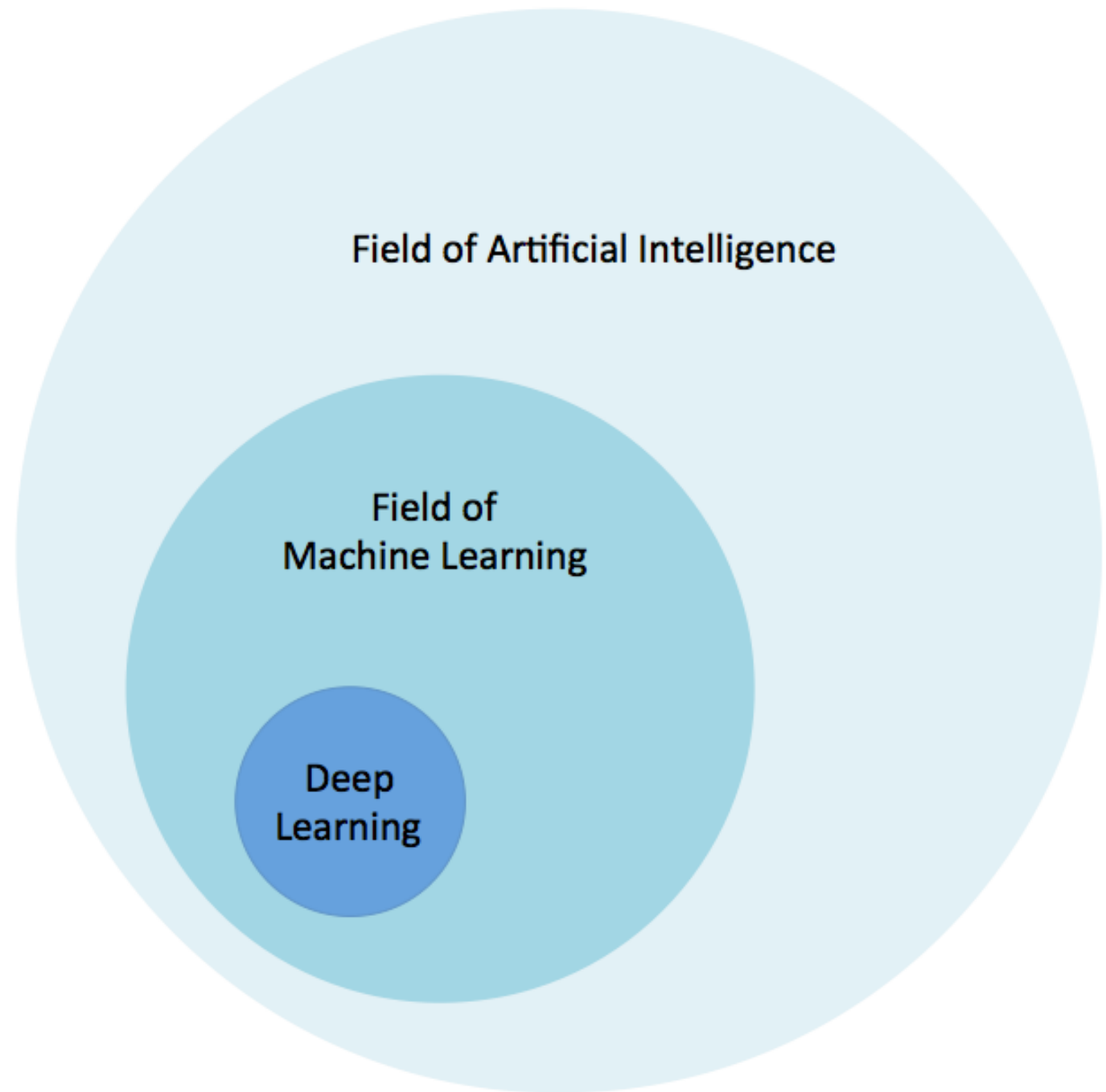


Application of Mathematics in Machine Learning



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)
 - ...
 -
 - ...

