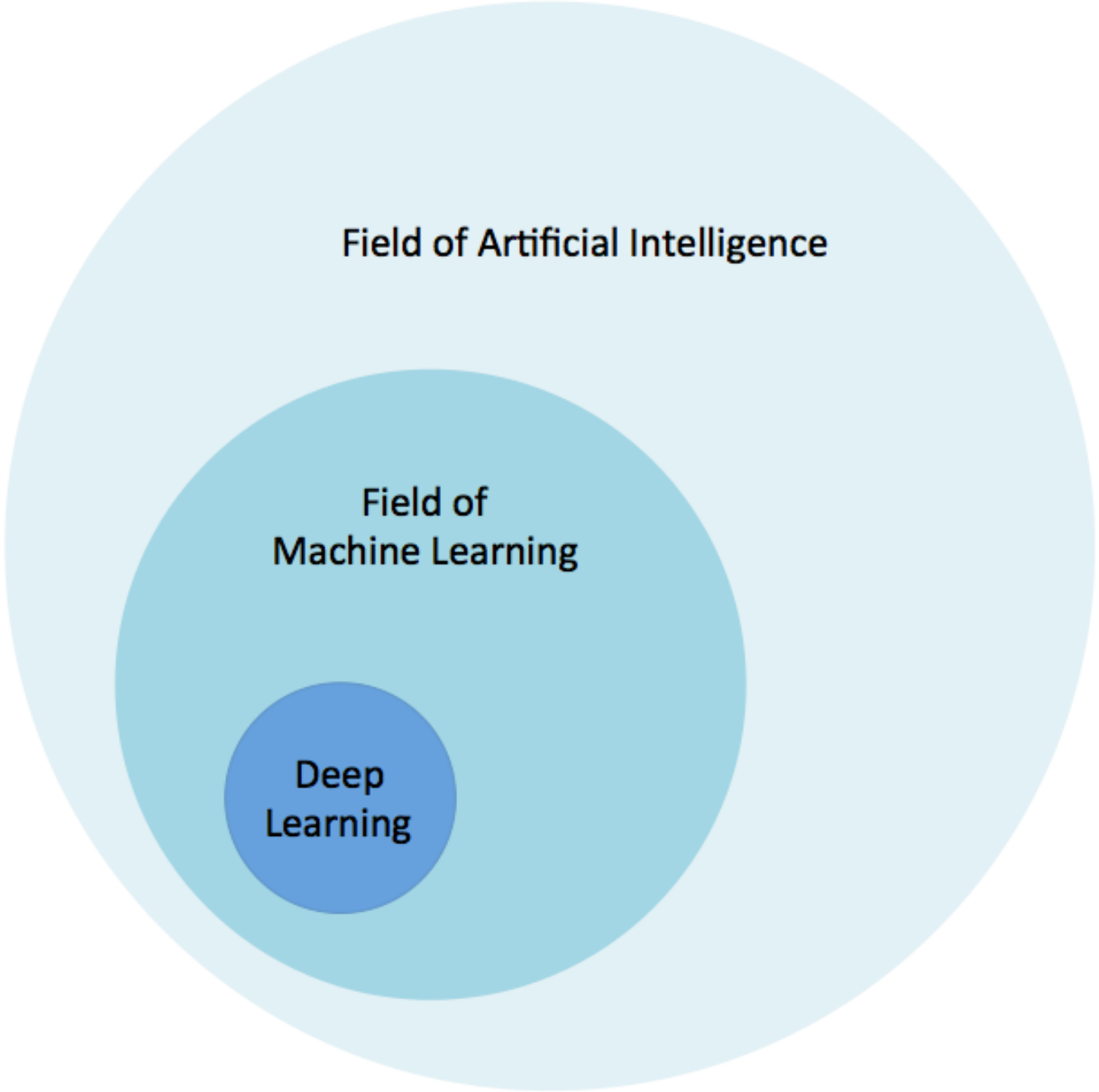
Application of Mathematics in Machine Learning

What is Machine learning



Application OF Machine Learning

- Natural language processing (NLP):: Answering questions; speech recognition; summarizing documents; classifying documents; finding names, dates, etc. in documents; searching for articles mentioning a concept
- Computer vision:: Satellite and drone imagery interpretation (e.g., for disaster resilience); face recognition; image captioning; reading traffic signs; locating pedestrians and vehicles in autonomous vehicles
- Medicine:: Finding anomalies in radiology images, including CT, MRI, and X-ray images; counting features in pathology slides; measuring features in ultrasounds; diagnosing diabetic retinopathy
- Biology:: Folding proteins; classifying proteins; many genomics tasks, such as tumor-normal sequencing and classifying clinically actionable genetic mutations; cell classification; analyzing protein/protein interactions
- Image generation:: Colorizing images; increasing image resolution; removing noise from images; converting images to art in the style of famous artists
- Recommendation systems:: Web search; product recommendations; home page layout
- Playing games:: Chess, Go, most Atari video games, and many real-time strategy games
- Robotics:: Handling objects that are challenging to locate (e.g., transparent, shiny, lacking texture) or hard to pick up
- Other applications:: Financial and logistical forecasting, text to speech, and much more...

