



Workshop:  
Applications of  
Machine  
Learning



## **ARTIFICIAL INTELLIGENCE**

A program that can sense, reason,  
act, and adapt

## **MACHINE LEARNING**

Algorithms whose performance improve  
as they are exposed to more data over time

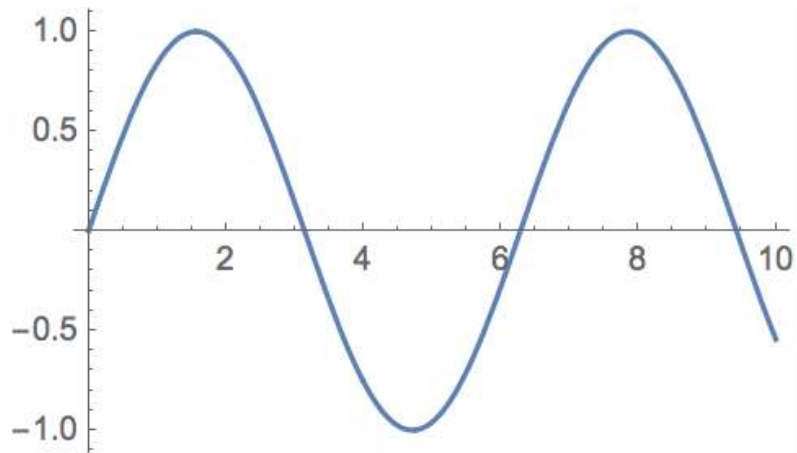
## **DEEP LEARNING**

Subset of machine learning in  
which multilayered neural  
networks learn from  
vast amounts of data



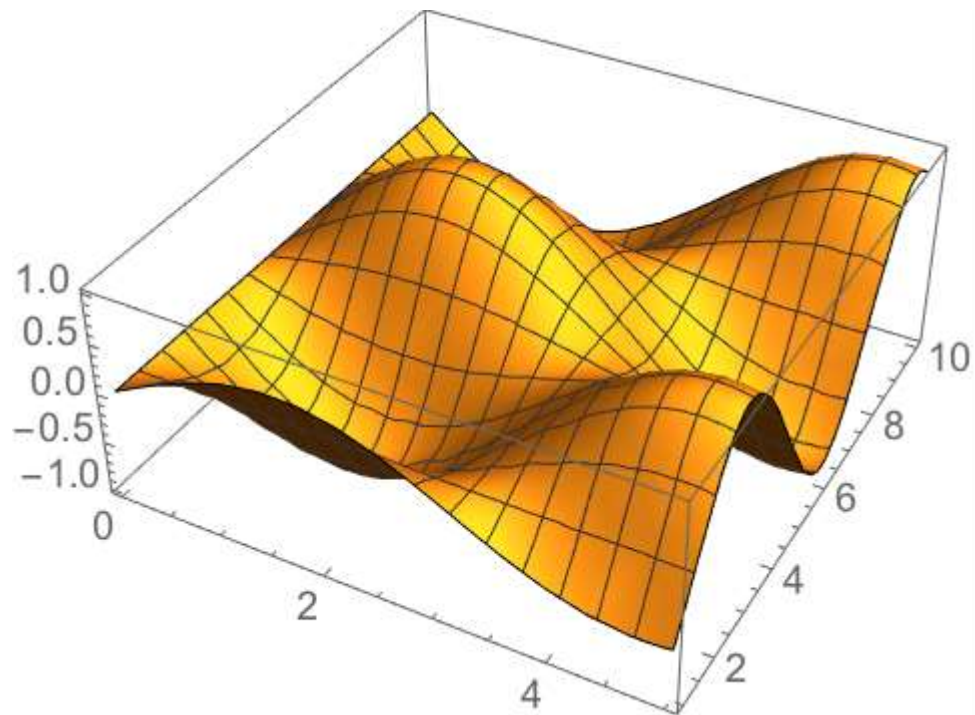
# Neural Nets

- $F(\text{data}) = \text{prediction}$
- In machine learning, the goal is to learn  $F$
- Neural nets serve as a “universal function approximator”

