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QUESTION: 1

In Multi-Armed Bandit problems, which strategy is known for being effective in scenarios where the rewards are subject to sudden changes or shifts?

- Option A : Thompson Sampling with a low variance prior
- Option B : Sliding Window with a short time frame
- Option C : UCB1 with frequent updates
- Option D : Epsilon-Greedy with a high epsilon

Correct Answer: B

Explanation/Reference:

The Sliding Window strategy with a short time frame is effective for environments with sudden changes or shifts in rewards, as it focuses on recent data and adapts quickly to changes.

QUESTION: 2

Which of the following techniques is most suitable for reducing the dimensionality of a dataset with a high number of correlated features?

- Option A : K-means clustering
- Option B : Principal Component Analysis (PCA)
- Option C : Decision Trees
- Option D : Linear Regression

Correct Answer: B

Explanation/Reference:

Principal Component Analysis (PCA) is a statistical technique used to reduce the dimensionality of a dataset by transforming it into a new set of variables (principal components). These components are uncorrelated and ordered by the amount of variance they explain in the data. PCA is particularly effective when dealing with datasets that have highly correlated features, as it captures the underlying structure of the data while minimizing information loss. This makes PCA a go-to method for dimensionality reduction in machine learning, where reducing the number of features can improve model performance and reduce computational cost.

QUESTION: 3

How can "machine learning algorithms" be used to improve traffic signal management?

- Option A : By replacing physical traffic signals with virtual ones
- Option B : By manually configuring signal timings for each traffic light
- Option C : By increasing the number of physical sensors installed
- Option D : By predicting and adjusting signal timings based on historical data

Correct Answer: D

Explanation/Reference:

Machine learning algorithms analyze historical and real-time traffic data to predict traffic patterns and adjust signal timings dynamically, improving traffic flow and reducing congestion.

QUESTION: 4

What is a significant ethical challenge associated with the deployment of White Box XAI models?

- Option A : Risk of revealing sensitive data through transparency
- Option B : Difficulty in achieving model accuracy
- Option C : Potential over-reliance on human interpretations
- Option D : Complexity in maintaining model interpretability

Correct Answer: A

Explanation/Reference:

A significant ethical challenge in deploying White Box XAI models is the risk that increased transparency might inadvertently reveal sensitive or private information. Since these models expose the underlying logic and feature importance, there is a potential for sensitive data points to be exposed or inferred, particularly in contexts where the data includes personal or confidential information. This raises concerns about privacy and the need to carefully balance transparency with data protection, ensuring that the model's interpretability does not compromise individual privacy.

QUESTION: 5

Which TensorFlow tool provides a graphical interface for converting and optimizing models for mobile deployment?

- Option A : TensorFlow Lite Model Maker
- Option B : TensorFlow Extended
- Option C : TensorFlow Hub
- Option D : TensorFlow Lite Interpreter

Correct Answer: A

Explanation/Reference:

TensorFlow Lite Model Maker provides a graphical interface and easy-to-use API for converting and optimizing models for mobile deployment. It simplifies the process of adapting pre-trained TensorFlow models to TensorFlow Lite format and applying common optimizations such as quantization, making it accessible for developers working on mobile and IoT projects.

QUESTION: 6

What is the purpose of the cv2 module in OpenCV?

- Option A : To interface with sensors
- Option B : To run machine learning algorithms
- Option C : To manage GPIO pins
- Option D : To handle image and video processing

Correct Answer: D

Explanation/Reference:

The cv2 module in OpenCV is used for image and video processing. It provides various functions for tasks such as reading, writing, and manipulating images and videos, which are essential for computer vision applications.

QUESTION: 7

What is the primary advantage of using Non-Negative Matrix Factorization (NMF) over PCA in text data analysis?

