2.1 WHY ARE TENSORS USEFUL?

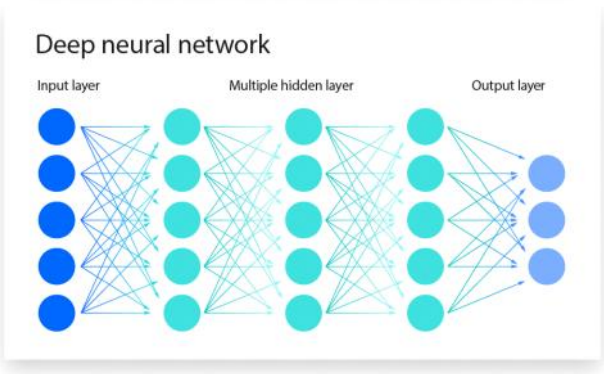
31 August 2025 02:50 PM Avinash Yadav

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.