Exercises

TP 1:

Try to find the solution by yourself; don't use AI tools.

Tensor Creation Exercises

1. **Create a Zero Tensor**: Create a 3x3 tensor filled with zeros.
2. **Create a Random Tensor**: Create a 2x4 tensor with random values between 0 and 1.
3. **Create a Tensor from a List**: Create a 1D tensor from the list [1, 2, 3, 4, 5].
4. **Create an Identity Matrix Tensor**: Create a 4x4 identity matrix tensor.
5. **Create a Tensor with a Range of Values**: Create a 1D tensor with values from 0 to 9.
6. **Create a Tensor with Specified Data Type**: Create a 4x4 tensor with integer values ranging from 1 to 16, and set its data type to torch.float32.
7. **Create a Tensor with Normal Distribution**: Create a 3x3 tensor with values sampled from a normal (Gaussian) distribution with mean 0 and standard deviation 1.

Indexing and Slicing Exercises

8. **Accessing Specific Elements**: Given a 3x3 tensor, access the element at row 2, column 1.
9. **Selecting Rows and Columns**: Given a 4x4 tensor, select the third row.
10. **Selecting a Column**: Given a 4x4 tensor, select the second column.
11. **Slice a Submatrix**: Given a 5x5 tensor, extract the 3x3 submatrix from the top-left corner.
12. **Reverse a Tensor along a Dimension**: Given a 1D tensor, reverse it.
13. **Select Elements with a Condition**: Given a tensor of values from 0 to 9, select only the even numbers.
14. **Use Advanced Indexing**: Given a 5x5 tensor with values from 0 to 24, extract all elements at positions where both row and column indices are even numbers.
15. **Set All Negative Values to Zero**: Given a tensor with random values from a normal distribution, replace all negative values with zero.

Reshaping and Manipulation Exercises

16. **Flatten a 2D Tensor to 1D**: Given a 2D tensor, reshape it into a 1D tensor.
17. **Expand a 1D Tensor to 2D**: Create a 1D tensor and expand it to a 2D tensor by repeating its values along a new dimension.
18. **Reshape a 1D Tensor into 3D**: Create a 1D tensor with 24 elements and reshape it into a 3D tensor of shape (2, 3, 4).
19. **Transpose a Tensor**: Given a 2x3 tensor, transpose it to a 3x2 tensor.
20. **Stack Tensors Along a New Dimension**: Create two 2x3 tensors and stack them along a new dimension to form a 2x2x3 tensor.
21. **Concatenate Tensors Along an Existing Dimension**: Create two 3x3 tensors and concatenate them along the second dimension (columns) to create a 3x6 tensor.

Operations on Tensors

22. **Broadcast Operations on Tensors**: Create a 1D tensor with values [1, 2, 3] and add it to a 3x3 tensor with each row equal to [10, 20, 30] using broadcasting.
23. **Perform Element-wise Multiplication**: Create two 3x3 tensors and compute their element-wise multiplication.
24. **Compute the Mean and Standard Deviation**: Given a 3x3 tensor with random values, compute its mean and standard deviation.
25. **Calculate the Sum Along a Dimension**: Given a 4x4 tensor, calculate the sum along each column.
26. **Find the Max Value and its Index**: Given a 1D tensor, find the maximum value and its index.