- Option A : NMF is better at capturing global structure
- Option B : NMF can handle negative values in the dataset
- Option C : NMF provides a parts-based representation of data
- Option D : NMF requires fewer computational resources

Correct Answer: C

Explanation/Reference:

Non-Negative Matrix Factorization (NMF) is advantageous in text data analysis because it provides a parts-based representation of data, meaning that the factors it extracts are additive and can be interpreted as parts of the original data. This is particularly useful in text mining, where topics or features are typically non-negative and interpretable. Unlike PCA, which provides a global view of the variance in the data, NMF allows for a more meaningful decomposition in contexts where

the components need to be non-negative, such as identifying topics in documents.

QUESTION: 8

Which TensorFlow Lite feature is used to enable real-time inference on edge devices?

- Option A : TensorFlow Federated
- Option B : TensorFlow Hub
- Option C : TensorFlow Extended
- Option D : TensorFlow Lite Micro

Correct Answer: D

Explanation/Reference:

TensorFlow Lite Micro is used to enable real-time inference on edge devices with very limited computational resources. It provides a minimal runtime environment and optimizations specifically designed for microcontrollers and other low-power devices, allowing for efficient execution of machine learning models in real-time.

QUESTION: 9

In natural language processing, what is the primary advantage of using word embeddings over one-hot encoding?

- Option A : Ability to capture semantic relationships between words
- Option B : Compatibility with non-neural network models
- Option C : Simplicity in implementation
- Option D : Reduced computational cost

Correct Answer: A

Explanation/Reference:

Word embeddings, such as Word2Vec or GloVe, represent words as dense vectors in a continuous vector space, capturing semantic relationships between words based on their context in large corpora. Unlike one-hot encoding, which creates sparse vectors with no inherent relationship between different words, word embeddings allow similar words to have similar vector representations. This capability to capture semantic meaning and relationships is a significant advantage, enabling models to understand the context and meaning of words better, leading to improved performance in various NLP tasks. Additionally, word embeddings can generalize better across different texts and domains compared to the more rigid one-hot encoding.

QUESTION: 10

How can you extract text from a tab-delimited file using pandas?

- Option A : `pd.read_fwf()`
- Option B : `pd.read_table()`
- Option C : `pd.read_csv('\t')`
- Option D : `pd.read_json()`

Correct Answer: B

Explanation/Reference:

`pd.read_table()` handles tab-delimited files by default, reading them into DataFrames and allowing for flexible data manipulation.

QUESTION: 11

Which feature distinguishes SAC from other off-policy algorithms like DDPG and TD3?

- Option A : Use of soft Bellman backup
- Option B : Implementation of target network updates
- Option C : Use of deterministic policy
- Option D : Application of experience replay

Correct Answer: A

Explanation/Reference:

SAC is distinguished by its use of soft Bellman backup, which incorporates entropy regularization into the value function update. This approach enhances exploration and stability compared to the deterministic backups used in algorithms like DDPG and TD3.

QUESTION: 12

What does the Gensim library primarily offer for NLP tasks?

- Option A : Named entity recognition
- Option B : Sentiment analysis
- Option C : Text preprocessing and vectorization
- Option D : Topic modeling and document similarity

Correct Answer: D

Explanation/Reference:

Gensim specializes in topic modeling and document similarity tasks, offering implementations of algorithms like LDA (Latent Dirichlet Allocation) for discovering topics in large text corpora.

QUESTION: 13

What is the main challenge associated with the variance of Policy Gradient estimates?

- Option A : It can lead to slow convergence and unstable learning
- Option B : It complicates the implementation of target networks
- Option C : It requires large experience replay buffers
- Option D : It makes the reward signals less informative

Correct Answer: A

Explanation/Reference:

High variance in Policy Gradient estimates can lead to slow convergence and unstable learning because it causes large fluctuations in policy updates. Variance reduction techniques, such as using baseline functions or advantage functions, are employed to mitigate this issue and stabilize learning.

QUESTION: 14

In the context of the Bellman Equation, what is the role of the discount factor (γ)?

- Option A : Adjust Future Reward
- Option B : Normalize Action Values
- Option C : Update State Transitions
- Option D : Modify State-Action Probabilities

Correct Answer: A

Explanation/Reference:

The discount factor (γ) adjusts the importance of future rewards in the Bellman Equation, balancing the immediate and future rewards in the value function calculation.