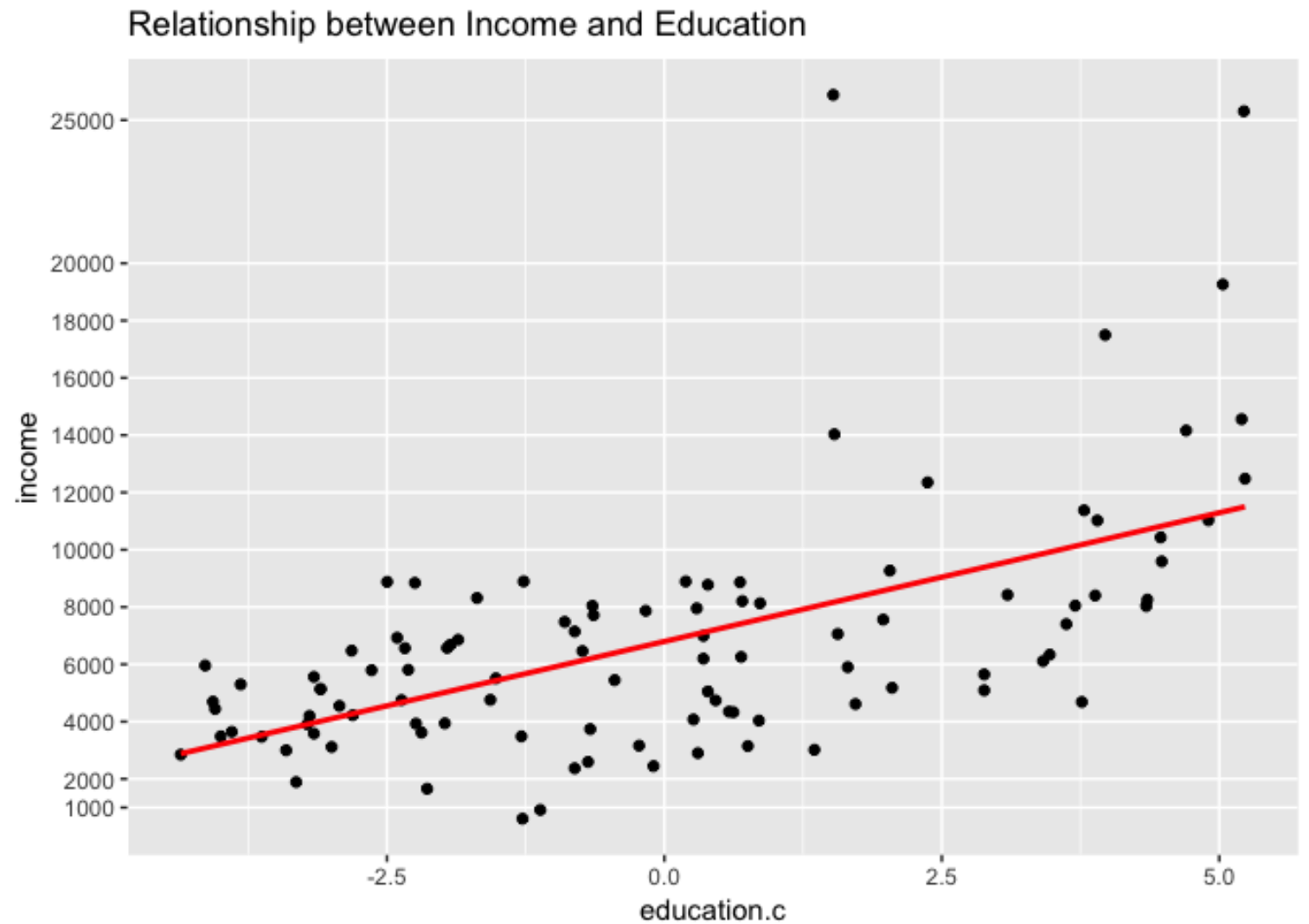
Mathematics In Machine Learning

Linear Algebra

Calculus

Probability and Statistics

