**Question: 1**

(a) Explain how you can implement DL in a real-world application.

(b) What is the use of Activation function in Artificial Neural Networks? What would be the problem if we don't use it in ANN networks.

(a).

Implementing Deep Learning (DL) in real-world applications involves several key steps and considerations based on the provided search results:

1. Data Understanding and Preprocessing: Before building a DL model, it is crucial to understand and preprocess the data. This involves handling structured, semi-structured, or unstructured data to extract meaningful insights. DL models typically require a large amount of data to build accurate models

2. DL Model Building and Training: The core of implementing DL involves building and training the model using techniques like convolutional neural networks, recurrent neural networks, autoencoders, and deep belief networks. Unlike traditional machine learning models, DL automates feature extraction rather than manual feature engineering.

3. Hardware Dependencies: DL algorithms demand significant computational resources, especially when training models with large datasets. High-performance hardware like GPUs is essential for efficient operations in DL training compared to standard machine learning methods

4. Feature Engineering Process: DL simplifies the feature engineering process by automatically extracting high-level features from raw data, reducing the time and effort required to construct feature extractors for each problem.

5. Model Training Time: Training a DL algorithm can be time-consuming due to the large number of parameters involved. Despite longer training times, DL models offer advanced capabilities in handling complex data structures and patterns.

6. Real-World Applications: Deep Learning finds applications in various domains such as fraud detection, customer relationship management systems, computer vision, vocal AI, natural language processing, autonomous vehicles, supercomputers, investment modeling, and e-commerce.

To implement DL effectively in real-world applications, organizations need to focus on data preparation, model building using appropriate DL techniques, hardware optimization for efficient computations, streamlined feature engineering processes, and understanding the specific requirements of the application domain to leverage the full potential of deep learning technologies.

(b).

Activation functions in Artificial Neural Networks (ANNs) play a crucial role in introducing non-linearity to the output of neurons. Without activation functions, ANNs would only be capable of performing linear transformations on input data using weights and biases. This limitation arises because the composition of two linear functions results in another linear function, regardless of the number of hidden layers added to the network. In essence, without activation functions, the entire neural network would behave like a linear regression model, making it impossible to learn complex patterns or relationships in the data.

The primary purpose of activation functions is to enable ANNs to model non-linear relationships within the data. By adding non-linearity through activation functions at each layer during forward propagation, neural networks can effectively learn and represent intricate patterns and structures present in the data. Activation functions allow neural networks to capture complex features and relationships that would be unattainable with purely linear transformations, enhancing the network's ability to learn and make accurate predictions.