

2.1 WHY ARE TENSORS USEFUL?

1. Mathematical Operations

- Tensors enable efficient mathematical computations (addition, multiplication, dot product, etc.) necessary for neural network operations.

2. Representation of Real-world Data

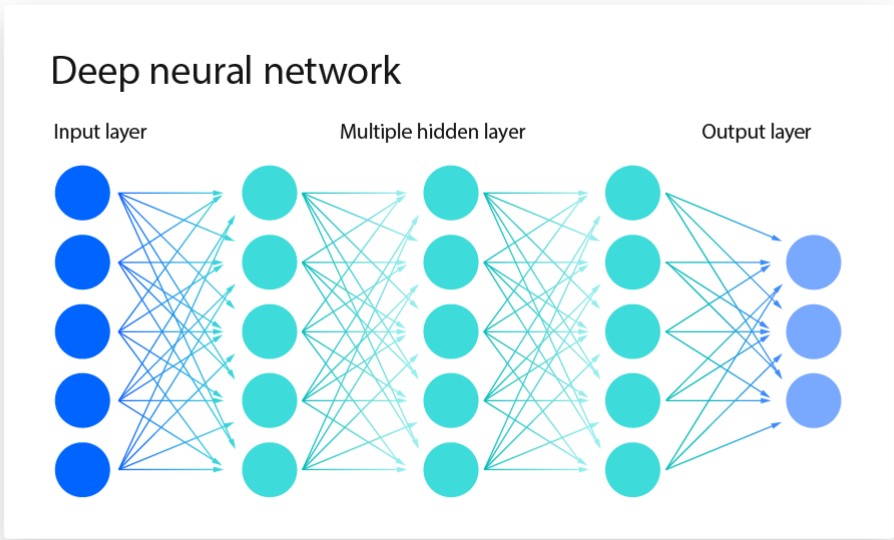
- Data like images, audio, videos, and text can be represented as tensors:
 - Images: Represented as 3D tensors (width × height × channels).
 - Text: Tokenized and represented as 2D or 3D tensors (sequence length × embedding size).

3. Efficient Computations

- Tensors are optimized for hardware acceleration, allowing computations on GPUs or TPUs, which are crucial for training deep learning models.



WHERE ARE TENSORS USED IN DEEP LEARNING?



1. Data Storage

- Training data (images, text, etc.) is stored in tensors.

2. Weights and Biases

- The learnable parameters of a neural network (weights, biases) are stored as tensors.

3. Matrix Operations

- Neural networks involve operations like matrix multiplication, dot products, and broadcasting—all performed using tensors.

4. Training Process

- During forward passes, tensors flow through the network.
- Gradients, represented as tensors, are calculated during the backward pass.