

DEEP
LEARNING

A 3D rendering of the words "DEEP LEARNING" in white, blocky, sans-serif capital letters. The letters are positioned on a blue background that features a complex, white circuit board pattern. The circuit lines are intricate, with many small circular pads and branching paths. The lighting is soft, creating subtle shadows beneath the letters, which gives them a three-dimensional appearance. The overall composition is clean and modern, emphasizing the technological nature of the subject.

[illegible]

```
import tensorflow as tf

mnist = tf.keras.datasets.mnist

(x_train, y_train), (x_test, y_test) = mnist.load_data()
x_train, x_test = x_train / 255.0, x_test / 255.0

model = tf.keras.models.Sequential([
    tf.keras.layers.Flatten(input_shape=(28, 28)),
    tf.keras.layers.Dense(128, activation='relu'),
    tf.keras.layers.Dropout(0.2),
    tf.keras.layers.Dense(10, activation='softmax')
])

model.compile(optimizer='adam',
              loss='sparse_categorical_crossentropy',
              metrics=['accuracy'])

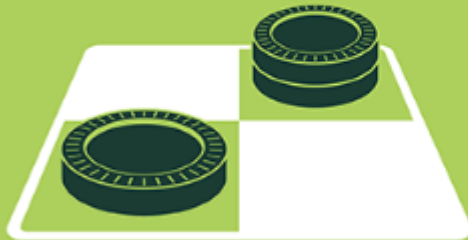
model.fit(x_train, y_train, epochs=5)

model.evaluate(x_test, y_test, verbose=2)
```

Deep Learning is a subfield of **Machine Learning** in which deep, multilayered **Neural Networks** are used to make predictions, especially excelling in computer vision, speech recognition, natural language understanding, and so on.

ARTIFICIAL INTELLIGENCE

Early artificial intelligence stirs excitement.



MACHINE LEARNING

Machine learning begins to flourish.

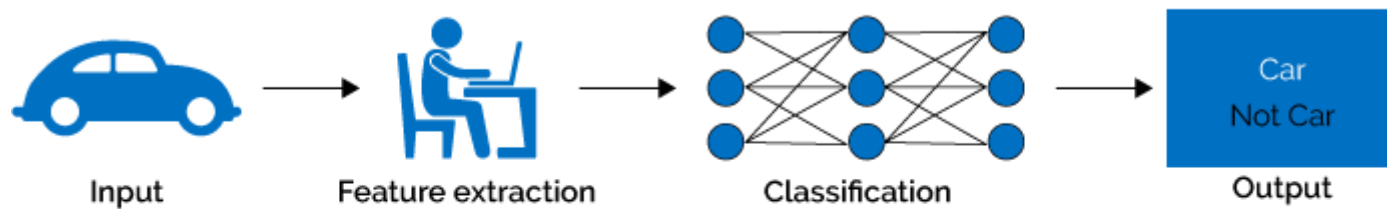


DEEP LEARNING

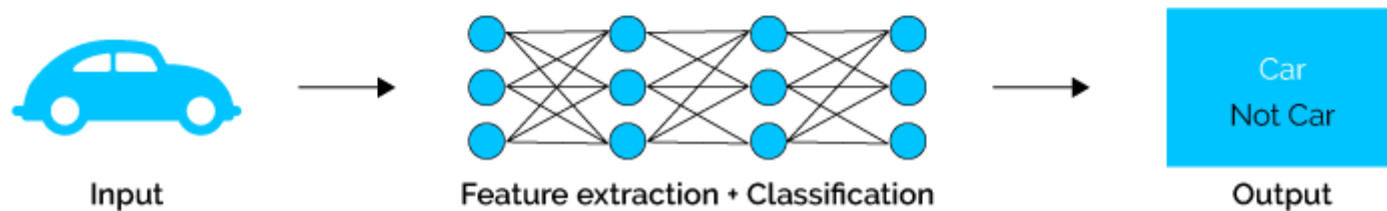
Deep learning breakthroughs drive AI boom.