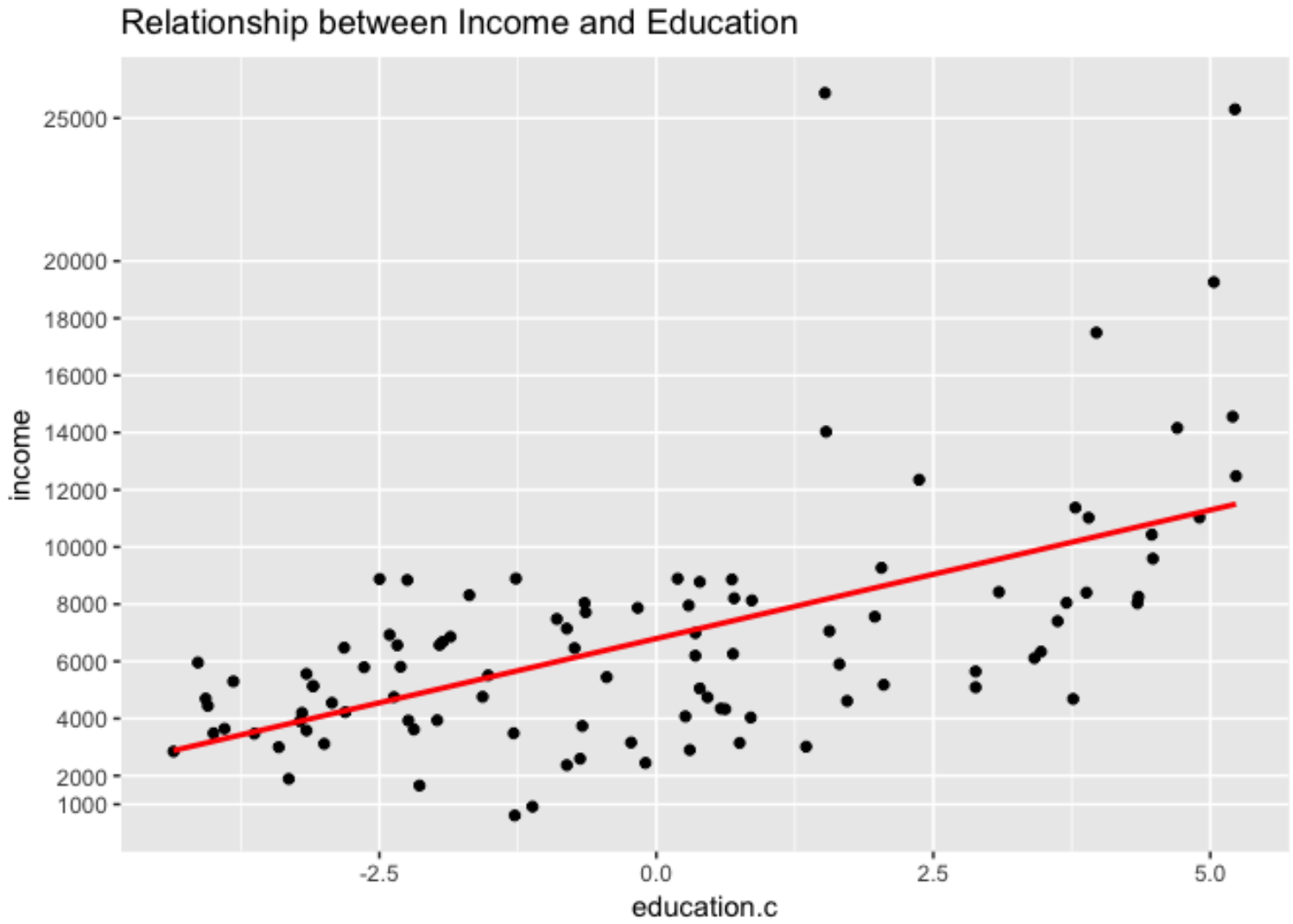
Types Of Machine Learning Problems

- Regression
- Classification
- Deep Learning
  - Computer Vision
  - Natural language Processing (NLP)
  - …
  - …..
  - …

