師大資工三 人工智慧　　期中考(2023-04-13)　　Ch1~4

一、(2 分)單選題：Thinking Humanly is a view of Artificial Intelligence, where the system

(A) behaves like a human.

(B) thinks in the best possible way.

(C) must protect humans from any danger.

(D) uses same cognitive processes as a human.

二、(2 分)單選題：Artificial Intelligence is about _____.

(A) playing a game on computer

(B) making a machine intelligent

(C) programming on machine with your own intelligence

(D) putting your intelligence in machine

三、 (2 分)單選題：Who is known as the "Father of AI"?

(A) Stuart Russell　　(B) Alan Turing　　(C) John McCarthy　　(D) Ramón y Cajál

四、(2 分)單選題：A technique that was developed to determine whether a machine could or could not demonstrate the artificial intelligence is known as the _____.

(A) machine learning　(B) Turing test　(C)neural network　(D)AlphaZero

五、 (2 分)單選題：How does Weak AI differ from Strong AI?

(A) Weak AI contains basic information like programmed response while Strong AI contains high cognitive information like the ability to reason.

(B) Weak AI is a developing type of intelligence while the Strong AI is already established.

(C) Strong AI is better than weak AI because it is an improved version.

(D) Strong AI is widely used compare to Weak AI.

六、(2 分)Artificial General Intelligence or AGI looks for a universal algorithm for learning and acting in any environment. 根據以上的定義，請問 Artificial General Intelligence 和 Artificial Intelligence 的差別為何？

七、 (16 分) Brains and digital computers have somewhat different properties. The following table shows a crude comparison of a leading supercomputer, Summit (2017); a typical personal computer of 2019; and the human brain.

	Supercomputer	**Personal Computer**	**Human Brain**
Computational units	10^6 GPUs + CPUs 10^{15} transistors	8 CPU cores 10^{10} transistors	10^6 columns 10^{11} neurons
Storage units	10^{16} bytes RAM 10^{17} bytes disk	10^{10} bytes RAM 10^{12} bytes disk	10^{11} neurons 10^{14} synapses
Cycle time	10^{-9} sec	10^{-9} sec	10^{-3} sec
Operations/sec	10^{18}	10^{10}	10^{17}

(A)Human brain power has not changed much in thousands of years, whereas supercomputers have improved from megaFLOPs in the 1960s to gigaFLOPs in the 1980s, teraFLOPs in the 1990s, petaFLOPs in 2008, and exaFLOPs in 2018 (1 exaFLOP = 10^{18} floating point operations per second). 從以上的敘述，請問 megaFLOP、gigaFLOPs、teraFLOP、petaFLOP 分別是 10 的多少次方？

(B)從以上(A)的敘述，請問 supercomputers 從 1960s 到 2018 加快了多少倍？

(C)The above table shows that computers have a cycle time that is a million times faster than a brain. 請問這是如何從上表中算出來的？

(D)The brain makes up for that with far more storage and interconnection than even a high-end personal computer. 請問這是如何從上表中得出來的結論？

(E)But the largest supercomputers match the brain on some metrics. 請問這是如何從上表中得出來的結論？

(F)Even with a computer of virtually unlimited capacity, we still require further conceptual breakthroughs in our understanding of intelligence. Crudely put, without the right theory, faster machines just give you the wrong answer faster. 請問以上的敘述對人工智慧的未來是悲觀還是樂觀的看法？為甚麼？

(G)上表中 Cycle time 指的是甚麼？

(H)上表中 neurons 和 synapses 有何差別？

八、 (2 分)單選題：What is the activation function in a neuron?

(A) Function used to enable neural network to solve non-linear problems.

(B) An optimization algorithm used to find the values of parameters (coefficients) of a function (f) that minimizes a cost function (cost).

(C) Function describes how computationally expensive is a neural network.

(D) A way to determine how well the machine learning model has performed given the different values of each parameter.

九、 (2 分)單選題：Which of the following statement is not correct?

(A) Neural networks mimic the human brain.

(B) Neural networks can only work for a single input and a single output.

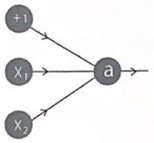
(C) Neural networks can be used in image classification.

(D) Neural networks consist of many neurons, each neuron takes an input, processes it and gives an output.