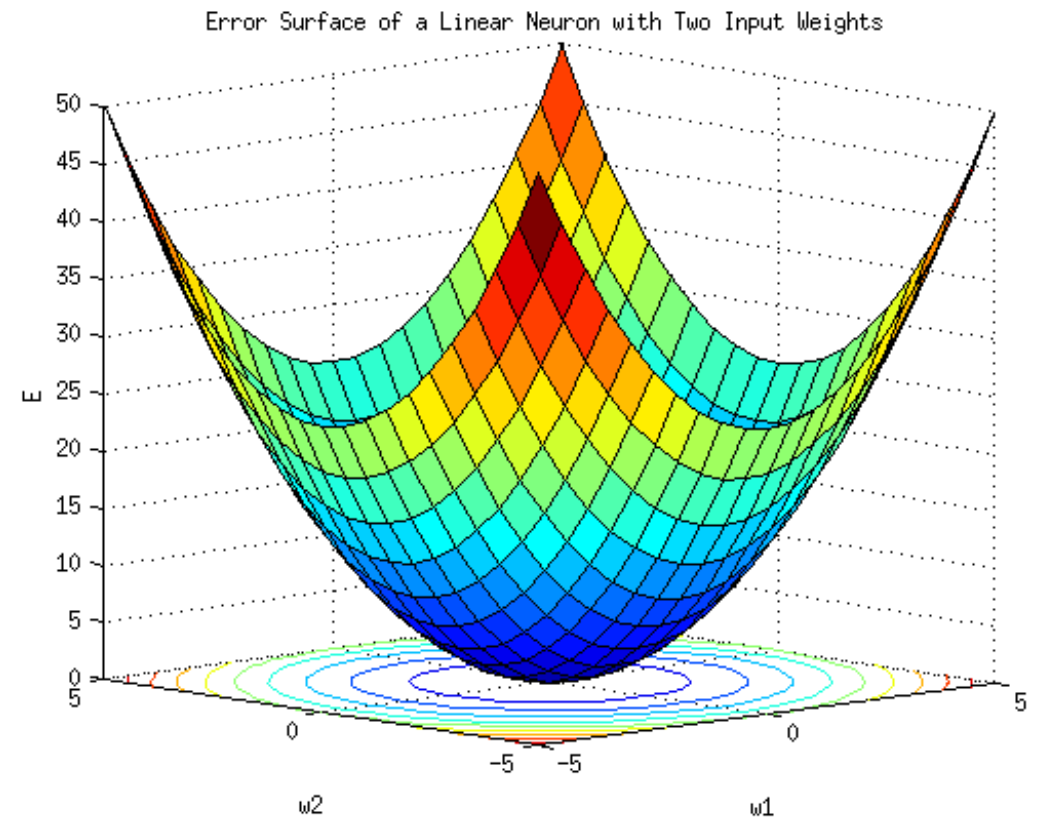
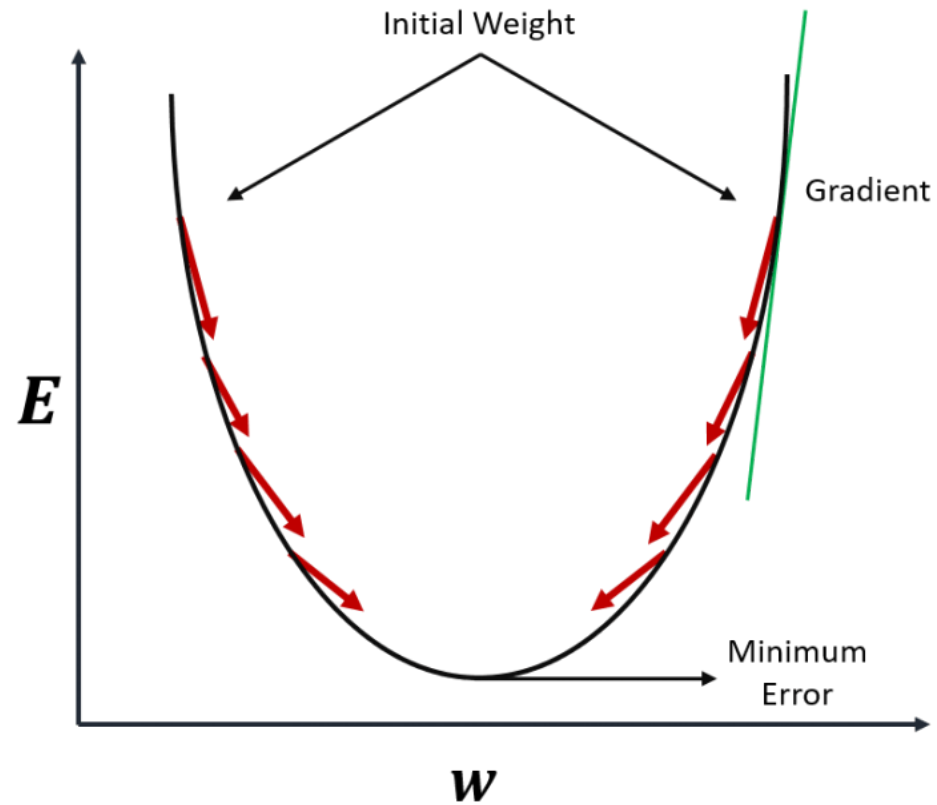
Linear Regression n