QUESTION: 15

Which Keras method is used to compile a model with a specified loss function and optimizer?

- Option A : `model.fit()`
- Option B : `model.evaluate()`
- Option C : `model.summary()`
- Option D : `model.compile()`

Correct Answer: D

Explanation/Reference:

The `model.compile()` method is used to configure the model's loss function, optimizer, and metrics before training begins. This method prepares the model for the training phase by setting up the necessary components for loss calculation, parameter updates, and performance evaluation.

QUESTION: 16

Which Raspberry Pi model has the highest performance for computer vision tasks?

- Option A : Raspberry Pi 2
- Option B : Raspberry Pi 4
- Option C : Raspberry Pi 1
- Option D : Raspberry Pi 3

Correct Answer: B

Explanation/Reference:

The Raspberry Pi 4 offers the highest performance among the listed models due to its improved CPU, GPU, and increased RAM options. This enhanced performance makes it more suitable for demanding computer vision tasks.

QUESTION: 17

How can you handle missing values when importing a CSV file into pandas?

- Option A : Use `replace()`
- Option B : Use `dropna()`
- Option C : Use `convert_dtypes()`
- Option D : Use `fillna()`

Correct Answer: D

Explanation/Reference:

`fillna()` allows you to handle missing values by filling them with a specified value or method, improving data quality after import.

QUESTION: 18

How does TensorFlow's `tf.keras.layers.Layer` differ from `tf.keras.layers.Dense`?

- Option A : `tf.keras.layers.Dense` requires custom activation functions, while `tf.keras.layers.Layer` does not
- Option B : `tf.keras.layers.Layer` can only be used for convolutional operations
- Option C : `tf.keras.layers.Layer` is an abstract base class, while `tf.keras.layers.Dense` is a concrete layer implementation
- Option D : `tf.keras.layers.Layer` performs matrix operations, while `tf.keras.layers.Dense` does not

Correct Answer: C

Explanation/Reference:

`tf.keras.layers.Layer` is an abstract base class in TensorFlow, serving as a foundation for building custom layers. It provides the basic structure and functionality that other layers can extend. In contrast, `tf.keras.layers.Dense` is a concrete implementation of a fully connected layer that performs specific operations (linear transformations) and includes built-in functionality like activation functions. Thus, `tf.keras.layers.Dense` inherits from `tf.keras.layers.Layer` and is used to create dense (fully connected) neural network layers.

QUESTION: 19

In a multi-class classification problem, how can you compute the overall accuracy from a confusion matrix?

- Option A : Sum the true positives and true negatives, and divide by the total number of samples
- Option B : Average the recall across all classes
- Option C : Average the precision across all classes
- Option D : Compute the F1 score for each class and average them

Correct Answer: A

Explanation/Reference:

Overall accuracy in a multi-class classification problem is computed by summing the true positives and true negatives across

all classes and dividing by the total number of samples. This gives the proportion of correctly classified instances across all classes.

QUESTION: 20

What is a common strategy to handle a model that is suffering from underfitting?

- Option A : Increase model complexity by adding more layers or neurons
- Option B : Simplify the model architecture
- Option C : Apply data augmentation
- Option D : Reduce the training dataset size

Correct Answer: A

Explanation/Reference:

Underfitting often results from a model being too simple to capture the data's underlying patterns. To address this, you can increase the model's complexity by adding more layers or neurons, which allows the model to learn more complex representations and improve performance on both training and validation datasets.

QUESTION: 21

What type of plot would you use to compare the performance metrics of different models across multiple evaluation criteria?

- Option A : Line Chart
- Option B : Bar Chart
- Option C : Radar Chart
- Option D : Box Plot

Correct Answer: C

Explanation/Reference:

A Radar Chart is ideal for comparing the performance metrics of different models across multiple evaluation criteria. It displays data on a multi-axis grid, allowing for visual comparison of various metrics in a single plot. Each axis represents a different criterion, and the chart's shape helps in understanding the overall performance of each model in relation to the criteria.