十、(2 分)單選題：Let us assume we implement an AND function to a single neuron. Below is a tabular representation of an AND function:

X1	X2	X1 and X2
0	0	0
0	1	0
1	0	0
1	1	1

The activation function of our neuron "a" shown below is denoted as: $f(x) = \begin{cases} 0, & for\ x < 0 \\ 1, & for\ x \geq 0 \end{cases}$



For which values of Bias, w1, and w2 does our neuron implement an AND function?

(A) Bias = -1.5, w1 = 1, w2 = 1

(B) Bias = 1.5, w1 = 2, w2 = 2

(C) Bias = 1, w1 = 1.5, w2 = 1.5

(D) None of these

十一、 (2 分) 單選題：上題 neuron 的 activation function 比較接近以下何者？

(A) Linear function (B) Sign function (C) Sigmoid function (D) Step function

十二、 (2 分)上題的 neuron 若想實現 OR function，請你設定一組 Bias、w1 及 w2 的值，並說明一下它們為何會正確實現 OR function。

十三、 (2 分) 單選題：What are the steps for using a gradient descent algorithm?

1. Calculate error between the actual value and the predicted value.
2. Reiterate until you find the best weights of network.
3. Pass an input through the network and get values from output layer.
4. Initialize random weights.
5. Go to each neuron which contributes to the error and change its respective weights to reduce the error.

(A) 1, 2, 3, 4, 5 (B) 5, 4, 3, 2, 1 (C) 3, 2, 1, 5, 4 (D) 4, 3, 1, 5, 2

十四、 (2 分)單選題：An AI agent perceives upon the environment using _____.

(A) Sensors (B) Speakers (C) Actuators (D) Robots

十五、 (2 分)單選題：What is meant by agent's percept sequence?

(A) Used to perceive the environment

(B) Complete history of actuator

(C) Complete history of perceived things

(D) Used to change the environment

十六、 (4 分)單選題：下表中間有 4 個空格，請填空。

	Solitaire (接龍)	Backgammom (西洋雙陸棋戲)	Internet shopping	Taxi
Observable??	FULL	FULL	PARTIAL	PARTIAL
Deterministic??				
Episodic??	NO	NO	NO	NO
Static??	YES	YES	SEMI	NO
Discrete??	YES	YES	YES	NO

十七、 (2 分)單選題：The PEAS in the task environment is about _____.

(A) Peer, Environment, Actuators, Sense

(B) Performance, Environment, Actuators, Sensors

(C) Perceiving, Environment, Actuators, Sponsors

(D) Python, Environment, Actuators, States

十八、 (4 分)試列出 Taxi driver agent 的 PEAS。(請至少各寫出一項)

十九、 (2 分)單選題：Which rule is applied for the simple reflex agent?

(A) Table-driven rule
(B) Neuron-action rule
(C) Condition-action rule
(D) Critic-improvement rule

二十、 (2 分)單選題：Which agent deals with the happy and unhappy state?

(A) Utility-based agent
(B) Model-based agent
(C) Goal-based Agent
(D) Learning Agent

二十一、 (2 分)單選題：Web Crawler(網路爬蟲程式) is an example of _____.

(A) Intelligent Agent
(B) Problem-solving agent
(C) Simple reflex agent
(D) Model-based agent

二十二、 (2 分)單選題：Which of the given element improve the performance of AI agent so that it can make better decisions?

(A) Changing Element (B) Performance Element (C) Learning Element (D) Actuator Element

二十三、 (2 分)單選題：In state-space, the set of actions for a given problem is expressed by the _____.

(A) intermediate States
(B) successor function that takes current action and returns next state
(C) initial State
(D) heuristic function

二十四、 (2 分)單選題：A search algorithm is said as complete if _____.

(A) it ends with a solution if any exists
(B) it begins with a complete solution
(C) it does not end with a solution
(D) it contains a loop

二十五、 (2 分)單選題：To solve a problem, which search algorithm requires less memory?

(A) A* Search (B) Depth First Search (C) Breadth-First Search (D) Bidirectional Search

二十六、 (2 分)單選題：Which search strategy is also called as blind search?

(A) Uninformed search (B) Informed search (C) Hill-climbing search (D) IDA* search

二十七、 (2 分)單選題：Which search is implemented with an empty first-in-first-out queue?

