Chapter 5 MCQs

1. What type of deep learning model is specifically designed for processing structured data like images and videos?
    A. Recurrent Neural Network
    B. Feedforward Neural Network
    C. Convolutional Neural Network
    D. Generative Adversarial Network
2. CNNs are widely used in which type of tasks?
    A. Natural Language Processing
    B. Computer Vision
    C. Time Series Forecasting
    D. Reinforcement Learning
3. How do CNNs work to detect patterns and features from images?
    A. Through manual feature extraction
    B. By processing input data as a whole
    C. By automatically detecting patterns and features
    D. By using only linear operations
4. What specialized mechanism do CNNs use to extract important features like edges, shapes, and textures from an image?
    A. Pooling
    B. Flattening
    C. Convolution
    D. Activation
5. Why are CNNs more efficient for image-related tasks compared to traditional neural networks?
    A. They process input data as a whole.
    B. They require manual feature extraction.
    C. They use a specialized mechanism called convolution.
    D. They have fewer layers.
6. What is one reason CNNs are widely used in image processing?
    A. They increase computational complexity.
    B. They require manual feature engineering.
    C. They reduce computational complexity using pooling layers.
    D. They cannot maintain spatial relationships.
7. What is the core operation in basic CNN architecture that enables the model to extract meaningful features from input data?
    A. Pooling
    B. Fully Connected Layer
    C. Convolution
    D. Activation Function
8. What does the convolution operation apply to the input to detect patterns like edges and textures?
    A. Neurons
    B. Filters
    C. Biases
    D. Outputs
9. Which of the following is NOT a typical component of a CNN architecture?
    A. Convolutional layers
    B. Pooling layers

C. Recurrent layers
D. Fully connected layers

10. What is the first layer in a Convolutional Neural Network that receives the input data, typically an image?
    A. Convolutional Layer
    B. Pooling Layer
    C. Input Layer
    D. Output Layer
11. What does the input layer in a CNN often do to pixel values to ensure consistent input?
    A. Inverts them
    B. Normalizes them to a range of 0 to 1
    C. Randomizes them
    D. Converts them to negative values
12. What are the fundamental components of CNNs designed to automatically and adaptively learn spatial hierarchies of features from input images?
    A. Activation Functions
    B. Pooling Layers
    C. Convolution Layers
    D. Fully Connected Layers
13. What are "filters" also known as in a convolution layer?
    A. Neurons
    B. Kernels
    C. Biases
    D. Strides
14. What do filters in a convolution layer do?
    A. Reduce dimensions of the input.
    B. Extract specific features from the input data.
    C. Introduce non-linearity.
    D. Flatten the data.
15. What determines how much the filter moves during the convolution operation?
    A. Padding
    B. Activation Function
    C. Stride
    D. Kernel size
16. What type of padding adds extra pixels around the input data to ensure the output feature map has the same dimensions as the input?
    A. 'Valid' padding
    B. 'Same' padding
    C. 'Full' padding
    D. 'Zero' padding
17. Which activation function is typically applied after the convolution operation to introduce non-linearity?
    A. Sigmoid
    B. Tanh
    C. Softmax
    D. Rectified Linear Unit (ReLU)
18. What technique reduces the number of parameters and computational cost by using the same filter across different parts of the input?
    A. Local Connectivity
    B. Parameter Sharing

C. Hierarchical Feature Learning
D. Pooling

19. What is the purpose of Activation Functions in CNNs?
    A. To make the model linear.
    B. To reduce the number of layers.
    C. To introduce non-linearity into the model.
    D. To increase computational complexity.
20. Which activation function returns 0 if it receives any negative input, but returns the value itself for positive inputs?
    A. Sigmoid
    B. Tanh
    C. ReLU
    D. Leaky ReLU
21. Which activation function is a variant of ReLU that allows a small, non-zero gradient for negative inputs to mitigate the dying ReLU problem?
    A. ReLU
    B. Sigmoid
    C. Leaky ReLU
    D. Softmax
22. After which layers are activation functions typically applied in a CNN?
    A. Only after pooling layers.
    B. After each convolutional layer and fully connected layer.
    C. Only after the input layer.
    D. Never applied in CNNs.
23. What is the purpose of Pooling layers in CNNs?
    A. To extract features from images.
    B. To introduce non-linearity.
    C. To gradually shrink the representation's spatial dimension.
    D. To increase the number of parameters.
24. What property do pooling layers provide that makes a CNN able to recognize features even if the input is slightly shifted?
    A. Feature Extraction
    B. Computational Efficiency
    C. Translational Invariance
    D. Hierarchical Learning
25. Which type of pooling computes the maximum value within a specified window?
    A. Average Pooling
    B. Min Pooling
    C. Max Pooling
    D. Sum Pooling
26. What is a consequence of adding pooling layers to a CNN model?
    A. Increased overfitting
    B. Decreased efficiency
    C. Slower training times
    D. Reduction of overfitting
27. What is the final layer in a convolutional network, also known as the dense layer?
    A. Convolutional Layer
    B. Pooling Layer
    C. Fully Connected Layer
    D. Input Layer