QUESTION: 22

In Keras, what does the `tf.keras.Model.fit()` method do during training?

- Option A : It trains the model on the dataset
- Option B : It compiles the model
- Option C : It evaluates the model's performance
- Option D : It saves the model to a file

Correct Answer: A

Explanation/Reference:

The `tf.keras.Model.fit()` method trains the model on a dataset. It takes the input data, labels, and other parameters (like epochs and batch size) to perform the training process, adjusting the model's weights based on the loss function and optimizer specified during the compilation phase.

QUESTION: 23

In Keras, which class is used to define a custom training loop?

- Option A : `tf.keras.Model`
- Option B : `tf.keras.callbacks.Callback`
- Option C : `tf.keras.layers.Layer`
- Option D : `tf.keras.optimizers.Optimizer`

Correct Answer: A

Explanation/Reference:

To define a custom training loop in Keras, you use the `tf.keras.Model` class, where you can override methods like `train_step` and `test_step` to implement custom training logic. This allows for fine-grained control over the training process, including custom loss calculations and metric tracking.

QUESTION: 24

Which GAN variant is specifically designed to improve stability and training efficiency?

- Option A : Wasserstein GAN (WGAN)
- Option B : CycleGAN
- Option C : Conditional GAN (cGAN)
- Option D : Deep Convolutional GAN (DCGAN)

Correct Answer: A

Explanation/Reference:

Wasserstein GANs (WGANs) are designed to address stability and training efficiency issues in GANs by using the Wasserstein loss, which provides smoother gradients and better convergence properties.

QUESTION: 25

Which TensorFlow tool is specifically designed to optimize models for deployment on mobile and IoT devices?

- Option A : TensorFlow Serving
- Option B : TensorFlow Cloud
- Option C : TensorFlow Model Analysis
- Option D : TensorFlow Lite Converter

Correct Answer: D

Explanation/Reference:

The TensorFlow Lite Converter is specifically designed to optimize TensorFlow models for deployment on mobile and IoT devices. It converts models into the TensorFlow Lite format, which is optimized for performance and efficiency on resource-constrained devices. This tool supports quantization, pruning, and other techniques to reduce model size and improve inference speed on mobile platforms.

QUESTION: 26

In dynamic programming, what does the term "policy evaluation" refer to?

- Option A : Comparing different policies for effectiveness
- Option B : Updating the policy based on new data
- Option C : Selecting the best action in each state
- Option D : Calculating the value function for a given policy

Correct Answer: D

Explanation/Reference:

Policy evaluation involves calculating the value function for a given policy to assess its performance, which is crucial for iterative policy improvement.

QUESTION: 27

Which Monte Carlo method is particularly useful when dealing with episodic tasks where the environment is non-stationary?

- Option A : Every-Visit MC
- Option B : On-Policy MC
- Option C : Off-Policy MC
- Option D : First-Visit MC

Correct Answer: C

Explanation/Reference:

Off-Policy Monte Carlo methods are useful for dealing with non-stationary environments and episodic tasks, as they allow the value function to be updated based on experiences from different policies.

QUESTION: 28

During the model development phase, which step is crucial for ensuring that a model generalizes well to unseen data?

- Option A : Model Deployment
- Option B : Hyperparameter Tuning
- Option C : Feature Engineering
- Option D : Data Splitting into Training, Validation, and Test Sets

Correct Answer: D

Explanation/Reference:

Data splitting into training, validation, and test sets is crucial for evaluating how well a model generalizes to unseen data. This process helps in assessing model performance, avoiding overfitting, and ensuring that the model is not just memorizing the training data but can make accurate predictions on new, unseen data.

QUESTION: 29

What is the role of V2X communication in modern traffic management systems?

- Option A : To enhance vehicle-to-vehicle communication for safety features

- Option B : To provide entertainment and infotainment options for drivers
Option C : To control the speed of vehicles on highways
Option D : To connect vehicles with traffic lights and other infrastructure for improved coordination

Correct Answer: D

Explanation/Reference:

V2X (Vehicle-to-Everything) communication enables vehicles to communicate with traffic lights, road signs, and other infrastructure, allowing for better coordination and management of traffic flow and safety.