Mathematics In Machine Learning

- Linear Algebra
- Calculus
- Probability and Statistics

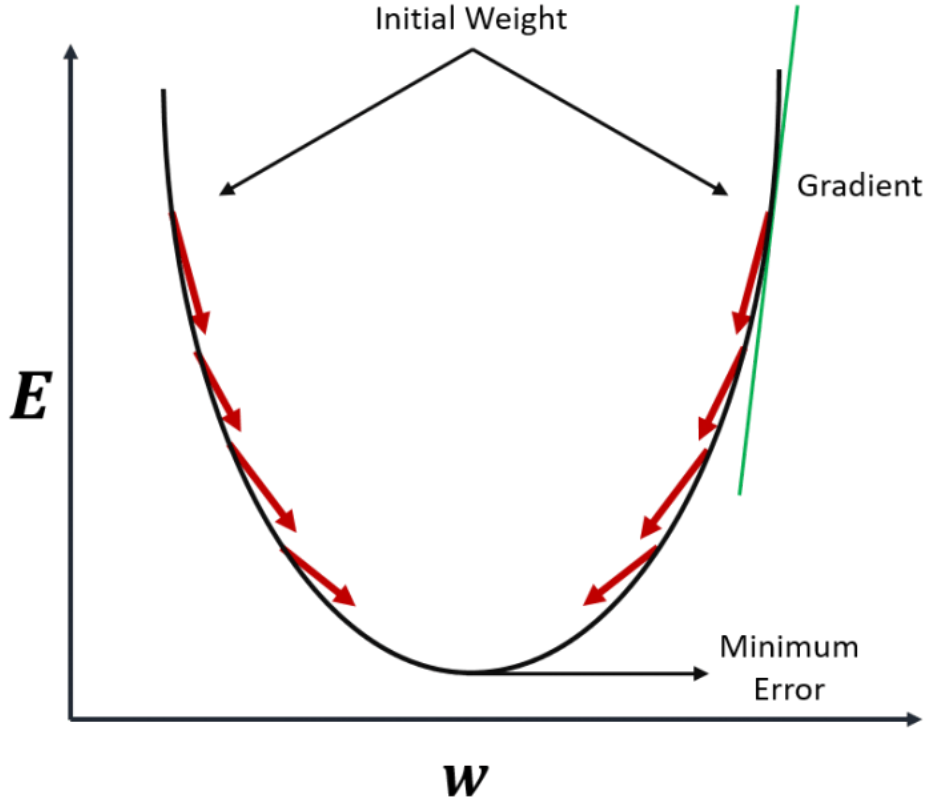