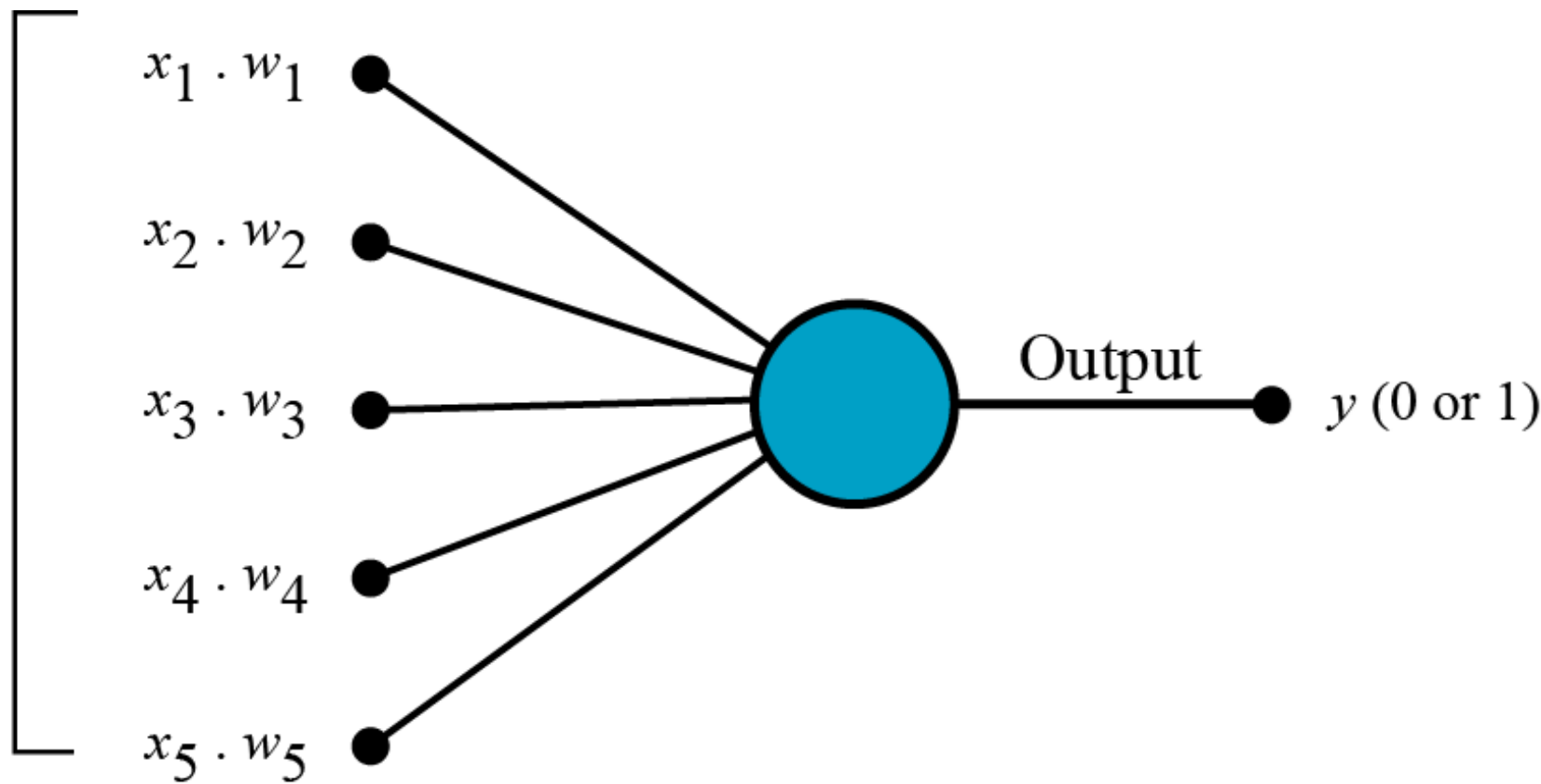


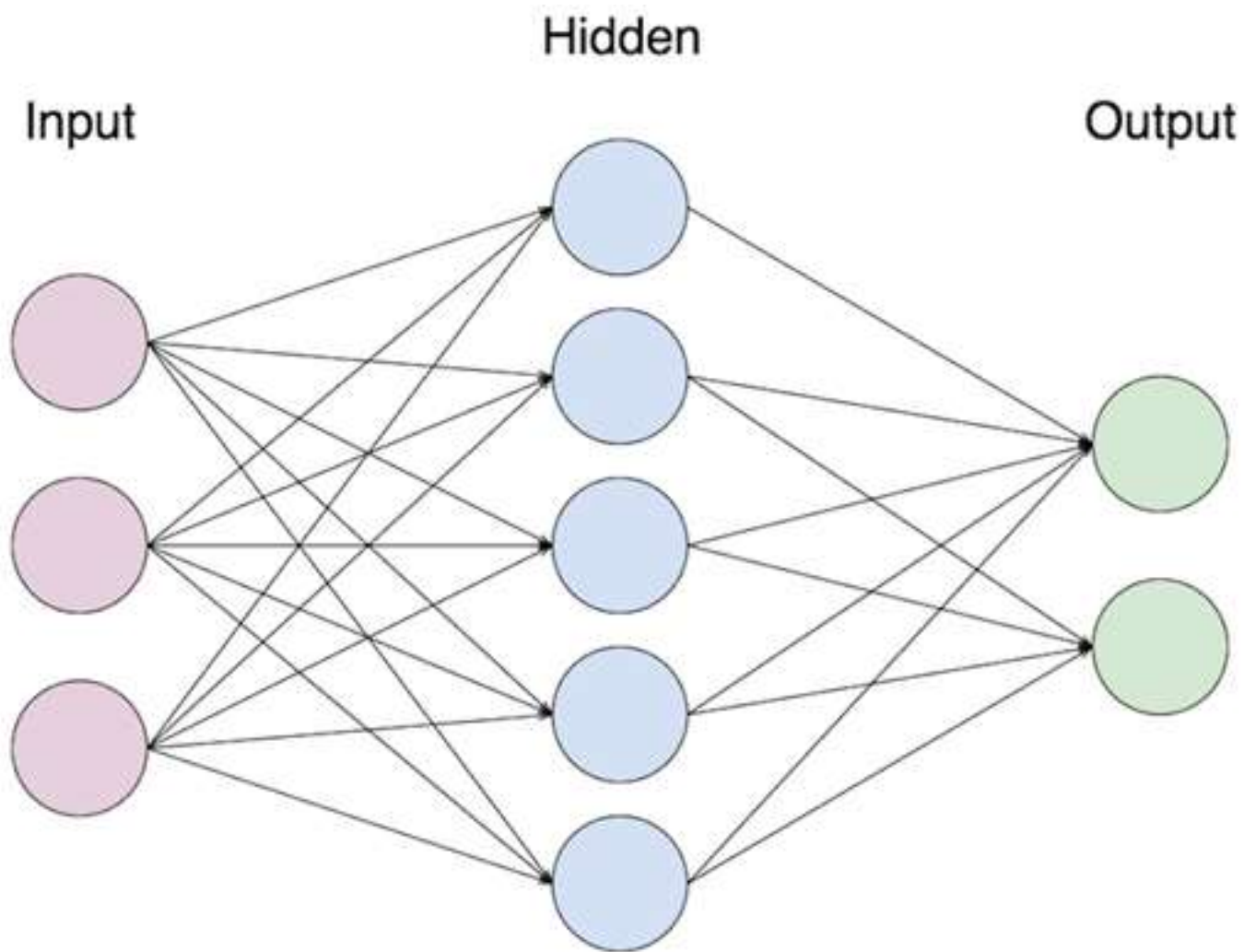
`Plot[Sin[x], {x, 0, 10}]`

`Plot3D[Sin[x] Cos[y], {x, 0, 5}, {y, 1, 10}]`



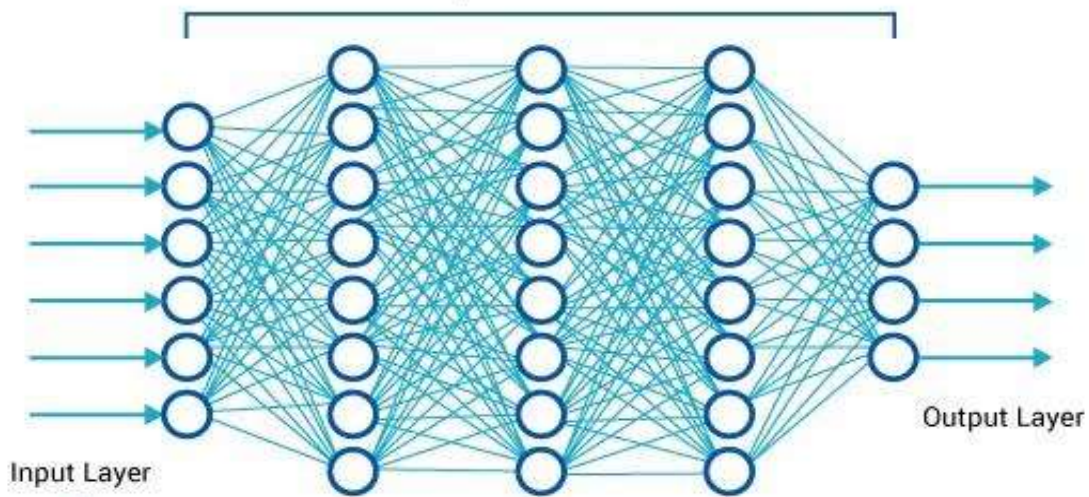
Inputs







# Deep Neural Network



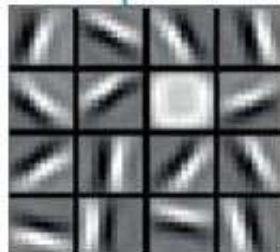
Input Layer

Hidden Layer 1

Hidden Layer 2

Hidden Layer 3

Output Layer



edges



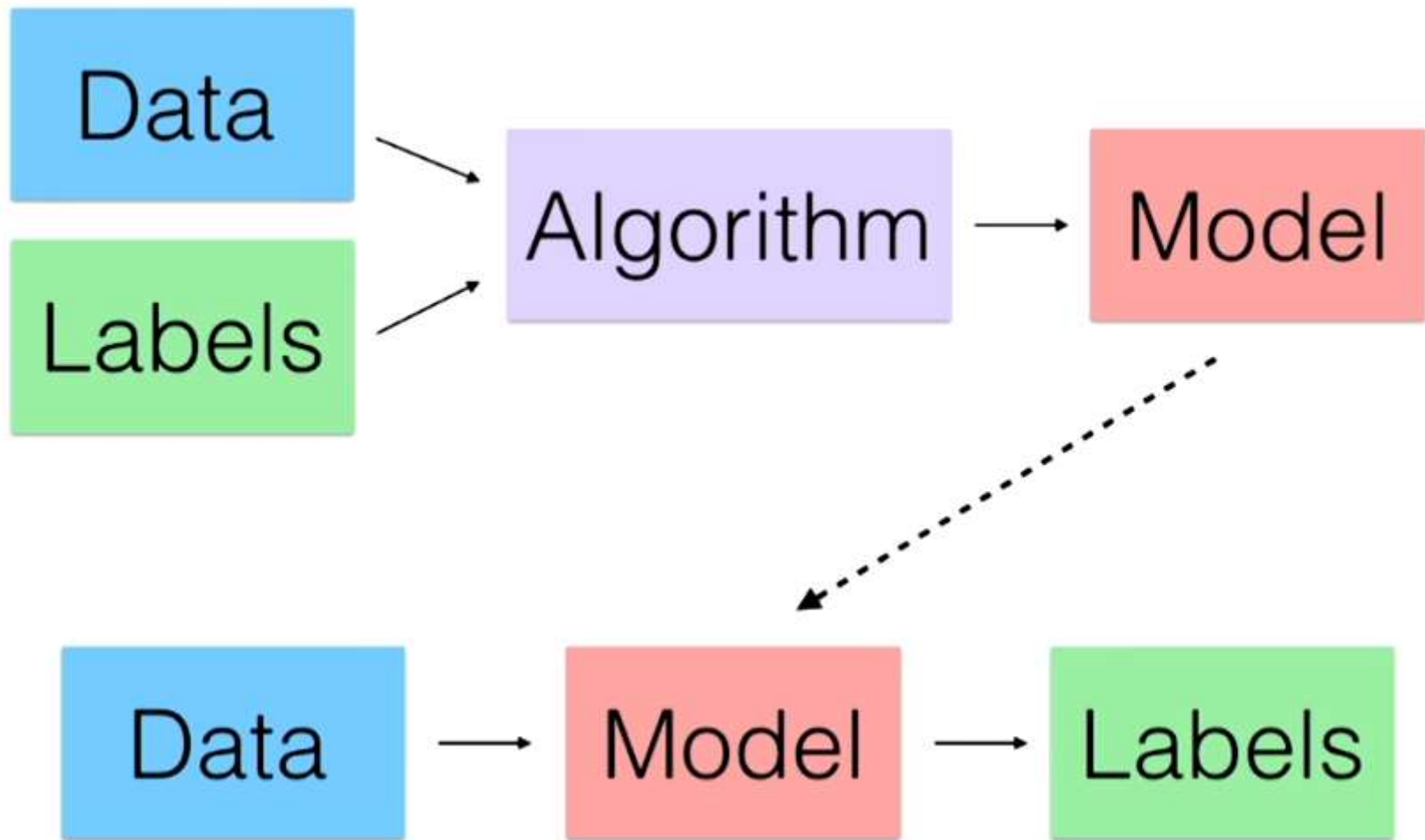
combinations of edges



object models

# Toolbox





# Yeah, But What does it do?

## Demo #1 - Classification

Determine a label or category.

Eg. Predict whether a person's mole is cancerous or not.

# Yeah, But What does it do?

## Demo #2 - Regression

We want to find out a number.

Eg. How many days before a patient discharged from the hospital with a chronic condition such as diabetes will return.

# Yeah, But What does it do?

## Demo #3 - Clustering

Find patterns in unlabelled data.

Eg. People living in a certain area have higher rates of cancer. Is there an issue with the water supply?

# Yeah, But What does it do?

## Demo #4 - Misc

- Genetic Algorithms
  - <https://www.youtube.com/watch?v=FKbarpAlBkw>
- Reinforcement Learning
  - <https://www.youtube.com/watch?v=V1eYnij0Rnk>