QUESTION: 30

In a multiclass classification problem, what does the term "class imbalance" refer to?

- Option A : Disparity in the number of samples per feature
Option B : Unequal distribution of classes in the dataset
Option C : Inconsistent labeling of training data
Option D : Variability in feature values across different classes

Correct Answer: B

Explanation/Reference:

Class imbalance refers to an unequal distribution of classes in the dataset, where some classes have significantly more samples than others. This imbalance can lead to biased models that perform well on majority classes but poorly on minority ones.

QUESTION: 31

Which TD learning variant involves updating the value function based on the difference between the estimated value of the current state and the reward plus the value of the next state?

- Option A : TD(λ)
Option B : Q-Learning
Option C : SARSA
Option D : Actor-Critic

Correct Answer: B

Explanation/Reference:

Q-Learning updates the value function based on the difference between the estimated value of the current state-action pair and the reward plus the value of the next state-action pair, using the maximum value over actions.

QUESTION: 32

Which technique is used to visualize high-dimensional word embeddings in 2D or 3D?

- Option A : UMAP
- Option B : PCA
- Option C : t-SNE
- Option D : ICA

Correct Answer: C

Explanation/Reference:

t-SNE is employed to reduce the dimensionality of word embeddings, making it possible to visualize their relationships in 2D or 3D while preserving local structure.

QUESTION: 33

Which method in spaCy is used to perform named entity recognition (NER) on a text?

- Option A : doc.pos_
- Option B : doc.dep_
- Option C : doc.vector
- Option D : doc.ents

Correct Answer: D

Explanation/Reference:

doc.ents provides a list of named entities recognized in the text, including entities like people, organizations, and locations, which is used in named entity recognition tasks.

QUESTION: 34

In multiclass classification, what does the term "class probability calibration" refer to?

- Option A : Normalizing features to balance class distribution
- Option B : Modifying class probabilities to better reflect true likelihoods
- Option C : Adjusting class probabilities to ensure they sum to one
- Option D : Standardizing class probabilities for numerical stability

Correct Answer: B

Explanation/Reference:

Class probability calibration involves adjusting the predicted probabilities so they more accurately reflect the true likelihood of each class. Techniques such as Platt scaling or isotonic regression are used to improve probability estimates.

QUESTION: 35

Which type of Monte Carlo method specifically evaluates the value of a policy based on the average returns of states visited under that policy?

- Option A : On-Policy MC
- Option B : Policy Gradient MC
- Option C : Off-Policy MC
- Option D : Model-Free MC

Correct Answer: A

Explanation/Reference:

On-Policy Monte Carlo methods evaluate the value of a policy based on the average returns of states visited while following that same policy, ensuring that the value estimates reflect the policy being evaluated.

QUESTION: 36

Which strategy is commonly used to address the exploration-exploitation trade-off in the Multi-Armed Bandit problem?

- Option A : Temporal Difference Learning
- Option B : Value Iteration
- Option C : Gradient Descent
- Option D : Epsilon-Greedy

Correct Answer: D

Explanation/Reference:

The Epsilon-Greedy strategy addresses the trade-off by selecting the best-known action with high probability and exploring random actions with a small probability (epsilon).

QUESTION: 37

What is a primary advantage of using sentence embeddings over word embeddings?

- Option A : More Detailed Word Representations
- Option B : Contextual Understanding of Sentences
- Option C : Simplified Tokenization
- Option D : Better Handling of Synonyms

Correct Answer: B

Explanation/Reference:

Sentence embeddings capture the context and meaning of entire sentences, providing a more holistic representation than word embeddings.

QUESTION: 38

What is the purpose of using "dynamic lane management" in traffic control?