Optimization Of Loss Function

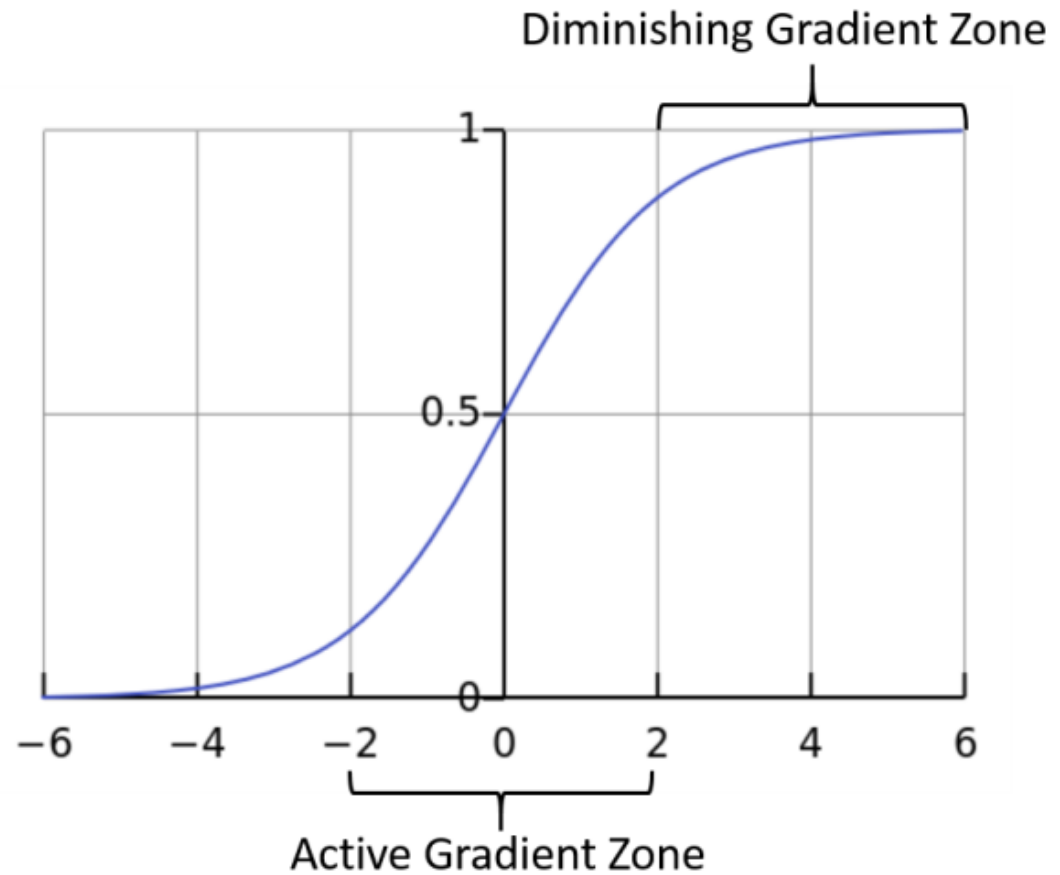
- $c = (y - y')^2$

Loss Function



Classification