28. What is the purpose of the Fully Connected Layer in a CNN?
    A. To extract local features.
    B. To reduce spatial dimensions.
    C. To aggregate extracted features and learn global relationships.
    D. To introduce non-linearity only.
29. What happens to the pooled feature map before it is fed into the fully connected network?
    A. It is expanded.
    B. It is convolved.
    C. It is flattened into a column vector.
    D. It is activated.
30. In a fully connected layer, how are its nodes connected to the nodes in the next layer?
    A. Randomly
    B. Partially connected
    C. Each node connects to every node in the next layer
    D. Only to a single node
31. What is the activation function commonly used in the fully connected layer for image classification to output a probability distribution?
    A. ReLU
    B. Sigmoid
    C. Tanh
    D. Softmax
32. What dataset is commonly used as an example for building a simple CNN for handwritten digit recognition?
    A. ImageNet
    B. CIFAR-10
    C. MNIST
    D. COCO
33. How many grayscale images of digits (0 to 9) does the MNIST dataset contain?
    A. 10,000
    B. 20,000
    C. 70,000
    D. 100,000
34. What is the pixel dimension of each image in the MNIST dataset?
    A. 32x32
    B. 64x64
    C. 28x28
    D. 128x128
35. What is the typical number of output units in the final `Dense` layer for MNIST digit classification?
    A. 1
    B. 5
    C. 10
    D. 100
36. What is the purpose of `x_train = x_train.reshape((-1, 28, 28, 1)).astype('float32') / 255.0` in the example code?
    A. To reduce the image size.
    B. To flatten the images.
    C. To normalize pixel values and add a channel dimension.
    D. To convert images to color.

37. Which optimizer is generally better for faster convergence due to its adaptive learning rates and combination of Momentum and RMSprop?
    A. SGD
    B. RMSprop
    C. Adam
    D. AdaGrad
38. What is a reason you might still want to use Stochastic Gradient Descent (SGD)?
    A. It automatically adjusts learning rates.
    B. It is simpler and more tunable.
    C. It combines Momentum and RMSprop.
    D. It is always faster.
39. What loss function is used in the example CNN model for MNIST digit classification?
    A. Mean Squared Error
    B. Binary Cross-Entropy
    C. Sparse Categorical Crossentropy
    D. Categorical Crossentropy
40. What metric is tracked during the training of the example CNN model?
    A. Loss
    B. Precision
    C. Recall
    D. Accuracy
41. What does `model.fit()` do in Keras?
    A. Evaluates the model on test data.
    B. Defines the model architecture.
    C. Handles batch updates, forward passes, and backpropagation automatically.
    D. Makes predictions on new data.
42. What does `model.evaluate(x_test, y_test)` do?
    A. Trains the model on the test data.
    B. Defines the model's architecture.
    C. Evaluates the trained model on the test dataset.
    D. Makes predictions on the test data.
43. What does a higher "Test accuracy" value indicate?
    A. The model is overfitting.
    B. The model is underfitting.
    C. Better model performance.
    D. Slower training.
44. What is the role of `layers.Conv2D(32, (3, 3), activation='relu', input_shape=(28, 28, 1))` in the example model?
    A. To perform pooling.
    B. To flatten the input.
    C. To apply 32 filters with a 3x3 kernel and ReLU activation.
    D. To define the output layer.
45. What is the role of `layers.MaxPooling2D((2, 2))` in the example model?
    A. To add more features.
    B. To reduce the spatial dimensions of the feature maps.
    C. To apply an activation function.
    D. To connect all neurons.
46. What is the role of `layers.Flatten()` in the example model?
    A. To add more layers.
    B. To convert 2D feature maps into a 1D vector.

C. To perform convolution.
D. To apply pooling.

47. What is the role of `layers.Dense(10, activation='softmax')` in the example model?
    A. To extract features.
    B. To reduce dimensions.
    C. To provide 10 output units for classification with softmax activation.
    D. To perform convolution.
48. Why is `activation='relu'` commonly used in hidden layers of CNNs?
    A. It saturates for positive values.
    B. It helps to alleviate the vanishing gradient problem.
    C. It is a linear function.
    D. It is computationally expensive.
49. What does `model.compile()` do?
    A. Starts the training process.
    B. Configures the model for training with an optimizer, loss function, and metrics.
    C. Loads the dataset.
    D. Makes predictions.
50. What is the purpose of `validation_split=0.1` in `model.fit()`?
    A. To use 10% of the data for testing.
    B. To use 10% of the training data for validation.
    C. To train on only 10% of the data.
    D. To split the data into 10 batches.