Linear Regression

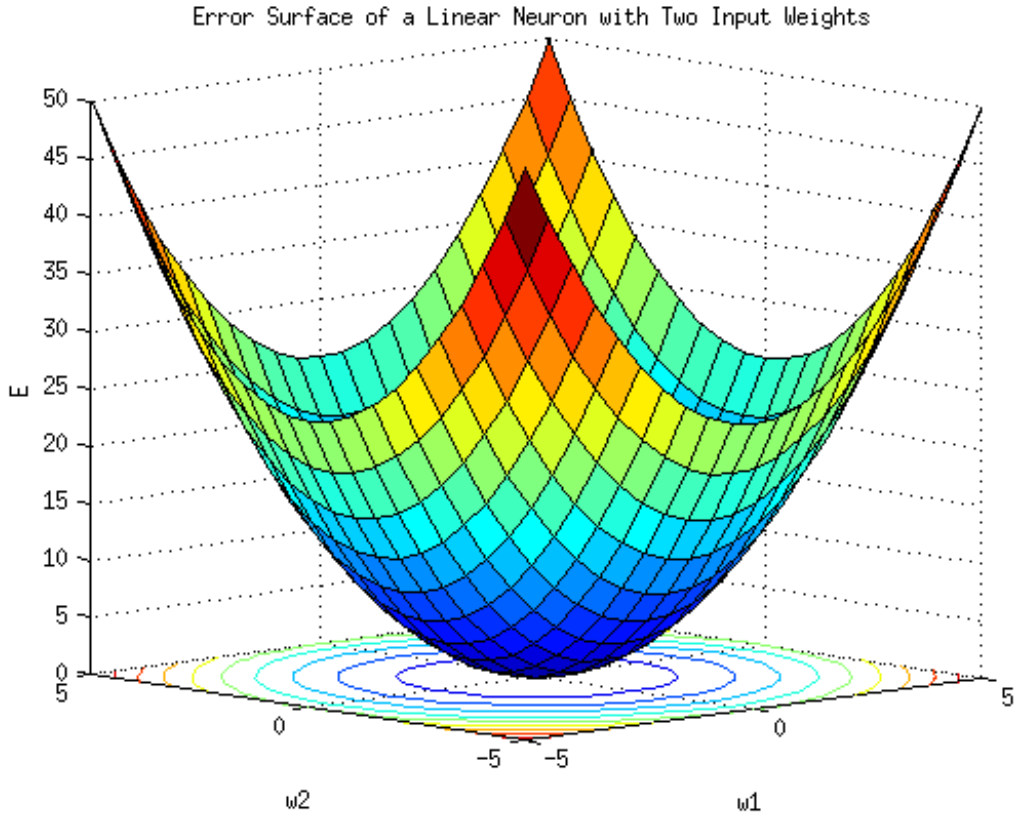


Optimization Of Loss Function

- $c = (y - y')^2$

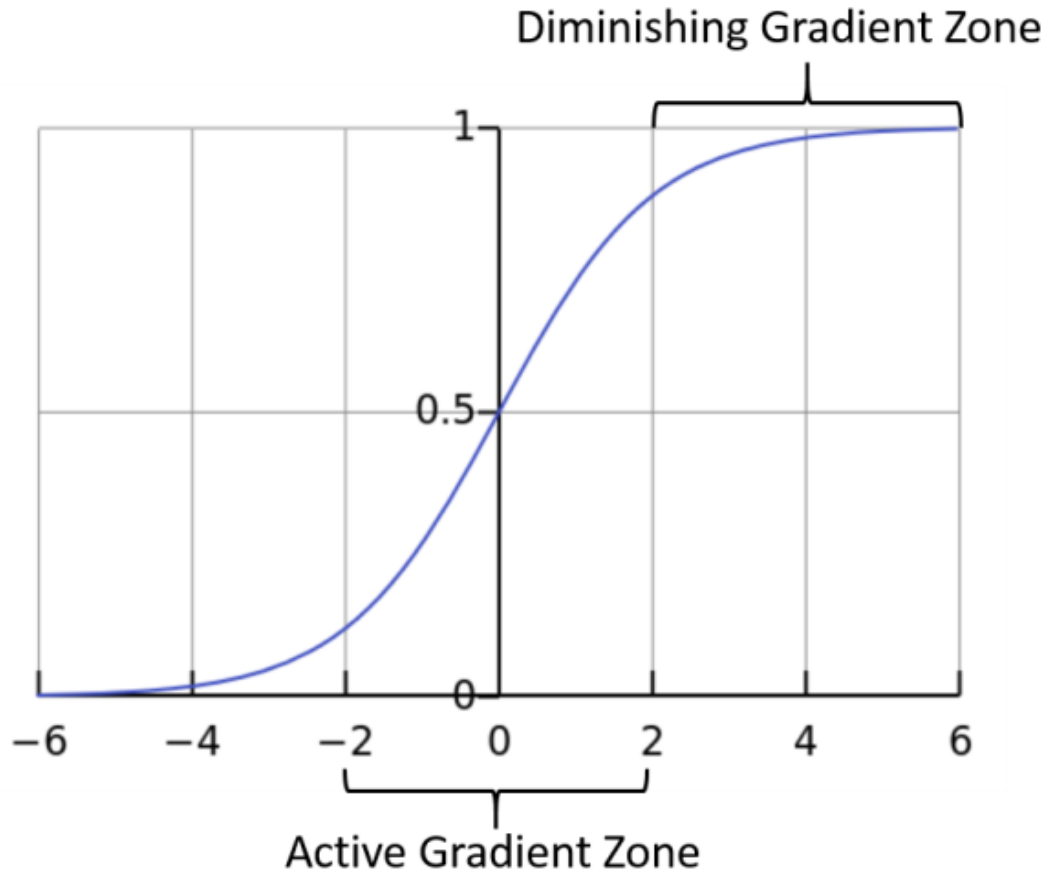