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



Deep Learning

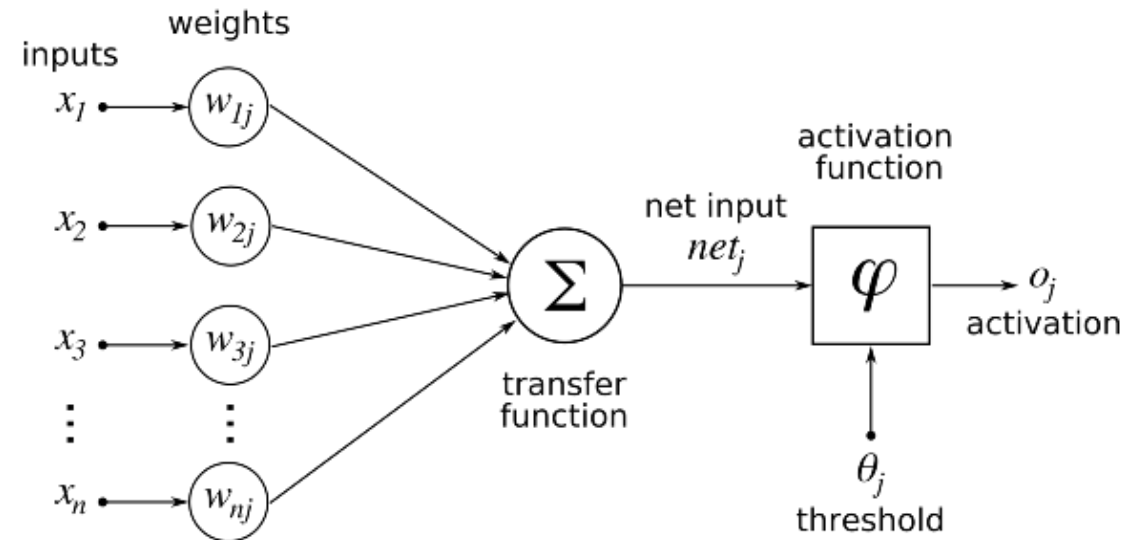
