



# **What is Deep Learning?**



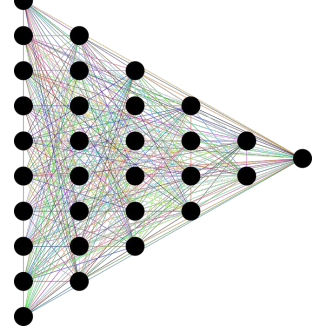
**Artificial intelligence**

A Venn diagram consisting of three nested ellipses. The outermost ellipse is dark brown and contains the text 'Artificial intelligence'. Inside it is a medium brown ellipse containing the text 'Machine learning'. Inside that is a light orange ellipse containing the text 'Deep learning'. This visualizes that Deep learning is a subset of Machine learning, which is a subset of Artificial intelligence.

**Machine learning**

**Deep learning**

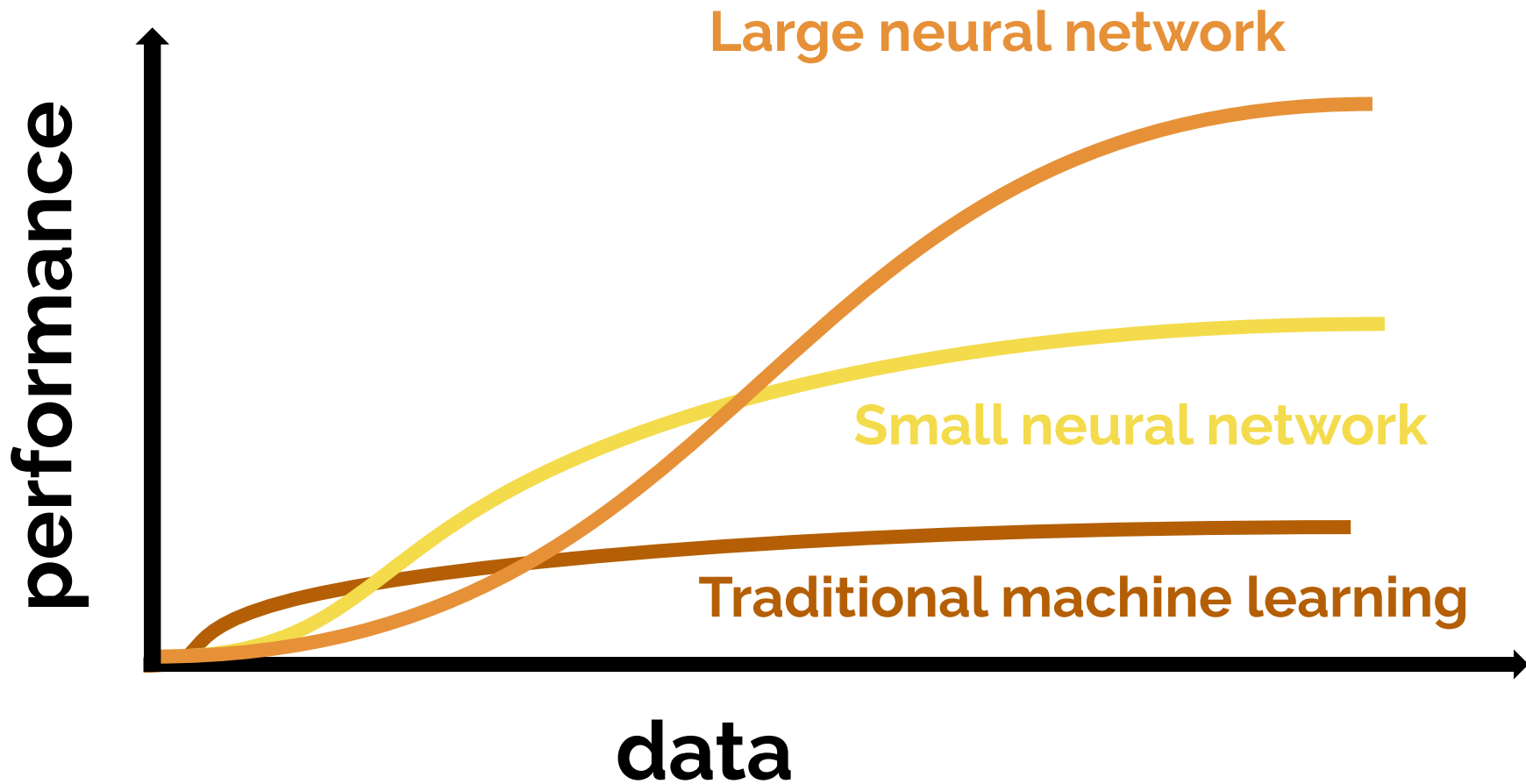
# What is “deep”?