Loss Function



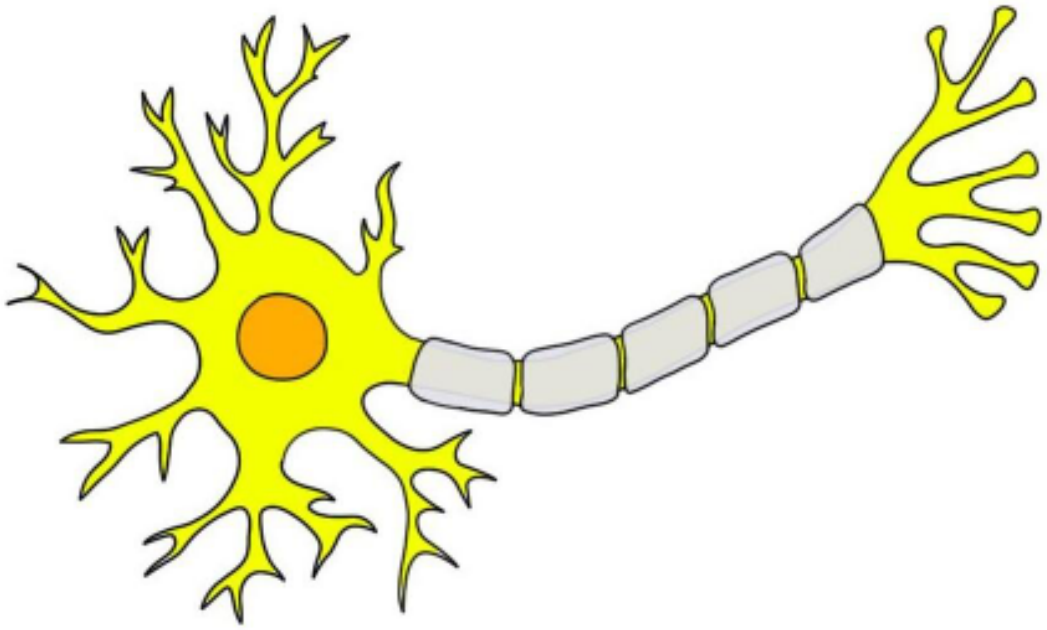


Classification

$$A = \frac{1}{1+e^{-x}}$$



