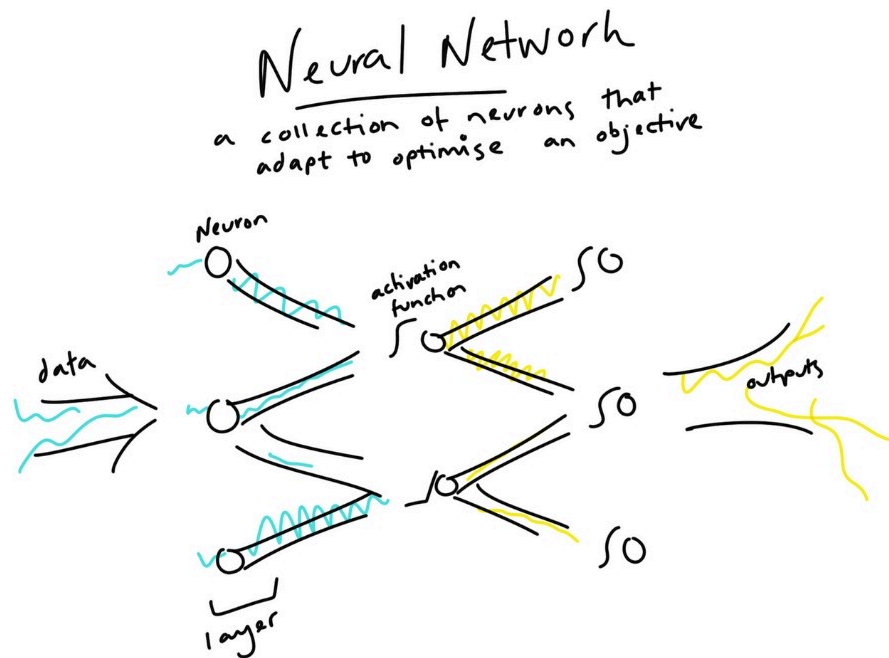
What am I looking at? What is wrong with my model?



# What is a Neural Network?

How does information flow through the network?

What really makes up a neural network?



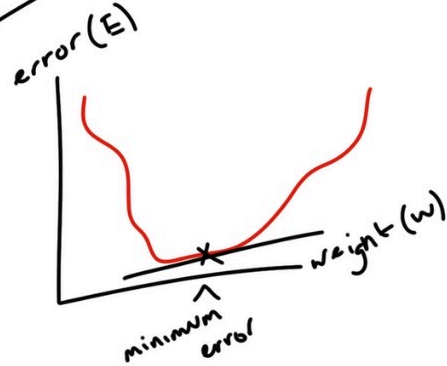
# How does a Neural Network change?

How does the network learn?

How is the change calculated?

What does the network optimise towards?

Error function: to calculate the difference between data (x) & outputs to indicate distance to desired output



Backpropagation: changing weights to minimise error over time

$$w_{ij} \leftarrow w_{ij} - \eta \frac{\partial E(x, w)}{\partial w_{ij}}$$

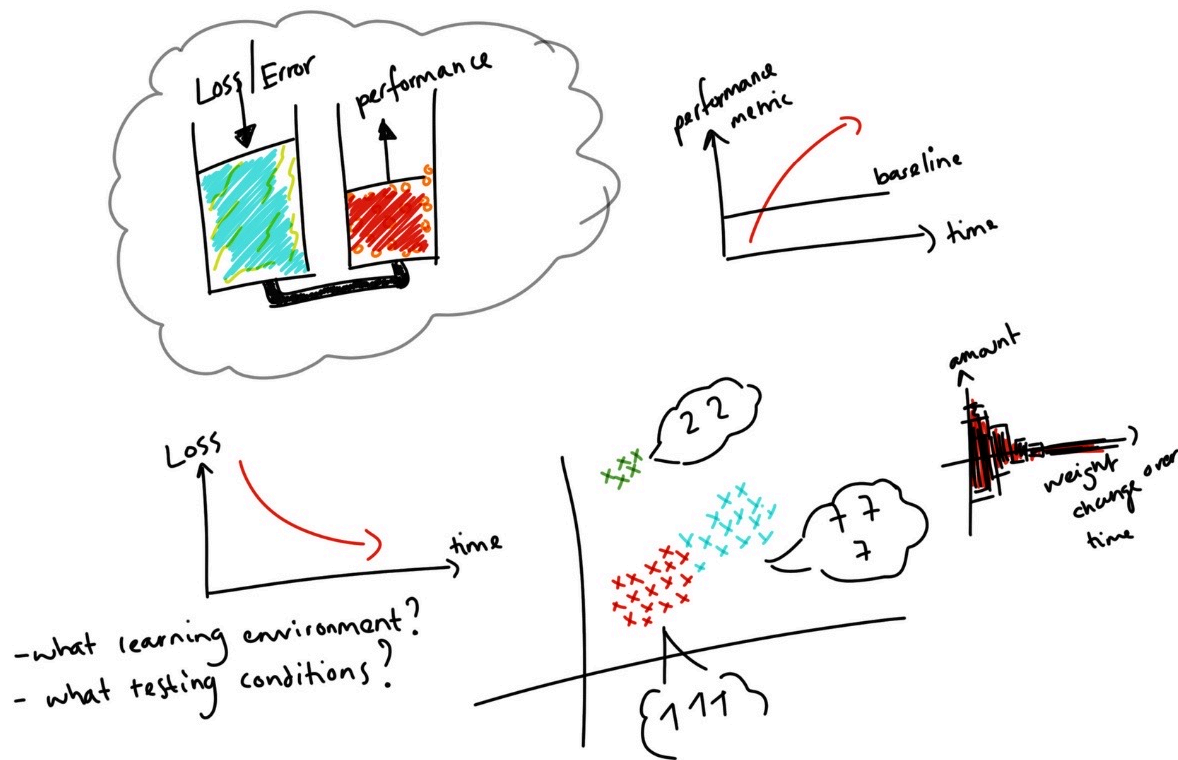
+ chain rule to propagate errors back across network