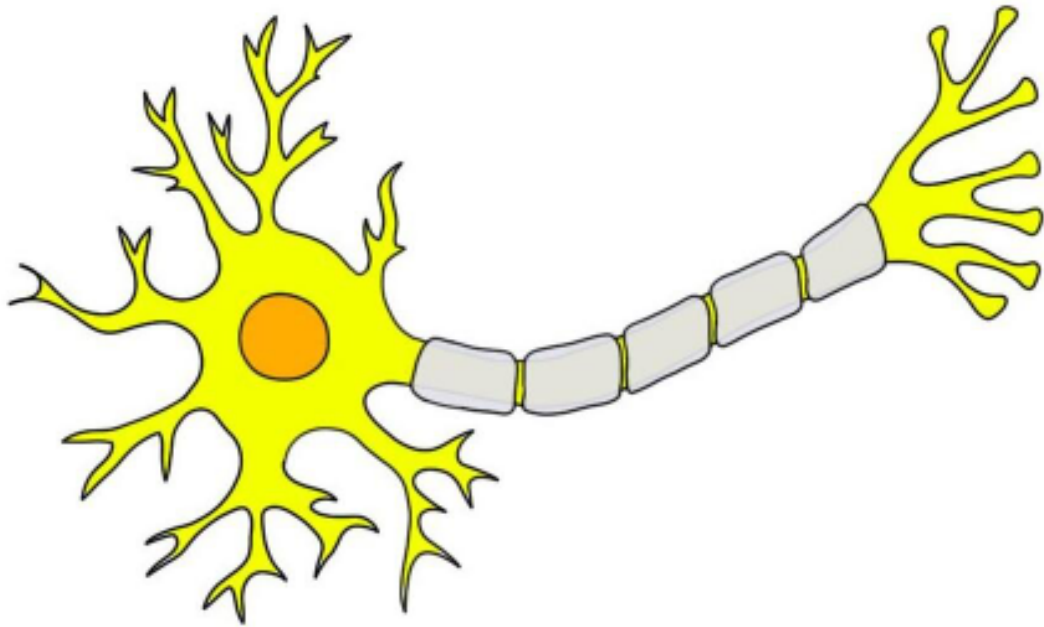
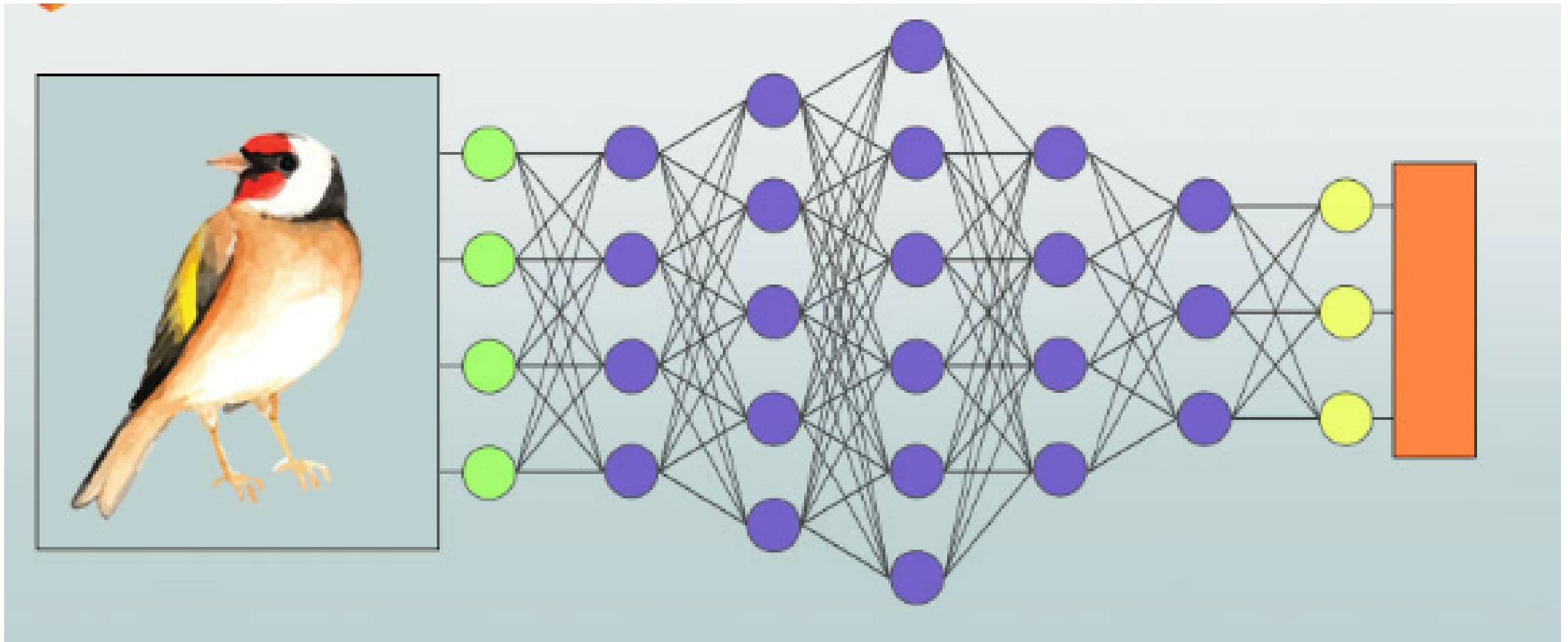
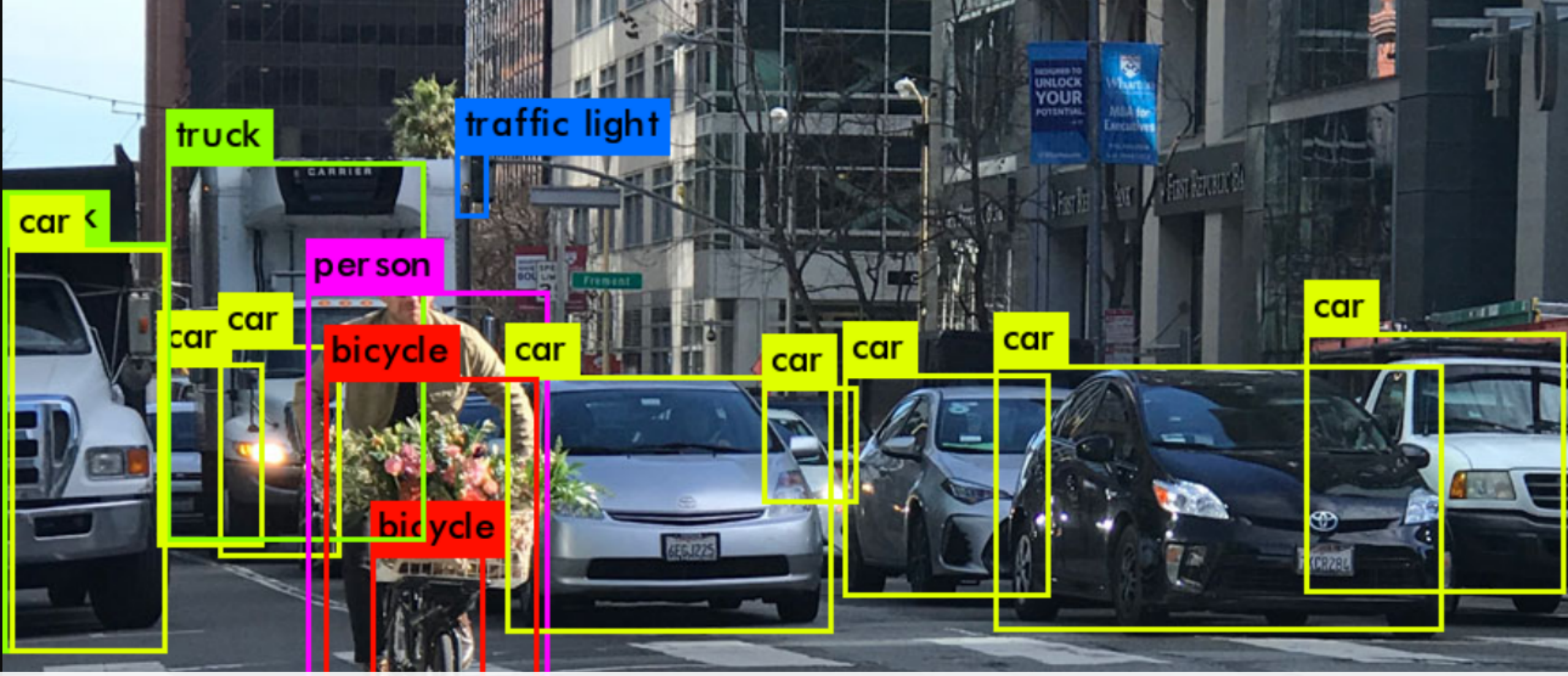