- Circuits are typically organized in many *layers*
  - *Computation paths from inputs to outputs have many steps*

# Rise of deep learning

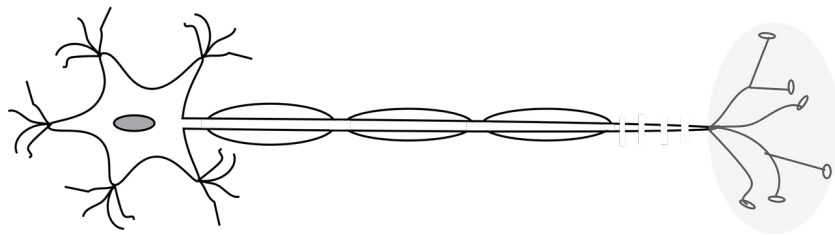
- **Data availability**
- **Compute resources**
- **Algorithmic innovation**



# How do you improve performance?

- Increase training data
- Increase neural network size

# Deep learning structure



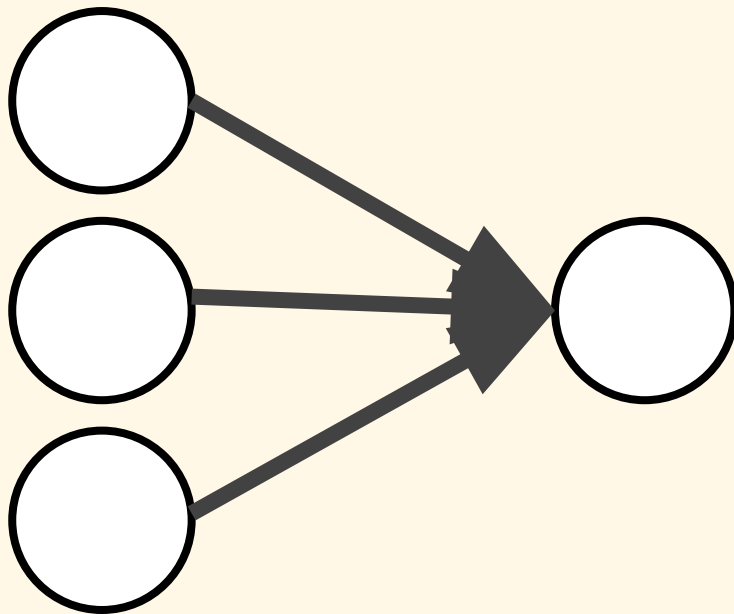
- Multi layered structure called neural networks

# What is the basic idea of deep learning?

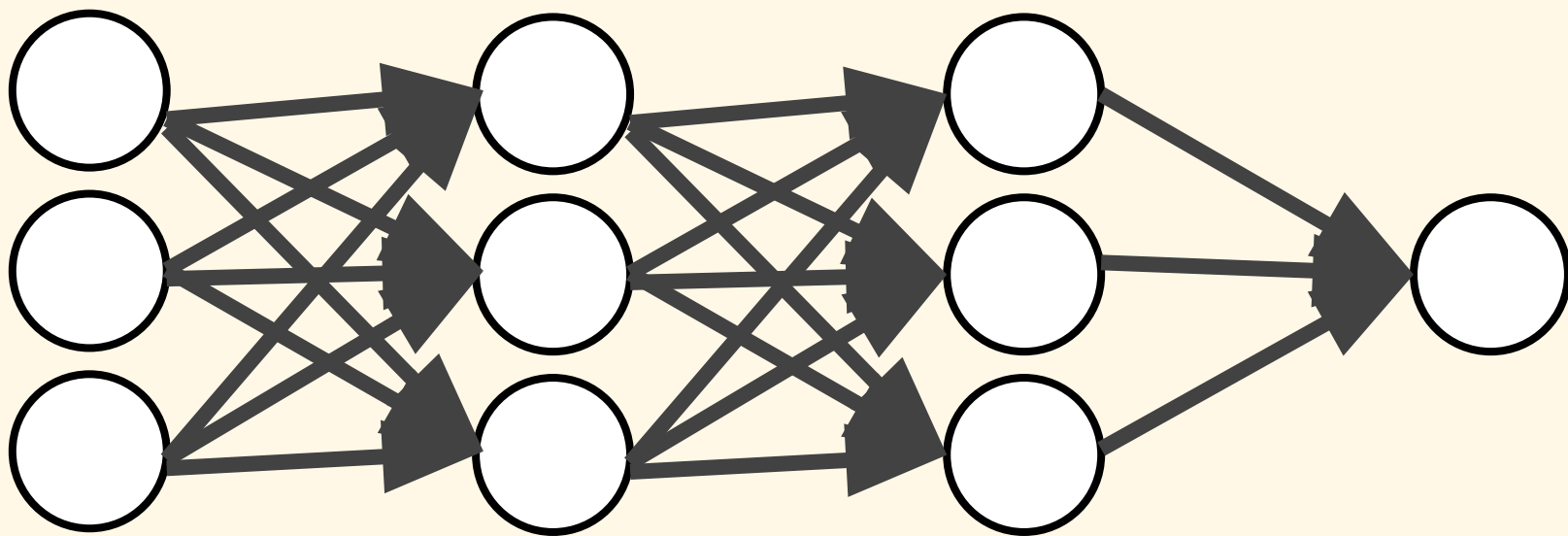


- **Train circuits with long computation paths**
  - Allows all input variables to interact in complex ways
  - Each variable can interact with all others

# Shallow model



# Deep learning model





**Coming up...**

**What is a Neural  
Network?**