$$\frac{\partial E(x, w)}{\partial w_{ij}} = \frac{\partial E(x, w)}{\partial w_{i+1, j}} \times \frac{\partial w_{i+1, j}}{\partial w_{ij}}$$

# How do I observe this change?

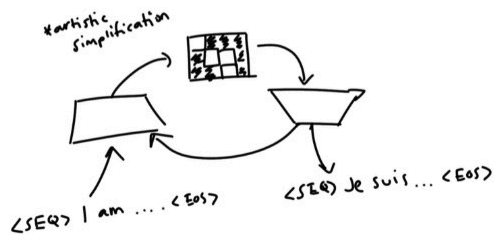
How do I know it's working?

What exactly is going on?



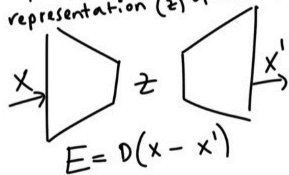
## transformers

neural architecture using attention  
to create learnable dependencies

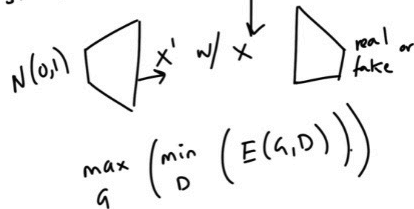


## AutoEncoder

finds a lower dimensional  
representation ( $z$ ) of data ( $x$ )

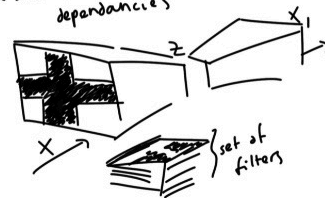


Generative Adversarial Network  
learns to generate new data w/ same  
statistics as old data