Image Classification

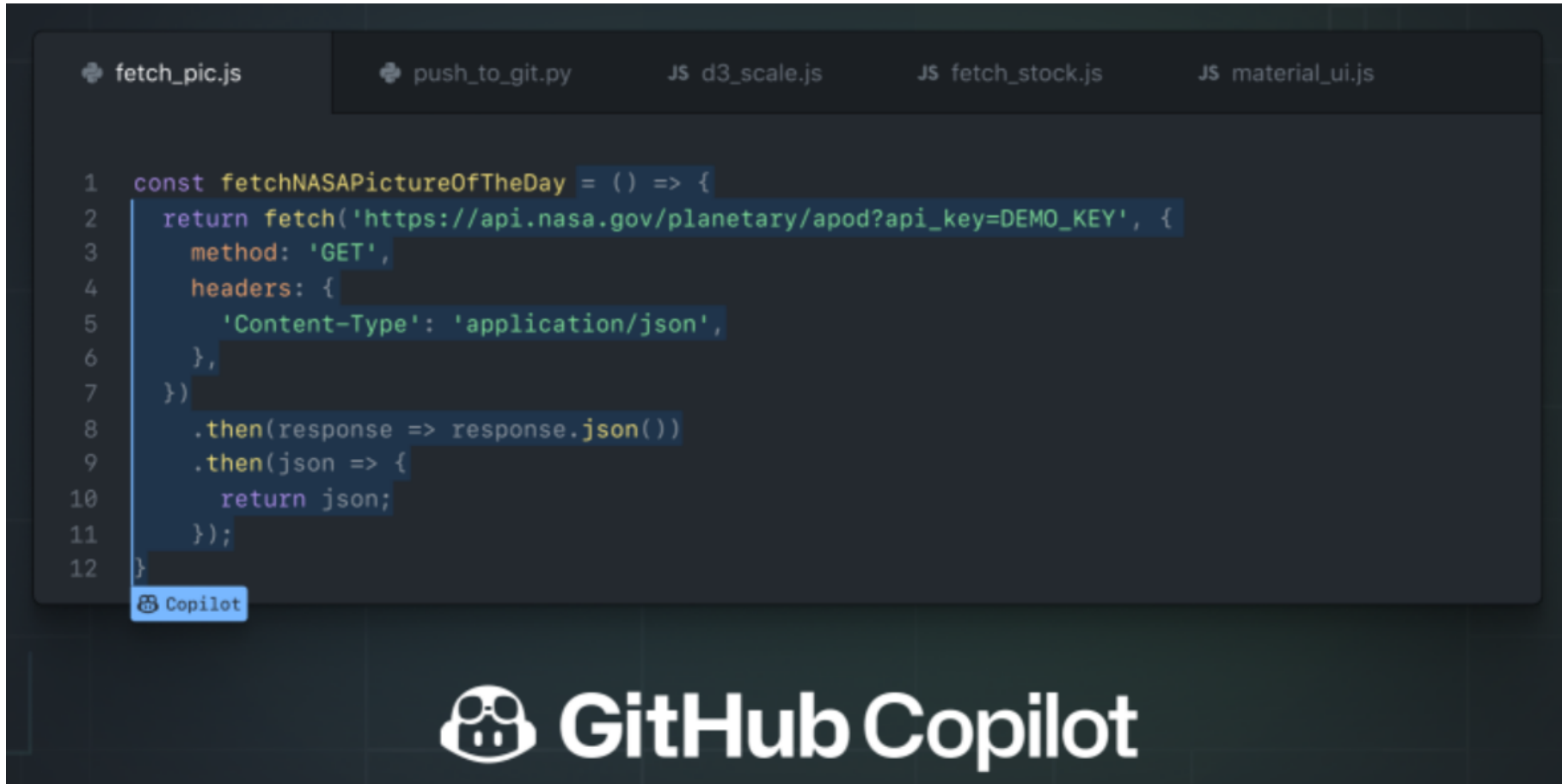




Object Detection


Text Generation

Text Generation

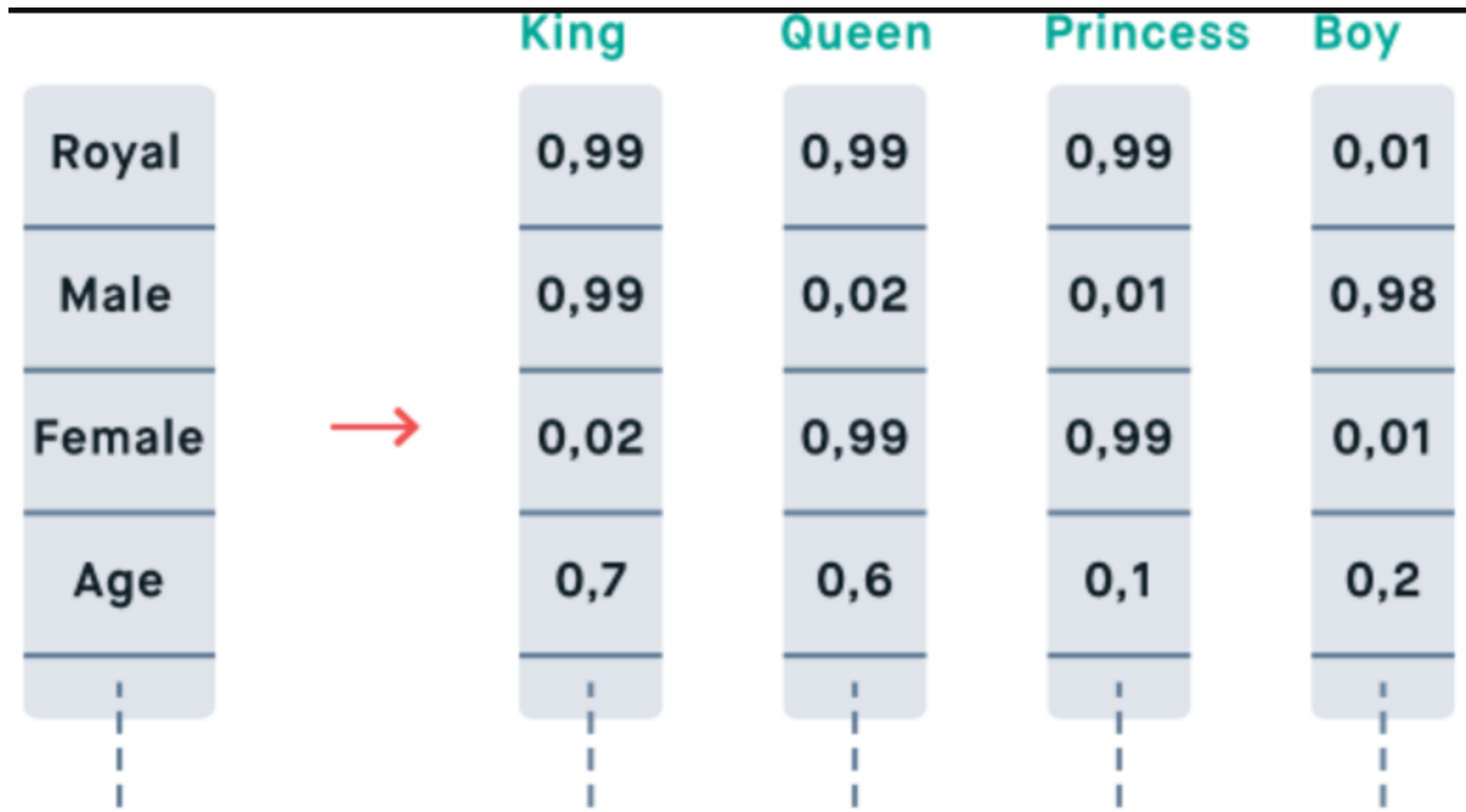


The image shows a code editor interface with a dark theme. At the top, there are several tabs: 'fetch_pic.js' (active), 'push_to_git.py', 'JS d3_scale.js', 'JS fetch_stock.js', and 'JS material_ui.js'. The main editor area displays a JavaScript function named 'fetchNASAPictureOfTheDay'. The function is defined as an arrow function that returns a Promise. It uses the 'fetch' API to request a NASA image from 'https://api.nasa.gov/planetary/apod?api_key=DEMO_KEY'. The request configuration includes a 'GET' method and a 'Content-Type' header of 'application/json'. The function