1.Can you think of a few applications for a sequence-to-sequence RNN? What about a sequence-to-vector RNN, and a vector-to-sequence RNN?

Ans.

Sequence-to-sequence RNNs are commonly used for machine translation, speech recognition, and text summarization. Sequence-to-vector RNNs are often used for sentiment analysis, text classification, and image captioning. Vector-to-sequence RNNs can be used for tasks such as image or speech generation.

2.How many dimensions must the inputs of an RNN layer have? What does each dimension represent? What about its outputs?

Ans.

The inputs to an RNN layer must have three dimensions: batch size, sequence length, and number of features per time step. The first dimension represents the number of instances in each batch, the second represents the length of each sequence, and the third represents the number of features at each time step. The outputs of an RNN layer have the same dimensions as the inputs.

3.If you want to build a deep sequence-to-sequence RNN, which RNN layers should have return\_sequences=True? What about a sequence-to-vector RNN?

Ans.

In a deep sequence-to-sequence RNN, all RNN layers should have return\_sequences=True, except for the last layer, which should have return\_sequences=False. In a sequence-to-vector RNN, only the last RNN layer should have return\_sequences=False.

4.Suppose you have a daily univariate time series, and you want to forecast the next seven days. Which RNN architecture should you use?

Ans.

For a daily univariate time series, a simple RNN or LSTM architecture can be used for forecasting the next seven days. The input to the model would be a sequence of the previous days' values, and the output would be the forecasted values for the next seven days.

5.What are the main difficulties when training RNNs? How can you handle them?

Ans.

The main difficulties when training RNNs are vanishing gradients and exploding gradients. To handle these issues, techniques such as gradient clipping, weight regularization, and using different activation functions can be used.

6.Can you sketch the LSTM cell’s architecture?

Ans.

The LSTM cell's architecture consists of a cell state, input gate, forget gate, and output gate. The input gate controls which values are updated in the cell state, the forget gate controls which values are discarded from the cell state, and the output gate controls which values are output from the cell.

7.Why would you want to use 1D convolutional layers in an RNN?

Ans.

1D convolutional layers can be used in an RNN to capture short-term patterns in the sequence. This can improve the model's ability to learn complex temporal patterns in the sequence.

8.Which neural network architecture could you use to classify videos?

Ans.

A 3D CNN architecture can be used to classify videos, where the input is a sequence of video frames, and the output is the predicted class label.