

# SPPU-BE-COMP-CONTENT - KSKA Git

Q1.) What are some variants of Recurrent Neural Network Architecture?

AnsX A Recurrent Neural Network (RNN) is designed for sequential data where output depends on previous inputs (e.g., text, speech)

o Common Variants:-

1. Simple RNN,

- Basic form of RNN.

- Uses previous hidden state.

Limitation: suffers from vanishing gradient.

2. LSTM

• Special RNN that handles long-term dependencies.

Features

• Has 3 gates

- Forget Gate

- Input Gate

- Output Gate

Advantage: remembers long sequences.

3. GRU (Gated Recurrent Unit)

• Simplified version of LSTM.

• Fewer Gates

• Update Gate

• Reset Gate.

• Faster than LSTM.

4. Bidirectional RNN.

• Processes data in:

- Forward Direction

- Backward Direction



- Useful when context from both sides is needed.
- Gives better context.

## 5. Encoder-Decoder (Seq2Seq)

- Used for sequence-to-sequence tasks.
- Example:-  
Machine Translation.

Q2) What are the Limitations of the Recurrent Neural Network?

ANS

1. Vanishing and Exploding Gradient Problem
  - Gradients become too small or too large.
  - Difficult to train long sequences.
2. Short Term Memory.
  - Cannot remember long dependencies effectively.
  - Earlier inputs get forgotten.
3. Slow Training.
  - Sequential processing (cannot parallelize easily)
  - Earlier inputs get forgotten.
4. Computationally expensive.
  - Requires more resources for long sequences.
5. Difficulty in Handling Long Sequences.
  - Performance degrades for long text.
6. Not suitable for Large-Scale Tasks.
  - Modern models (like Transformers) perform better.