Deep Learning



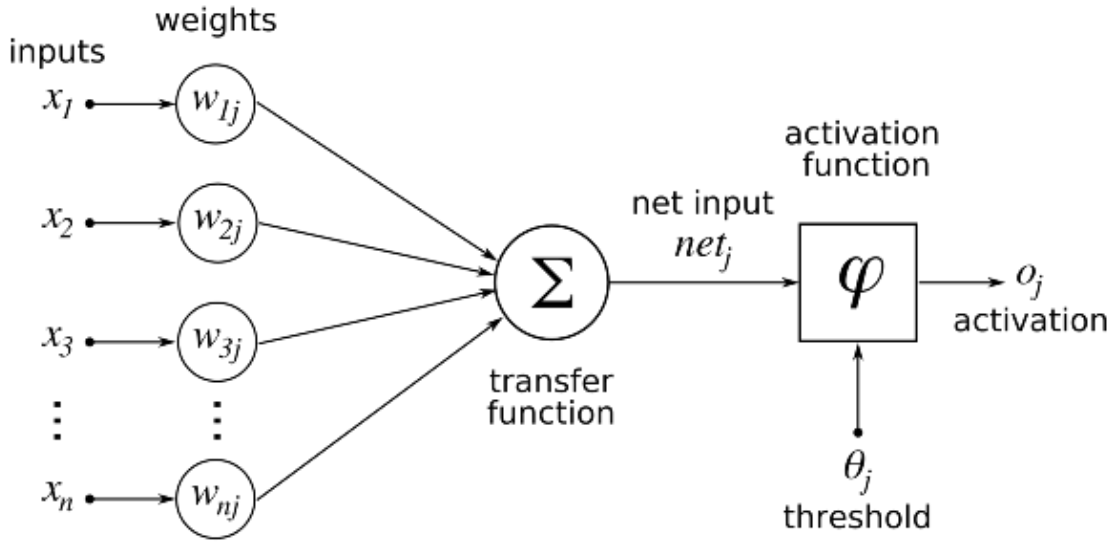
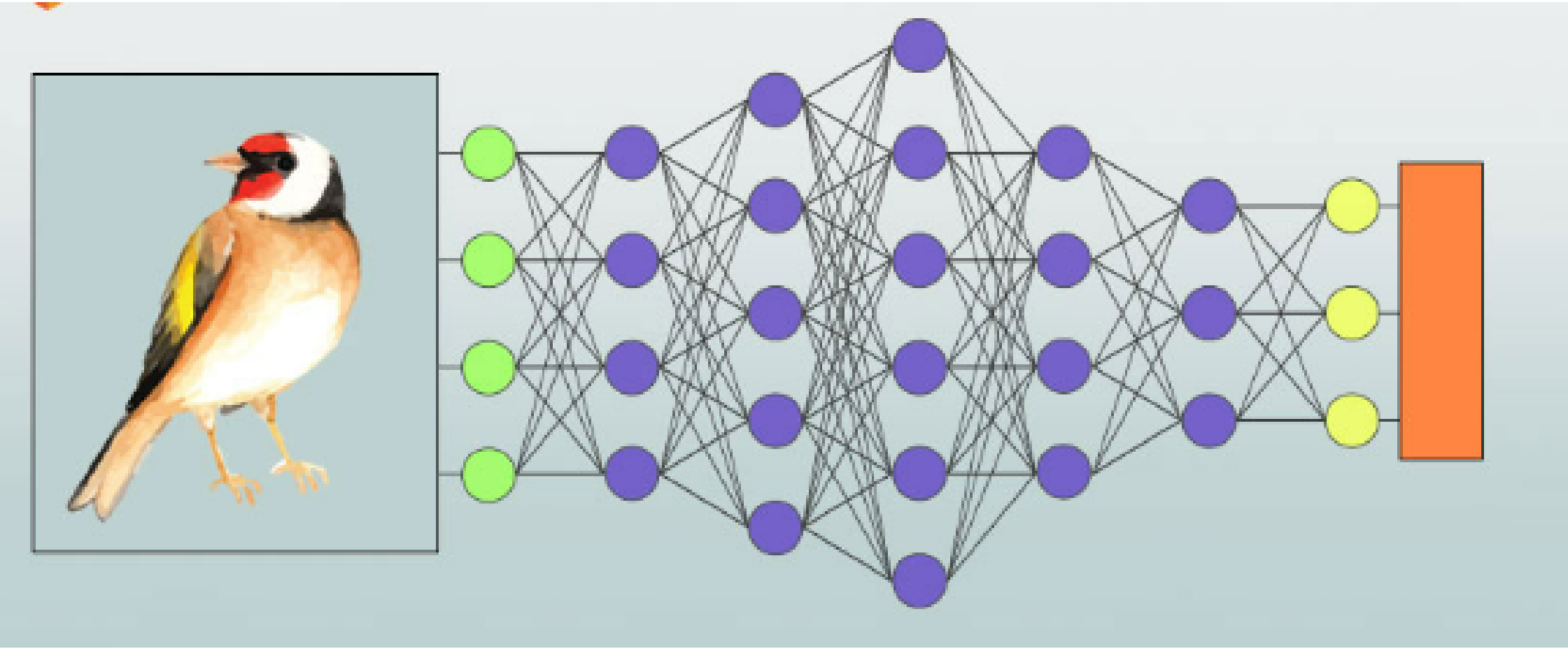
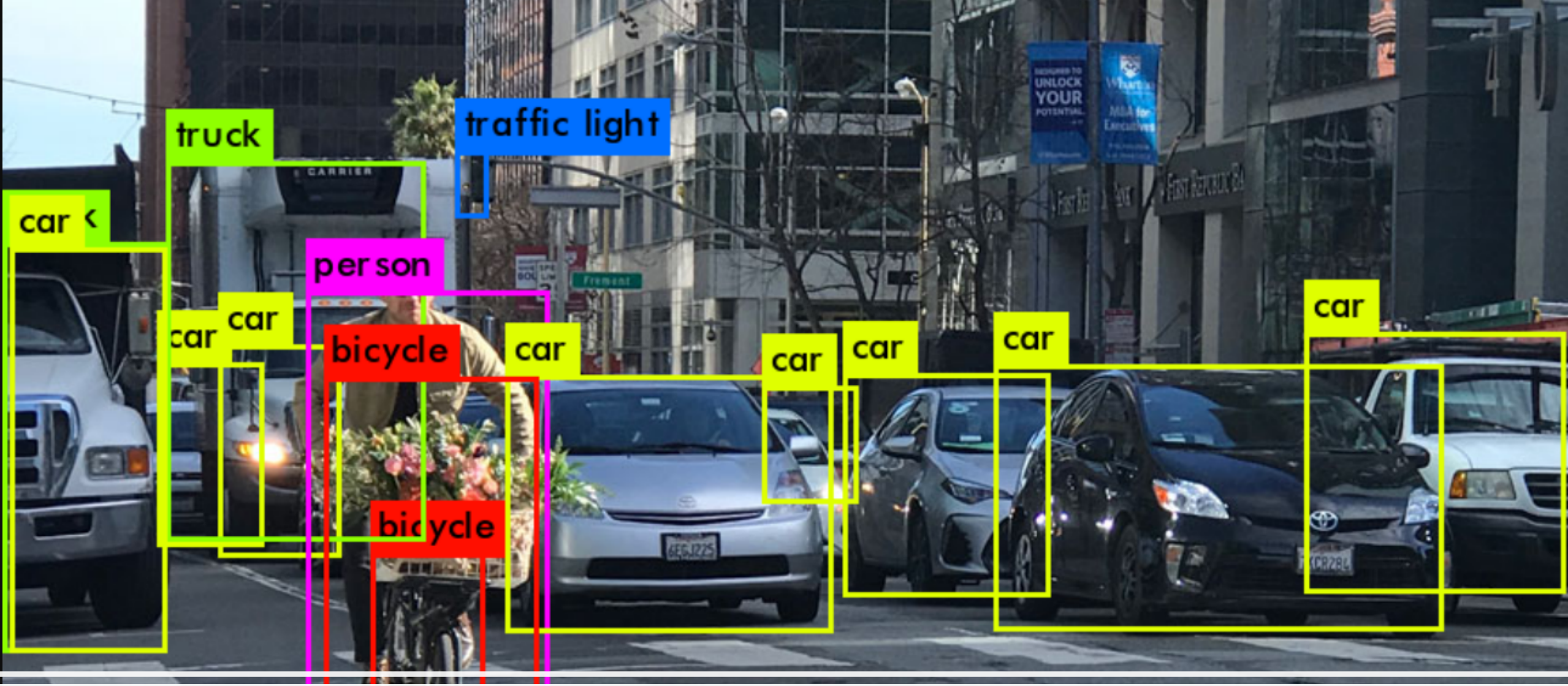