(A) Depth-first search (B) Breadth-first search (C) Bidirectional search (D) Hill-climbing search

二十八、 (2 分)單選題：Which search algorithm imposes a fixed depth limit on nodes?

(A) Depth-limited search (B) Depth-first search (C) Iterative deepening search (D) Bidirectional search

二十九、 (2 分)單選題：Which search implements stack operation for searching the states?

(A) Bidirectional search (B) Hill-climbing search (C) Breadth-first search (D)Depth-first search

三十、 (2 分)單選題：Consider a problem whose search space is a tree, with an initial state located at level 0 and a single goal state located at level 5. How many times will a state at level 3 be generated by iterative deepening search?

(A) 1 (B) 2 (C) 3 (D) 4

三十一、 (2 分)單選題：A* algorithm is based on _____.

(A) Breadth-first search (B) Depth-first search (C) Best-first search (D) Hill climbing

三十二、 (2 分)單選題：A* is optimal if h(n) is an admissible heuristic, that is, provided that h(n) never _____ the cost to reach the goal.

(A) unequals (B) equals (C) underestimates (D) overestimates

三十三、 (18 分)考慮一個 state space graph，其中 start state 是數字 1 。而每一個 state k 有三個後繼(successor)的 states： 數字 3k-1、3k 和 3k+1。

(A) 請畫出 states 1 到 21 的 state space。

(B) 請問branching factor b值是多少?

(C) 假設goal state是18。請依序列出使用breadth-first search會拜訪的節點(數字)的順序。

(D) 假設 goal state 是 18。請依序列出使用 depth-first search 會拜訪的節點(數字)的順序。

(E) 假設 goal state 是 18。請依序列出使用 depth-limited search with limit 3 會拜訪的節點(數字)的順序。

(F) 假設 goal state 是 18。請依序列出使用 iterative deepening search 會拜訪的節點(數字)的順序。

(G) 假設 goal state 是 18。請依序列出使用 bidirectional search 會拜訪的節點(數字)的順序。

(H) 如果 goal state 是 n 且 n 值很大(例如 1000000)，請問以上(C)～(G)的五種算法中，哪一種會拜訪的節點總數量最少？

(I) 如果 goal state 是 n 且 n 值很大(例如 1000000)，請問以上(C)～(G)的五種算法中，哪一種所使用的空間最多？

三十四、 (2 分)單選題：In many problems the path to goal is _____, this class of problems can be solved using local search techniques.

(A) Short (B) long (C) irrelevant (D) relevant

三十五、 (2 分)單選題：When will hill-climbing algorithm terminate?

(A) Stopping criterion met

(B) Global minimal is achieved

(C) No neighbor has better value

(D) Global maximal is achieved

三十六、 (2 分)複選題：What are the main disadvantages of hill-climbing search?

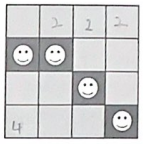
(A) Terminates at local optimum

(B) Terminates at global optimum

(C) Does not find optimum solution

(D) Fail to find a solution

三十七、 (4 分) Start with the configuration shown right.

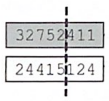


(A) Apply the hill-climbing search to solve the 4-queens problem. The heuristic cost function is the number of pairs of queens that are attacking each other. Please trace the hill-climbing search step by step. You can choose randomly among the set of best neighbors. 註:neighbor function 是 queen 可垂直移動，上下移動其中一個 queen 就是一個 neighbor。

(B) 請改用 random-restart hill-climbing search，若 restart 一百過，請問會得出甚麼結果？

三十八、 (6分) Simulated Annealing Search是模擬冷卻晶體的算法。上題的4-queens problem有時改用Simulated Annealing Search反而有可能會找到正解。請你以上題的例子來說明一個可能找到正解的搜索過程。

三十九、 (4 分)假設你使用 genetic algorithm 來解 8-queens problem.



(甲)請問圖中<2, 4, 4, 1, 5, 1, 2, 4>表示的盤面為何？請繪圖表示之。

(乙)若定義 Fitness function = number of non-attacking pairs of queens，則請問<2, 4, 4, 1, 5, 1, 2, 4>盤面的 Fitness function 值為何？

(丙)請執行右圖中的 crossover operation on these pairs of chromosomes at the indicated points.請寫出執行後產生的兩個後代(兩行)的空格內容。

(丁)請問這兩個產生的後代都有比較好嗎？