

AI in Astrophysics and Space Exploration

Artificial Intelligence · Answer Key · 18 Questions

1. Which NASA mission used the 'Planet Hunters' citizen science project alongside convolutional neural networks to confirm the existence of Kepler-90i?

- A) Hubble Space Telescope
- B) Kepler Space Telescope**
- C) James Webb Space Telescope
- D) TESS

2. The AEGIS (Autonomous Exploration for Gathering Increased Science) system is primarily used to control the camera instruments on which Mars rover?

- A) Perseverance
- B) Curiosity**
- C) Opportunity
- D) Sojourner

3. In the context of the Gaia mission, what specific AI-driven technique is primarily used to process petabytes of data to determine the precise positions and motions of stars?

- A) Bayesian inference**
- B) Gradient boosting
- C) Random forests
- D) Reinforcement learning

4. What is the primary function of the 'CIMON' (Crew Interactive Mobile Companion) AI system used on the International Space Station?

- A) Navigation control
- B) Structural monitoring
- C) Astronaut assistance**
- D) Radiation shielding

5. Which machine learning algorithm was famously used by researchers to identify the 'Earth-sized' exoplanet K2-18b in existing Kepler mission data?

- A) Support Vector Machines
- B) Deep Neural Networks**
- C) K-Nearest Neighbors
- D) Hidden Markov Models

6. The 'AutoNav' system, utilized by the Perseverance rover, performs what specific autonomous function during traverse operations?

- A) Fuel cell management
- B) Path planning and hazard avoidance**
- C) Deep space telemetry relay
- D) Soil chemical composition analysis

7. What specific type of neural network architecture has been successfully applied to identify faint gravitational lensing signals in large-scale cosmic structure surveys?

- A) Generative Adversarial Networks
- B) Recurrent Neural Networks
- C) ResNet (Residual Networks)**
- D) Boltzmann Machines

8. What is the primary challenge that the 'Artificial Intelligence for Space' (AI4Space) initiative aims to solve for satellite constellations?

- A) Collision avoidance**
- B) Atmospheric re-entry
- C) Fuel propulsion optimization
- D) Interstellar communication

9. Which astronomical observatory utilizes AI-based 'real-time transient detection' to identify supernovae and other high-energy events in the night sky?

- A) Zwicky Transient Facility (ZTF)**
- B) Chandra X-ray Observatory
- C) Very Large Array
- D) Spitzer Space Telescope

10. In the classification of galaxy morphologies, what tool was developed to automate the sorting process by mimicking human visual cortex processing?

- A) Galaxy Zoo's automated classification
- B) DeepGalaxy**
- C) Morphology-CNN
- D) Cosmos-AI

11. The 'SHERLOC' instrument on the Perseverance rover uses an AI-integrated system to select targets for what purpose?

- A) Atmospheric pressure logging
- B) Mineralogical analysis**
- C) Radioisotope heating
- D) Sub-surface water mapping

12. Which organization developed the 'Federated Learning' framework to improve privacy-preserving data analysis for distributed satellite networks?

- A) ESA**
- B) NASA
- C) SpaceX
- D) JAXA

13. What is the primary computational method used by the 'Deep-sky' AI model to improve image resolution for ground-based telescopic observations?

- A) Super-resolution convolutional neural networks**
- B) Linear regression modeling
- C) Decision tree clustering
- D) Principal component analysis

14. The 'Mars Helicopter' Ingenuity used a vision-based navigation system that relied on which fundamental AI technique to estimate its position relative to the surface?

- A) Natural Language Processing
- B) Optical flow estimation**
- C) Sentiment analysis
- D) Genetic algorithms

15. Which specific deep learning approach is currently used to filter radio frequency interference from SETI (Search for Extraterrestrial Intelligence) signal data?

- A) Autoencoders**
- B) Q-learning
- C) Support Vector Regression
- D) Naive Bayes

16. The 'AstroNet' model was designed to perform what specific task regarding exoplanet detection from light-curve data?

- A) Atmospheric composition analysis
- B) Binary classification of signals**
- C) Orbital stability prediction
- D) Stellar mass estimation

17. Which AI-based method is commonly used to predict solar flares by analyzing the magnetic complexity of solar active regions?

- A) Long Short-Term Memory (LSTM) networks**
- B) K-means clustering
- C) Simulated annealing
- D) Dynamic time warping

18. What is the main objective of the 'NASA Frontier Development Lab' (FDL) in the space sector?

A) Developing rocket propulsion

B) Applying AI to space exploration challenges

C) Astronaut recruitment

D) Space law lobbying