Machine Learning

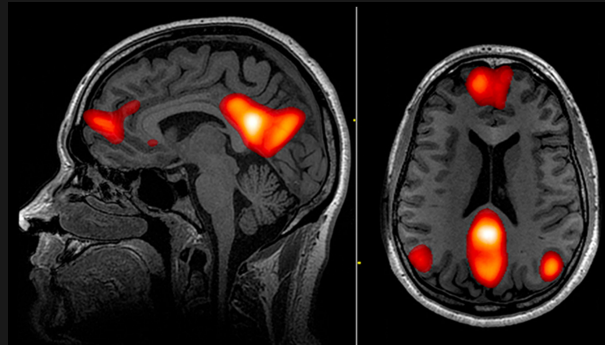
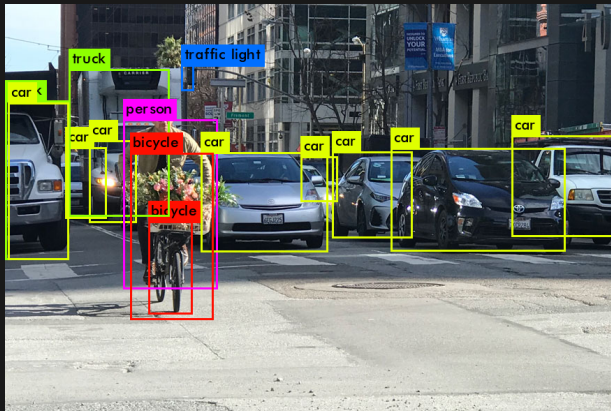


Deep Learning

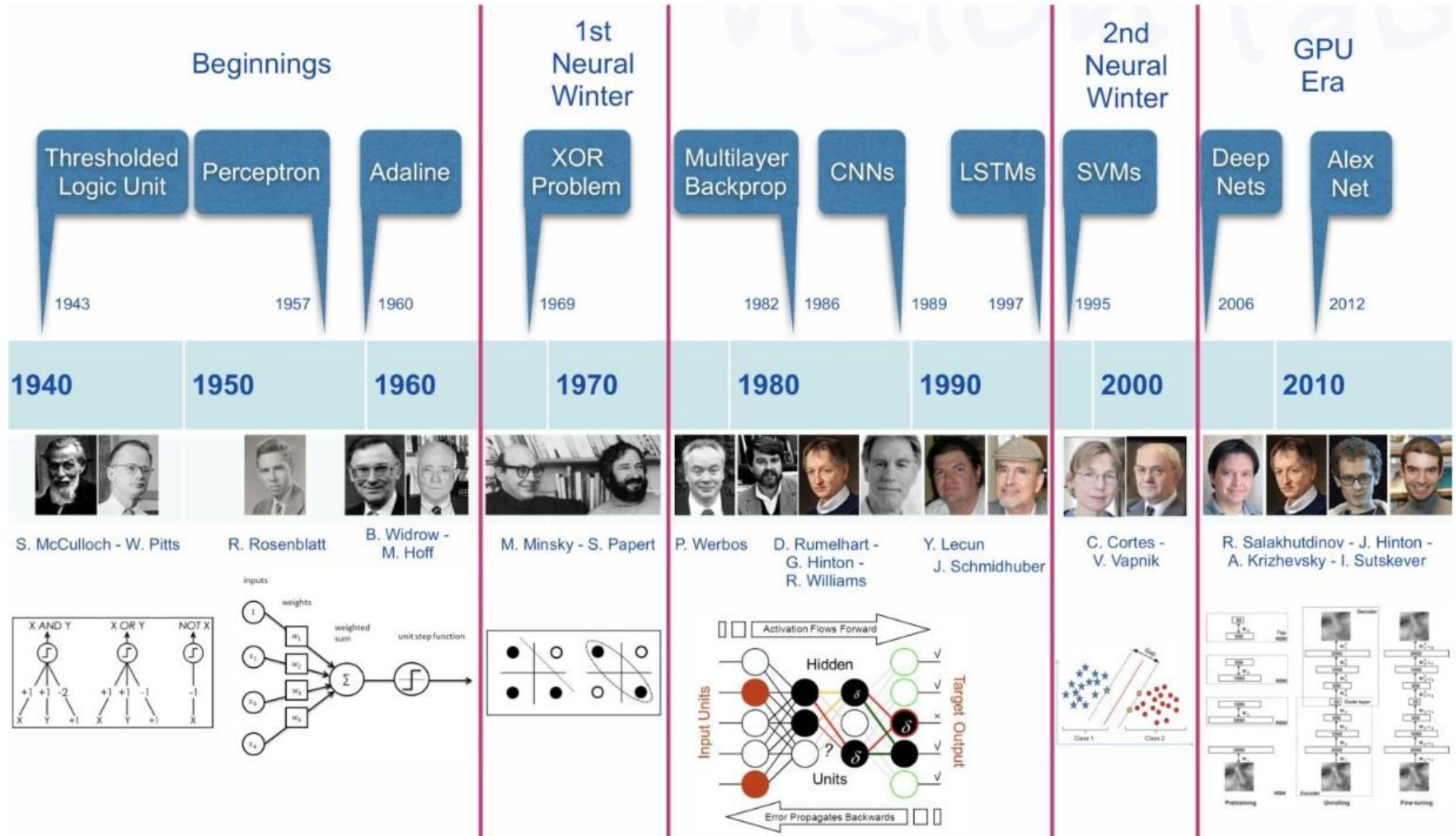


APPLICATIONS

Papers With Code



DEEP LEARNING EVOLUTION



WHY NOW ?