then uses '.then()' to parse the JSON response and return it. Line numbers 1 through 12 are visible on the left side of the code. A small 'Copilot' icon is visible at the bottom left of the code editor. At the bottom of the image, the 'GitHub Copilot' logo is displayed.

```
1  const fetchNASAPictureOfTheDay = () => {  
2    return fetch('https://api.nasa.gov/planetary/apod?api_key=DEMO_KEY', {  
3      method: 'GET',  
4      headers: {  
5        'Content-Type': 'application/json',  
6      },  
7    })  
8      .then(response => response.json())  
9      .then(json => {  
10       return json;  
11     });  
12  }
```

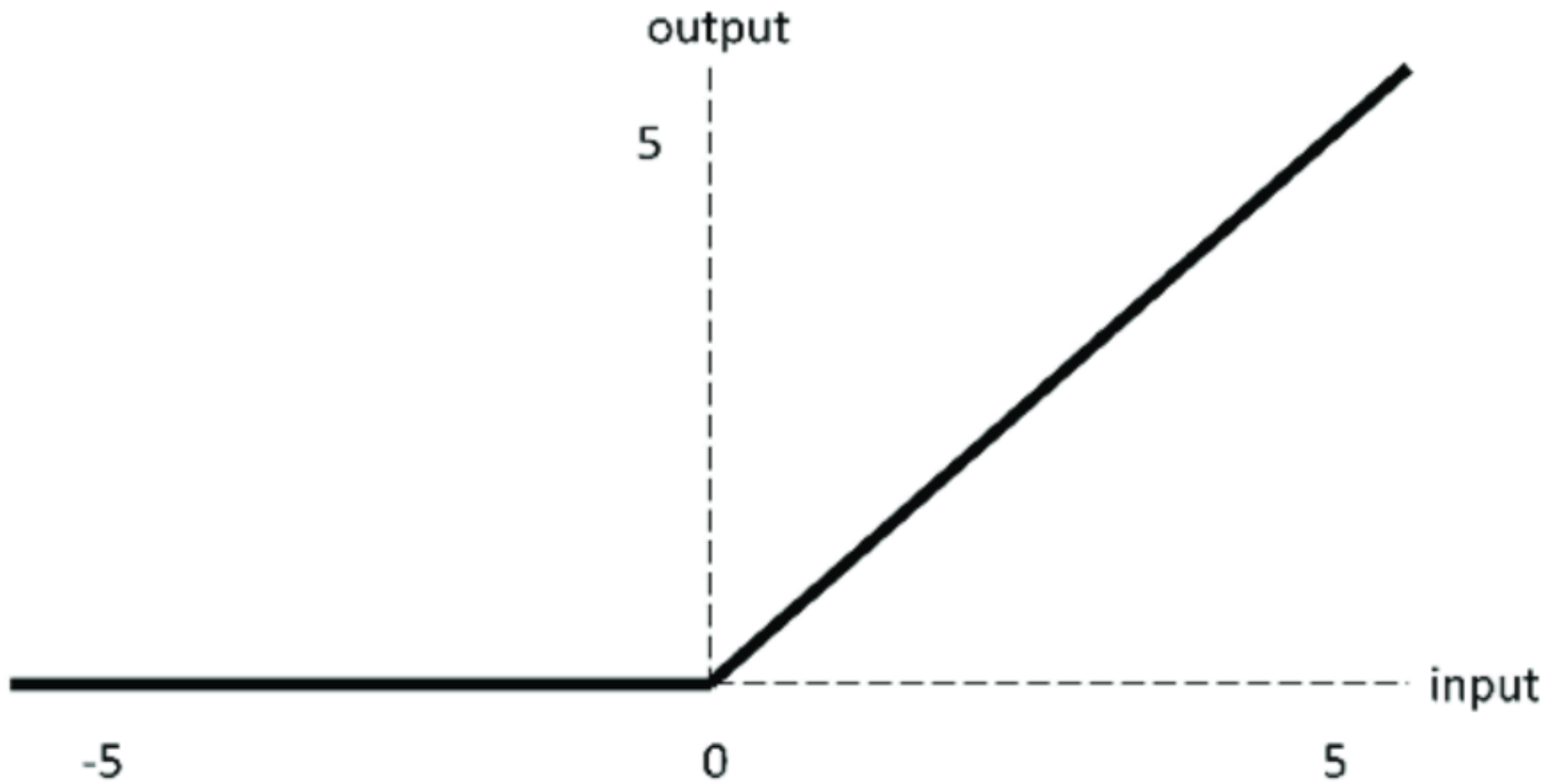
 **GitHub Copilot**

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