

AI and ML in Human Health: Advanced Applications

AI And ML In Health · Answer Key · 8 Questions

1. Which type of neural network architecture is particularly effective for analyzing sequential data like electrocardiogram (ECG) signals to detect arrhythmias?

- A) Convolutional Neural Networks (CNNs)
- B) Recurrent Neural Networks (RNNs)**
- C) Generative Adversarial Networks (GANs)
- D) Autoencoders

2. In medical imaging, transfer learning, often using pre-trained CNNs on large natural image datasets like ImageNet, is frequently applied to tasks such as identifying diabetic retinopathy from retinal scans. What is the primary benefit of this approach?

- A) It eliminates the need for any labeled medical data.
- B) It reduces the amount of labeled medical data required for effective training.**
- C) It guarantees a higher diagnostic accuracy than training from scratch.
- D) It allows for the direct generation of synthetic medical images with perfect realism.

3. Deep learning models, specifically graph convolutional networks (GCNs), have shown promise in predicting drug-target interactions. How do GCNs represent molecular structures for this purpose?

- A) As sequences of atoms and bonds.
- B) As pixel grids similar to images.
- C) As graphs where nodes represent atoms and edges represent bonds.**
- D) As high-dimensional vectors derived from chemical descriptors.

4. Natural Language Processing (NLP) techniques are used to extract information from unstructured clinical notes. Which NLP task is crucial for identifying mentions of diseases, symptoms, and medications in these notes?

- A) Text summarization
- B) Machine translation
- C) Named Entity Recognition (NER)**
- D) Sentiment analysis

5. Reinforcement learning (RL) is being explored for optimizing treatment strategies, such as in personalized cancer therapy. What defines the 'state' in an RL environment for such a medical application?

- A) The specific drug dosage administered.
- B) The patient's current physiological and clinical parameters.**
- C) The predicted outcome of the treatment.
- D) The overall cost of the therapy.

6. In genomics and personalized medicine, ML algorithms are used to predict a patient's response to certain drugs based on their genetic profile. Which ML model is commonly employed for this classification task?

- A) K-Means clustering
- B) Principal Component Analysis (PCA)
- C) Support Vector Machines (SVMs)**
- D) DBSCAN

7. Explainable AI (XAI) is gaining importance in healthcare for building trust in ML-driven diagnostic tools. For image-based diagnostics, what is a common XAI technique used to highlight the regions in an image that contributed most to a model's prediction?

- A) Principal Component Analysis (PCA)
- B) LIME (Local Interpretable Model-agnostic Explanations)**
- C) K-Nearest Neighbors (KNN)
- D) Decision Trees

8. The development of federated learning has significant implications for training ML models on sensitive patient data across multiple healthcare institutions. What is the core principle of federated learning in this context?

- A) All patient data is aggregated into a single, secure central server for training.
- B) Model training occurs locally on each institution's data, with only model updates shared.**
- C) Data anonymization is performed by a third-party intermediary before training.
- D) Only anonymized patient records are used for training, but data remains decentralized.