

Possible Questions for the AI exam

AI in general (3 questions)

1. What is the field of Artificial Intelligence about?
2. What is the difference between strong AI and weak AI?
3. List three advances in AI that are not considered as AI nowadays, but general computer science.
4. What is the Turing test?
5. Who was John McCarthy?
6. List two things crucial to deep learning that were not readily available 10 years ago.
7. List three tasks that were solved by deep learning much better than previous algorithms.
8. List three tasks in natural language processing.
9. List three tasks in computer vision.

Search (6 questions)

10. What is a state-space? Give an example (for example, the state space of the sliding puzzle).
11. What is an operator? Give an example (for example, the operators of the sliding puzzle).
12. What is the difference between the state-space and the problem space? Give an example where they are different, and explain how (for example, for the sliding puzzle).
13. What is the local search (how is it different from the general search problem)?
14. Define the algorithm of the hill climbing search.
15. What is the main difference between hill climbing and the tabu search?
16. What is the advantage of the tabu search compared to hill climbing?
17. What is the main difference between hill climbing and simulated annealing?
18. What are heuristics? Give an example (for example, a heuristic for the sliding puzzle).
19. List three problems where you would use backtracking search.
20. Define the algorithm of the simpler backtracking search (BT1).
21. When do we backtrack in the backtracking search?
22. What is an ordinal strategy (heuristic)? Give an example for an ordinal heuristic (for example, for the n-queens problem).
23. What is a cutting strategy? Describe the look forward cutting strategy.
24. List three problems where you would use graph search.
25. What is the evaluation function (f) in graph search?
26. What is the cost function (g) in graph search?
27. What do we use the heuristic function (h) for in graph search?
28. What do we use the parent pointer function (π) for in graph search?
29. Define the algorithm of the general graph search.
30. List three non-informed graph search algorithms, and define them in terms of f , g , and $c(n, m)$.
31. Define two heuristic graph search algorithms, and define them in terms of f , g , and h .
32. What is an admissible heuristic?
33. What is the relationship between f , g , and h in the A* algorithm?
34. What can we say about the memory complexity of the A* algorithm?
35. What can we say about the time complexity of the A* algorithm?
36. What kind of games can we use the minimax algorithm for? Give an example of such a game.
37. What does it mean that a game is zero-sum?

38. Draw a game tree and explain its parts.
39. What can we say about the outcome of two-player, perfectly informed, finite and deterministic games where either one of the player wins or it's a draw?
40. Describe the minimax algorithm.
41. Why do we need an evaluation function when using the minimax algorithm?
42. Describe the alpha-beta search.
43. What is the main advantage of the alpha-beta search compared to the minimax algorithm?
44. What are the main components of evolutionary search (individuals, etc.)? Define them.
45. List and define the evolutionary operators.
46. Describe the high-level algorithm of evolutionary search.
47. What is neuroevolution?
48. Describe a problem where evolutionary search could be used and define the individual, the representation, and the fitness function.
49. List three strategies for selection and define them.
50. List three strategies for crossover and define them.

Learning (6 questions)

51. What is an epoch?
52. What is a minibatch?
53. Why do we use separate training and test sets?
54. Why do we use a validation set in addition to the training and test sets?
55. What is the classification problem? Give an example.
56. Define and plot the sigmoid activation function.
57. Define the softmax activation function.
58. Define and plot the ReLU activation function.
59. Define the binary cross-entropy loss function.
60. Define the cross-entropy loss function.
61. What would be the activation function in the output layer and what kind of loss function would you use for a binary classification problem?
62. What would be the activation function in the output layer and what kind of loss function would you use for a multiclass classification problem?
63. What is a stopword? Give three examples.
64. What is stemming? Give an example.
65. What is a language model?
66. What is the difference between bag of words and TFIDF?
67. What kind of hyperplane is the Support Vector Machine (SVM) trying to learn?
68. What do we use a confusion matrix for?
69. How does k-fold cross-validation work?
70. How does the shuffle and split cross-validation work?
71. What is grid search? Why do we use it?
72. What is the difference between grid search and random search? Which would you use if you had lots of hyperparameters and why?
73. What does a word embedding do? Why do we use it?
74. Define the equations of a simple RNN.
75. Why would we use GRUs and LSTMs instead of simple RNNs?
76. What is clustering? Give an example.
77. What is the difference between hard and soft clustering?

78. Define the k-means problem, either formally or in text.
79. Define the k-means algorithm.
80. List three issues that can arise when using the k-means algorithm.
81. What does Latent Semantic Analysis do?
82. List three reasons to use dimensionality reduction.
83. What does correlation measure?
84. What does Principal Component Analysis do?
85. Define the algorithm of Principal Component Analysis.
86. What is the relationship between Principal Component Analysis and Singular Value Decomposition?
87. What does an autoencoder do?
88. What are the components of an autoencoder? What are they for?
89. Why doesn't an autoencoder do just an identity transformation?