

1 Questions to Deep Learning for Image Processing And Analysis

1. Tasks of Image processing and analysis (including computer vision) with examples.
2. Advantages and Disadvantages of Using Deep Learning in Image Processing (Computer Vision).
3. Advantages and Disadvantages of Alternative approach to Using Deep Learning in Image Processing (Computer Vision).
4. Advantages of using Convolution Neural Network (CNN) in Image Processing and Analysis (Computer Vision).
5. Structure of Convolution Neural Network (meaning of feature extractor (backbone) and types of head layers).
6. Meaning of an Receptive Field in CNN
7. Explaining how 2d-convolution layer work (Multiple Channel Multiple Kernel)
8. Meaning of extending the 2d-convolution operation (padding, stride, dialed rate)
9. Types of Convolution and their aims:
 - Conventional (square) Convolution,
 - Cascade Convolution,
 - Grouped Convolution,
 - Spatially Separable Convolution,

- Pointwise Convolution,
- Deepwise-Convolution (and Deepwise-Separable Convolution),
- Pixel-shuffle (High Resolution) Convolution,
- Transposed Convolution.

10. Meaning of the Local Pooling Operation in CNN (for instance max-pooling).

11. Types of Local Pooling operations and their aims:

- max-pooling,
- average-pooling,

12. Advantages of the Global Average Pooling in CNN in comparison with flatten operation.

13. Types of Upsampling Layers

14. Meaning of the Activation Function in Neural Networks

15. Why we use Sigmoid and SoftMax in Last Layers for Classification tasks
(Advantages and Disadvantages of Sigmoid Activation function).

16. Advantages of Reflected Linear Unit (ReLU) in hidden layers of CNN.

17. Types of ReLU: ReLU6, Leaky ReLU, Parametric ReLU, ELU, SELU, GELU, Swish, Mish and how do you think why they all need (Disadvantages of Conventional ReLU).

18. Meaning of Weights initialization.

19. Difference between Binary Classification, Multi-Class Classification and Multi-Label Classification,
20. Types of Loss Function for Classification: Binary Cross-Entropy, One-Hot Categorical Cross-Entropy, Sparse Categorical Cross-Entropy, Imbalance cases.
21. Reasons of using Cross-Entropy with Logits (Binary Cross-Entropy with Logits and Categorical Cross-Entropy with Logits).
22. Types of Regression Loss: L2, L1, L1smooth (Huber Loss)
23. Specificity of Loss function in Semantic Segmentation.
24. Method of Neural Network Regularization: L2, data augmentation, 2d Dropout (spatial Dropout), Batch Normalization.
25. Advantages and Disadvantages of Batch Normalization and why some times we need to use Layer Norm or Group Norm.
26. Meaning of Cross Validation.
27. Meaning of Learning rate choosing and scheduling.
28. Types of Stochastic Gradient Descent (SGD): SGD with Momentum (Nesterov), RMS prop, ADAM - why they need to use.
29. The main tendencies in the modern state of CNN Architectures.
30. The main idea of Network In Net (and inception layer).
31. The main idea residual connection (skip connection and denseNet block).

- 32. The main idea of MobileNet V2 block.
- 33. The main idea of Squeeze and Excitation (and MobileNet V3 block).
- 34. The main ideas under EfficientNet V1/V2.
- 35. The main idea of the Noisy Student training scheme and its variants.
- 36. Advantages and Disadvantages of Visual Transformer Networks.

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