Image Classification

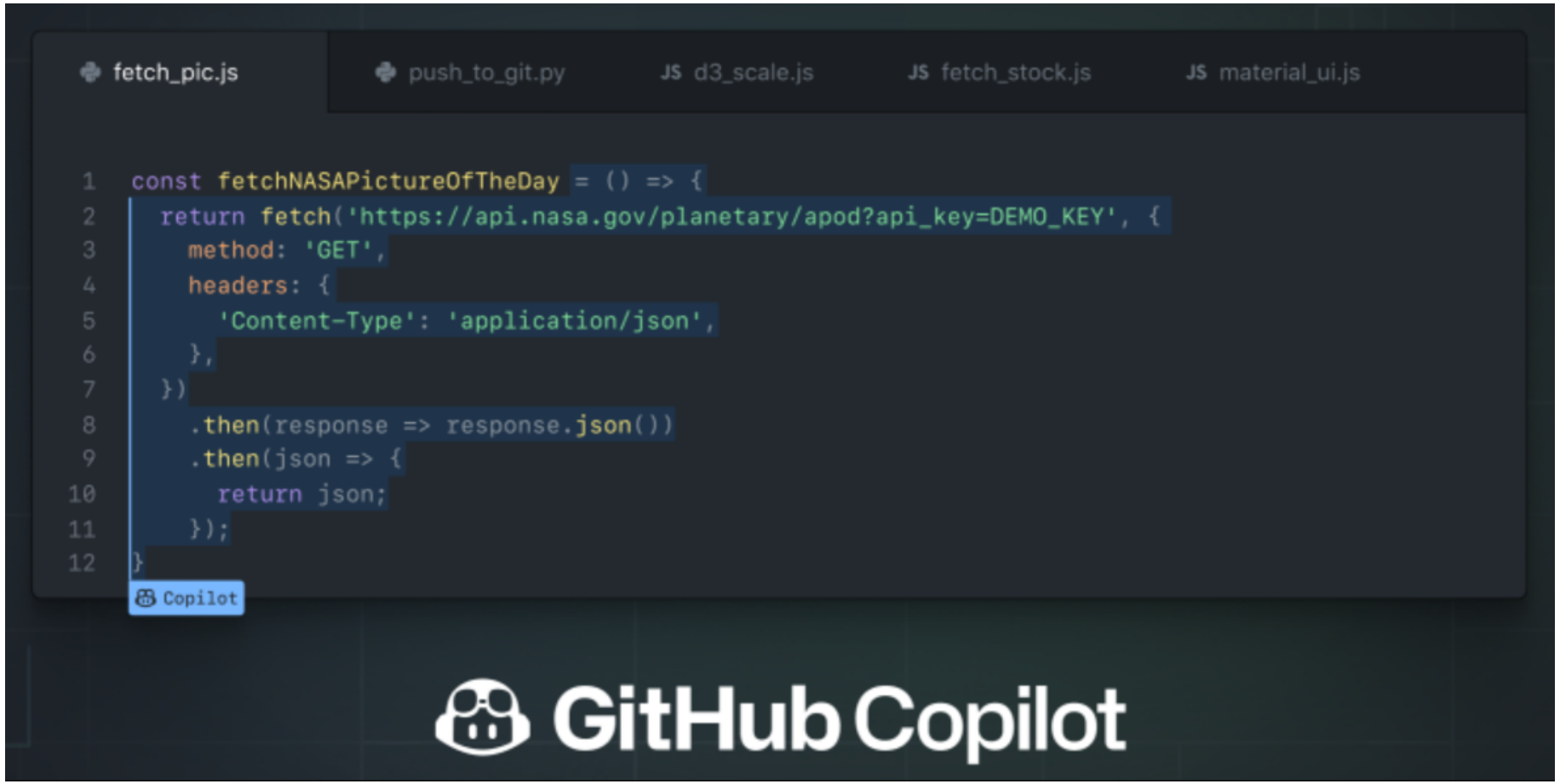




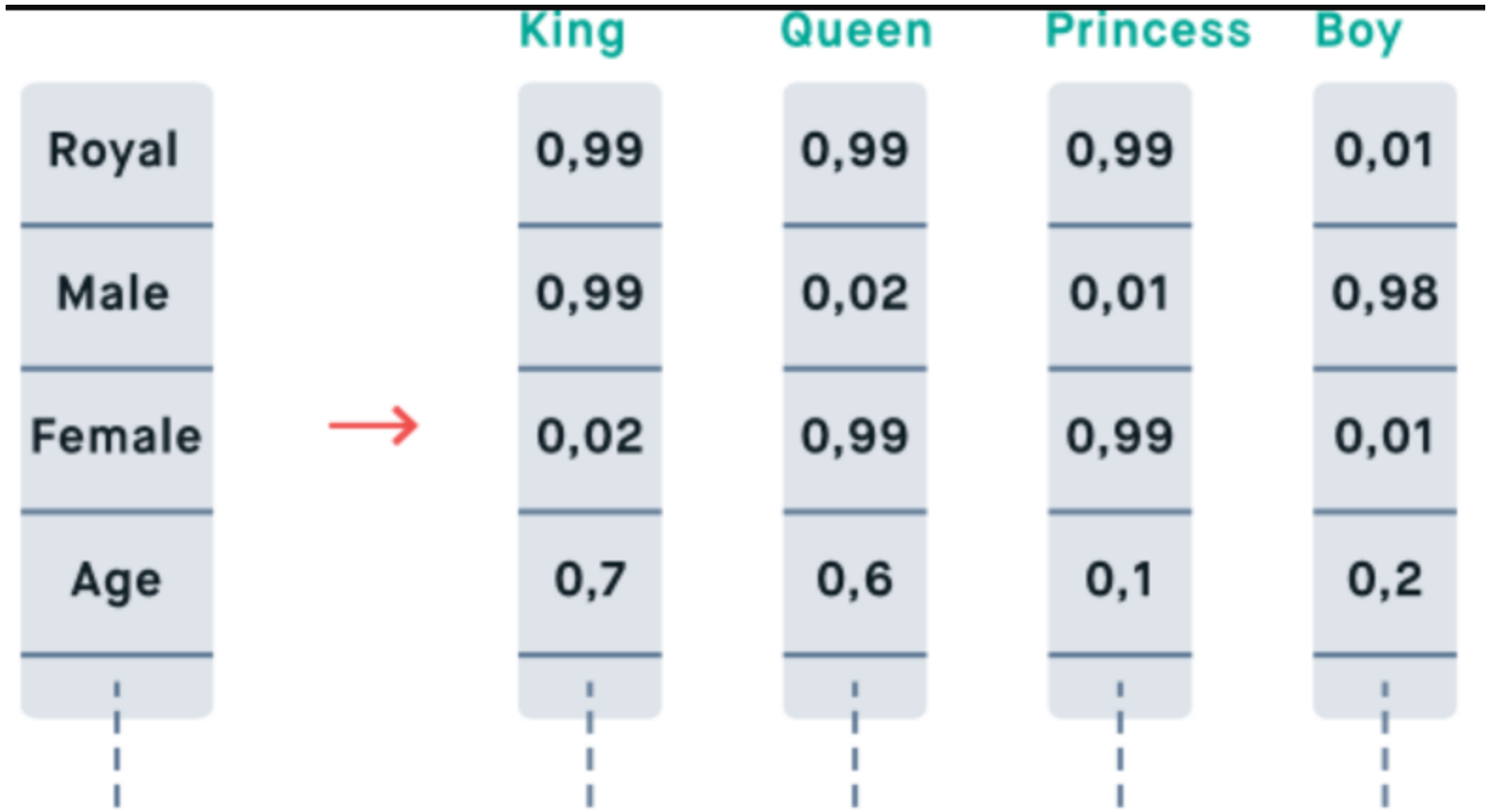
Object Detection

Text Generation

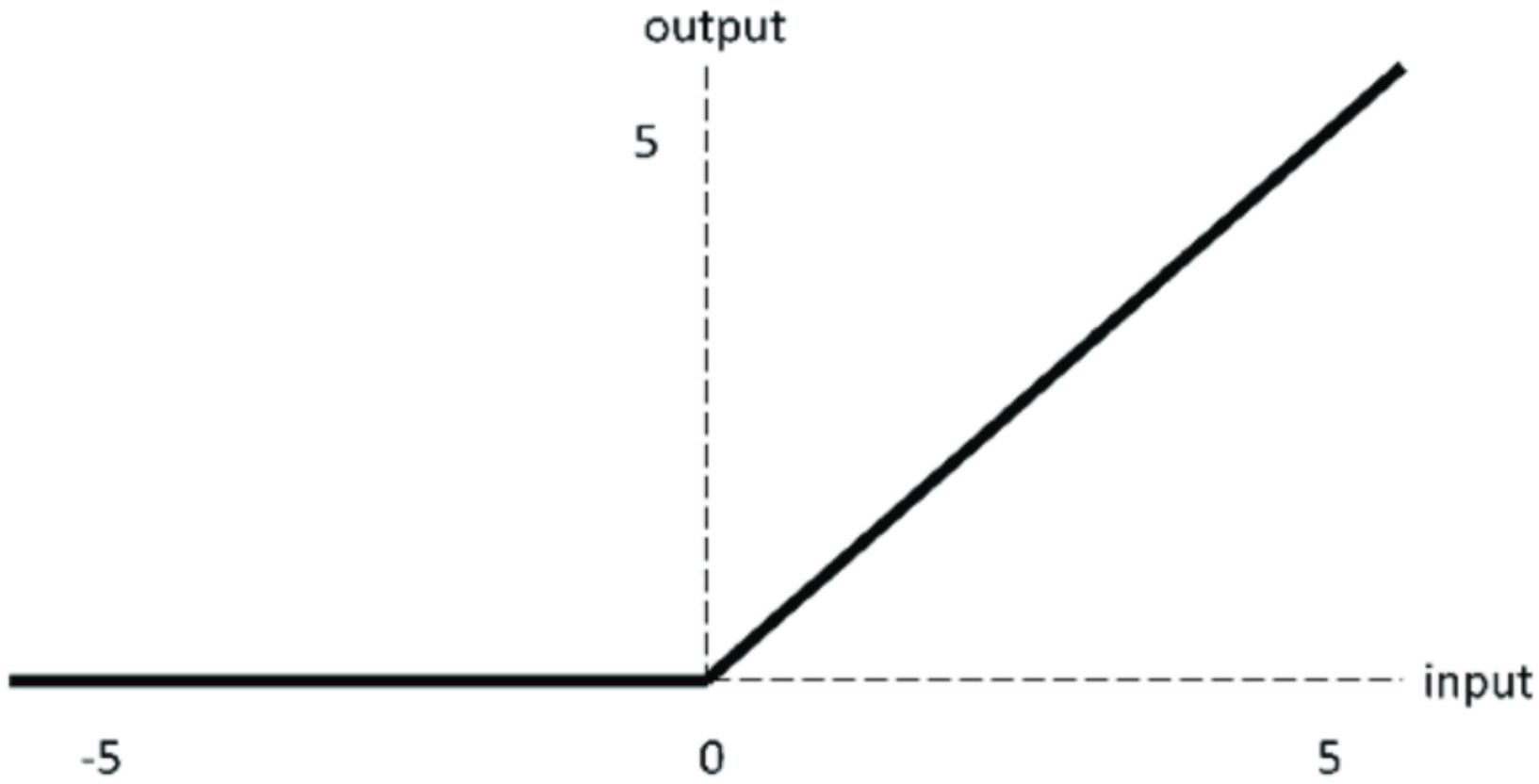
Text Generation



Embedding


King
Queen
Princess
Boy
Royal
0,99
0,99
0,99
0,01
Male
0,99
0,02
0,01
0,98
Female
0,02
0,99
0,99
0,01
Age
0,7
0,6
0,1
0,2

Important Functions



Advantage of Mathematical Knowledge

Can understand and what going on behind every algorithm

They can manipulate and existing function for new tasks

Can understand behavior of any function

Input and Output at each step using Linear Algebra

Understanding the nature of data with the help of Statistics and Probability