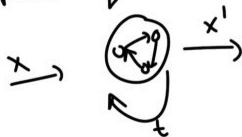
## Convolutions

a set of filters to learn spatial  
dependencies

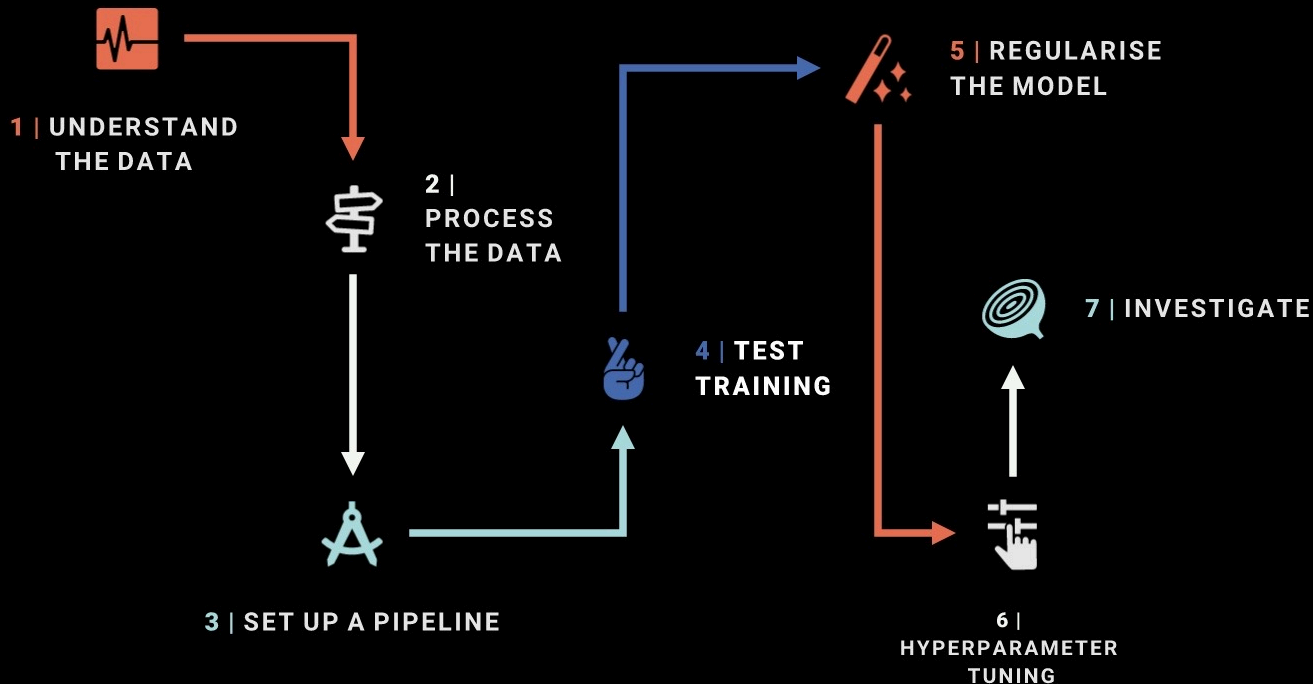


What  
types of  
architecture  
can I choose  
from?

Recurrent Neural Network  
a network that can process a  
temporal sequence



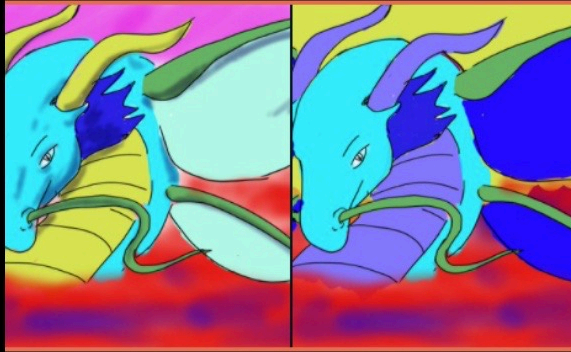
# How do I go about training a model?



# What are some applications of AI being used by humans?

How might AI aid us in the future?

What sort of examples can you give that are used right now?



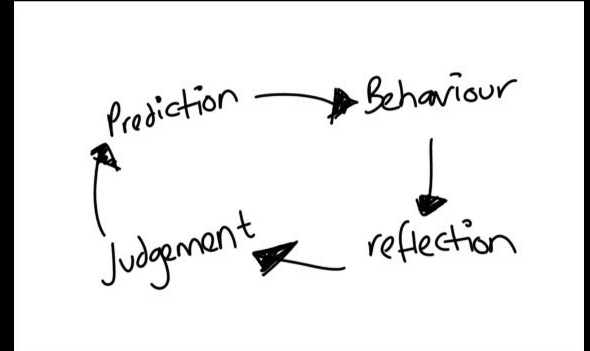
## SIMPLISTIC DRAWING TO...

Simplistic drawing concepts to actual graphics



## GENERATIVE ART

<https://twitter.com/emporiumloris/status/1524909939608649735?s=21>



## TO ... PREDICTIVE ENFORCING

Identify habits, personalities, behaviours, likes, pressure points to sell your data, to influence you, continue your addiction circles



# Research

How do I find more research? Are they implementations already written? Where can I learn more theory? How can I manage to keep up to date? Are there places I can learn to implement my own ideas? What are other people doing?



## #1 GOOGLE IT

- [scholar.google.com](https://scholar.google.com)
- [connectedpapers.com](https://connectedpapers.com)



## #2 IMPLEMENTATIONS

- [paperswithcode.com](https://paperswithcode.com) - hopefully intuitive
- [nn.labml.ai](https://nn.labml.ai) - pytorch implementations alongside markdown math



## #3 TRAINING COURSES

- [atcold.github.io/didactics.html](https://atcold.github.io/didactics.html)
- [www.youtube.com/c/MichaelBronsteinGDL](https://www.youtube.com/c/MichaelBronsteinGDL)



## #4 TUTORIALS

- [pytorch.org/tutorials/index.html](https://pytorch.org/tutorials/index.html)
- [pytorch-lightning.readthedocs.io](https://pytorch-lightning.readthedocs.io)



## #5 NEWSLETTERS

- [thegradient.pub](https://thegradient.pub) - ethics, policy, vision, language, trends and perspectives
- [twitter](https://twitter.com)



## #6 HELPFUL WEBPAGES

- [towardsdatascience.com](https://towardsdatascience.com) - learning
- [huggingface.co](https://huggingface.co) - building and using
- [kaggle.com](https://kaggle.com) - datasets, competitions and code

# Finishing Touches

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TRAINING SCHEMES

TYPES OF TASKS

EXPANSIVE  
ARCHITECTURE

MY RESEARCH

DIFFUSION  
MODELS