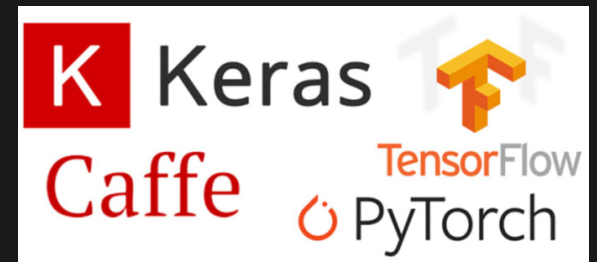
Data



Compute

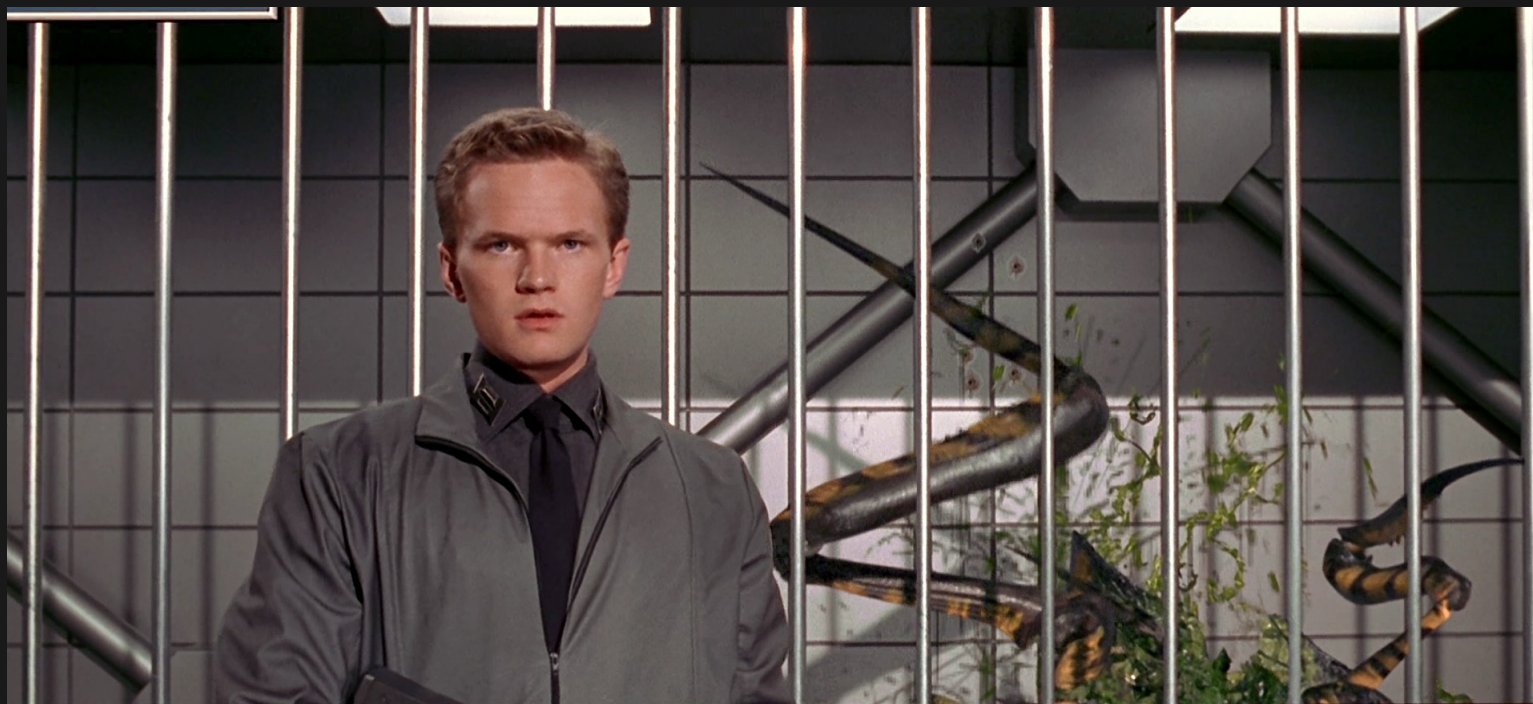


Frameworks



ETHICS

- Bias
- Accountability (explainability)
- Reproducibility (hacking)
- Robustness (adversarial attacks)
- Privacy



WOULD YOU LIKE TO KNOW **MORE?**

RESOURCES

- MIT Deep Learning SoA (2020)
- MIT Introduction to Deep Learning (2020)
- Goodfellow, I., Bengio, Y., Courville, A. (2016). Deep Learning
- Deep Learning with Python, by François Chollet