

Why would you choose PolyChord over Neural Networks?

Neural Networks are very good at solving some problems, and very poor at solving others.

So where are they Good?

- **Audio recognition**
What was that sound?
- **Image recognition**
What is in this internet picture, is it a cat or a dog?
- **Video recognition**
What is in this video, is it a cow?
- **Natural language processing**
What does this string of text mean?

Neural Networks are pretty good at navigating well-defined problems, but where the “features” are not easily distinguishable. i.e. I know I am looking for cats in these pictures, but there’s no specific combinations of pixels that define “a cat”.

Do you need an Optimiser, or a Neural Network?

An optimiser - I'm running a complex industrial process and I want to balance the materials usage, time required, monetary costs and energy efficiency in a production line. Changing any of these variables will affect the others. With an infinite amount of time, you could figure out the best use of all four by hand, but our optimiser can find **all the good solutions reliably** (a combination of cheapest, quickest, most efficient and least materials used). A neural network can't do this,

Neural Networks - A person watched a movie on Netflix, what should Netflix recommend they watch next? There are millions of movies and human behaviour is too complex to write down as rules that a computer can interpret easily. A neural network is a complex interconnected web which can predict this, but because it's a black box it is **hard for us to know how reliable the answers will be.**

Compared to Neural networks, PolyChord:

Is far less computationally expensive
Neural Networks are large, unwieldy and expensive to train. In contrast, PolyChord maps out the entire parameter space in a single run.

Is easier to interrogate

PolyChord allows you to examine why a particular answer was given, not doable with the black box of neural networks. It also allows you to reexplore a particular area of interest in the parameter space, without having to recalculate your entire solution.

Tells you how reliable your answer is.

With Neural networks, you're never sure how reliable your answer is. PolyChord simultaneously calculates quantifiable reliability with your answers (“we are 91% sure this answer is right”)

PolyChord can help you:



Optimise the placement of sensors, transmitters and receivers in a 5G network.



Optimise complex industrial processes with many interconnected objectives.



Optimise complex design processes.



Balance supply and demand in smart grids.