Assignment No. 06

Q. Applications based on Deep Neural Network with NLP such as LSTM Network, Recurrent Neural Network etc.

Introduction

In Natural Language Processing (NLP), understanding the meaning and order of words is very important. Traditional models cannot remember the sequence or context of words properly. To solve this, Deep Neural Networks like Recurrent Neural Networks (RNNs) and Long Short-Term Memory (LSTM) networks are used. These models are made for handling sequential data such as sentences, paragraphs or speech.

An RNN processes data step by step and tries to remember what came earlier. LSTMs are an advanced type of RNN that can remember information for a longer time and solve the problem of forgetting old data. These models are used in many the NLP applications that we use every day.

Applications of RNN and LSTM in NLP

1. Text Classification and Sentiment Analysis
RNNs and LSTMs are used to understand whether a sentence has a positive, negative or neutral meaning. They help in identifying topics, classifying emails or checking the tone of reviews. Example: Detecting positive or negative product reviews on online shopping platforms.

2. Machine Translation
In translation, sequence-to-sequence models built using LSTMs are used. They read the sentence in one language and generate it in another language. Example: Google Translate uses LSTM-based models for better grammar and context understanding.

3. Speech Recognition
Speech is a continuous flow of words, and RNNs or LSTMs are good at handling such data. They convert audio input into text by learning sound patterns over time. Example: Voice assistants like Siri, Alexa and Google Assistant use such models.

4. Image and Video Captioning
When combined with CNNs, LSTMs help generate captions for images or videos. CNN extracts image features and the LSTM creates a description. Example: Describing an image as "A group of people playing football."

5. Document Summarization
LSTMs can summarize long documents by finding the most important points or generating new shorter versions. Example: Summarizing news articles into short paragraphs.

6. Question Answering Systems
RNNs and LSTMs help systems read a paragraph and find answers to questions based on it. Example: Chatbots and online question-answer platforms.

7. Named Entity Recognition (NER) and POS Tagging
Bi-directional LSTMs understand both past and next context to label words properly. They identify names, places and parts of speech in text. Example: Recognizing Pranav as a person or India as a country.

8. Time-Series Prediction
Apart from text, RNNs and LSTMs are also used to predict sequential data like stock prices or weather. They work similarly since the data changes over time.

Conclusion

Deep Neural Networks like RNNs and LSTMs are very helpful in NLP because they can understand and remember word order and context. They are used in many applications like translation, speech recognition and sentiment analysis. These models help create smart systems such as chatbots, translators and voice assistants that we use in our daily life