Assignment 1

1. Describe the components of a neural network using both a textual and graphical representation. Include the input layer, hidden layers, and output layer.

2. Illustrate the training process of a neural network using both a textual and graphical representation. Explain the importance of training on a large dataset.

3. Explain the concept of overfitting and underfitting in the context of neural networks. How can these be avoided?

4. Discuss the role of activation functions in a neural network. Provide examples of common activation functions and their properties.

5. Analyze the impact of different learning rates on the performance of a neural network. Explain the concept of momentum and its role in optimization.

6. Explain the concept of regularization techniques in preventing overfitting. Discuss the role of dropout and weight decay.

7. Discuss the importance of choosing the right architecture for a neural network. Describe the process of selecting an appropriate architecture.

8. Compare and contrast feedforward and recurrent neural networks. Discuss their use cases.


10. Contrast the use of deep learning in natural language processing and image processing. Discuss the challenges and solutions in each domain.

11. Discuss the recent advancements in neural network research, such as transformer models and generative adversarial networks (GANs).

12. Analyze the impact of hardware accelerators on the performance of neural networks. Discuss the role of GPU and TPUs.

13. Discuss the ethical considerations in deploying neural networks, such as bias, fairness, and transparency.

14. Compare and contrast the use of ensemble models and neural networks in machine learning. Discuss the advantages and disadvantages of each approach.

15. Discuss the role of neural networks in real-world applications, such as self-driving cars, medical imaging, and financial market prediction.

16. Discuss the future of neural networks and emerging trends in the field, such as explainable AI and neural architecture search (NAS).

17. Discuss the limitations of neural networks and the research challenges in the field, such as interpretability, scalability, and the need for more diverse datasets.

18. Discuss the current state of research in neural networks, including recent breakthroughs, challenges, and potential future directions.

19. Discuss the role of research in neural networks and its impact on society. Consider ethical implications and technological advancements.

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