- Option A : To create additional lanes for emergency vehicles
- Option B : To maintain the physical condition of road lanes
- Option C : To synchronize lane changes with traffic signals
- Option D : To assign lanes to different traffic types based on real-time demand

Correct Answer: D

Explanation/Reference:

Dynamic lane management allows for the assignment of lanes to different traffic types (e.g., high-occupancy vehicles) or directions based on real-time demand, optimizing road usage and reducing congestion.

QUESTION: 39

What is the key advantage of the "Thompson Sampling" method over the "Upper Confidence Bound" (UCB)

method in Multi-Armed Bandits?

- Option A : Thompson Sampling is simpler to implement
- Option B : Thompson Sampling performs better in environments with large action spaces
- Option C : Thompson Sampling naturally handles uncertainty in reward estimates
- Option D : Thompson Sampling does not require parameter tuning

Correct Answer: C

Explanation/Reference:

Thompson Sampling inherently accounts for uncertainty in reward estimates by sampling from posterior distributions, providing a natural way to balance exploration and exploitation.

QUESTION: 40

In sentence embeddings, what does the Universal Sentence Encoder model provide?

- Option A : Word-Level Vectors
- Option B : Token Frequency Counts
- Option C : Fixed-Length Sentence Embeddings
- Option D : Character-Level Embeddings

Correct Answer: C

Explanation/Reference:

The Universal Sentence Encoder provides fixed-length embeddings for sentences, facilitating tasks like semantic similarity and text classification.

QUESTION: 41

How does the Dueling DQN architecture enhance the learning of value functions?

- Option A : By incorporating a second experience replay buffer for improved stability
- Option B : By combining Q-values with advantage values to better separate value and advantage estimates
- Option C : By adding a recurrent layer to capture temporal dependencies
- Option D : By using a separate network to compute the discount factor for future rewards

Correct Answer: B

Explanation/Reference:

The Dueling DQN architecture improves value function learning by separating the estimation of the state value and the advantage of actions. It uses two streams: one for estimating the state value and another for estimating the advantage of actions. The combined value provides a more precise Q-value estimation, especially in states where action values are similar.

QUESTION: 42

Which Monte Carlo method variant estimates the value function using returns for every state-action pair within an episode?

- Option A : Temporal Difference MC
- Option B : Every-Visit MC
- Option C : Policy Gradient MC
- Option D : First-Visit MC

Correct Answer: B

Explanation/Reference:

Every-Visit Monte Carlo methods estimate the value function by averaging returns for all visits to a state or state-action pair within an episode, not just the first visit.

QUESTION: 43

Which of the following is a key characteristic of embedded methods in feature selection?

- Option A : Feature selection occurs during model training
- Option B : They remove features before model training
- Option C : They rely on hypothesis testing
- Option D : They use external evaluation metrics

Correct Answer: A

Explanation/Reference:

Embedded methods integrate feature selection into the model training process, allowing the algorithm to select features while optimizing its performance. This approach combines the strengths of filter and wrapper methods, making it computationally efficient and more accurate in identifying relevant features. Lasso and Ridge Regression are examples of embedded methods, where the model itself penalizes less important features during training, leading to a more streamlined and effective model.

QUESTION: 44

Which Raspberry Pi accessory is commonly used to capture images and videos?

- Option A : USB Keyboard
- Option B : GPIO Expansion Board
- Option C : External Hard Drive
- Option D : Raspberry Pi Camera Module

Correct Answer: D

Explanation/Reference:

The Raspberry Pi Camera Module is specifically designed for capturing images and videos. It connects directly to the Raspberry Pi and provides high-quality imaging capabilities, ideal for computer vision applications.

QUESTION: 45

What is the primary purpose of the `tf.keras.layers.ReLU` activation function in deep learning?

- Option A : To apply regularization
- Option B : To introduce non-linearity into the model
- Option C : To normalize input data
- Option D : To prevent overfitting

Correct Answer: B

Explanation/Reference:

The `tf.keras.layers.ReLU` activation function introduces non-linearity into the model by outputting the input value if it is positive and zero otherwise. This non-linearity enables the model to learn complex patterns and relationships in the data, which is crucial for capturing intricate features in deep learning.

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