

RIPPLE ENGLISH

ACTIVE LEARNING PROGRAM

Workbook for:
“Artificial Intelligence: What It Truly Can Do”

問題は解きっぱなしにしないで！

英語資格試験の学習は、**解いた後の復習をしなければほとんど効果はありません。**

答え合わせをしておしまいせず、**テキストの音読練習やリスニング、多読学習などのインプット学習を何度も反復して記憶に定着させましょう。**ホームページからダウンロードできる音読練習用のテキストをぜひご活用ください。

また、数日置いてから再度解き直すのも効果的です。答えを記憶してしまっているかもしれませんが、**回答の根拠をなぞりながら繰り返し解くことで有効な復習になります！**



Artificial Intelligence: What It Truly Can Do

1. A British science fiction writer Arthur C. Clarke famously wrote, “Any sufficiently advanced technology is **indistinguishable** from magic,” and that is very much the case with Artificial Intelligence today. In 2016, Google’s Go-playing algorithm called AlphaGo defeated the world Go champion, Lee Sedol. Go is the most complex board game that requires intuition and creativity, so the game had long been considered to be difficult for machines. But AI **prevailed** over humans much earlier than predicted, making headlines around the world. Machine Intelligence has achieved impressive results in practical fields as well, such as labeling pictures, recognizing spoken language, and driving cars. News like this will make AI seem even more like magic. But it is essentially a computer software, not an almighty god. The only thing computers can do is computing—mathematical calculations. Instead of being tricked by its illusion, we need to understand what exactly is AI—what it can do and what it can’t do—and properly evaluate its potential impact to the economy and to our daily lives.
2. Most computer scientists define AI as a computer algorithm powered by advanced machine learning. Let’s start with an algorithm. An algorithm is a set of steps that can be used to reach decisions and resolve problems. An algorithm isn’t a particular solution or decision, but the method or process followed when providing a solution. For example, if you want to calculate the average between two numbers, you can use a simple algorithm. The algorithm says: ‘First step: add the two numbers together. Second step: divide the sum by two.’ When you enter the numbers 3 and 5, you will get 4. When you enter 64 and 82, you will get 73. In other words, an algorithm is a set of procedure that produces output based on specific input.

- (1) The word “indistinguishable” in the passage is closest in meaning to
 - A. identical
 - B. unclear
 - C. better
 - D. opposite
- (2) The word “prevail” in the passage is closest in meaning to
 - A. persist
 - B. spread
 - C. triumph
 - D. persuade
- (3) According to paragraph 2, which of the following best explains an algorithm?
 - A. An algorithm is the result of solving a problem.
 - B. An algorithm is a set of steps to calculate the average between two numbers.
 - C. An algorithm is a method to perform calculations correctly.
 - D. An algorithm is a process to generate an outcome depending on what’s given.

3. Computer algorithms run essentially the same way. But they work on much more complicated problems by harnessing its massive computing power. For example, go-playing algorithm receives input such as the current face of the board and the last move by the opponent, and generates output, which is your next move that most likely claims victory. Similarly, text-to-image algorithms like Stable Diffusion are given text descriptions as input and generate a corresponding picture as the output. Algorithms for medical diagnosis are fed with skin images of a patient, and then detect cancer and other potential health risks.
4. 19 years before AlphaGo defeated the human champion, IBM’s chess-playing computer “Deep Blue” beat the human chess champion, Garry Kasparov. These two achievements look almost identical, **but these two board game algorithms were built quite differently.** Deep Blue was programmed by expert chess players and computer scientists, while AlphaGo learned by itself. Learning is the key thing here. AlphaGo self-learned how to play the game of go from data. In other words, Deep Blue had human teachers, but AlphaGo didn’t. Instead, AlphaGo was taught by data. First, AlphaGo was fed with 100,000 games that strong amateurs played as a training data set and mimicked human players. Then, it played against different versions of itself millions of times and learned from its own data.
5. This self-learning mechanism is called “machine learning.” The idea itself is nothing new, but due to the massive increases in computing power in recent years, machine learning has become extremely powerful. Machine learning involves a variety of methods as its subset, including Deep neural network, which essentially imitates the way neurons work in the brain. The whole **beauty** of machine learning algorithms is that because they are learning for themselves, they can go beyond what we human programmers know how to do. They make breakthroughs in many practical areas, such as image recognition and self driving.

- (4) According to paragraph 3, which of the following is true?
- A. Algorithms for board games predict the next move opponent that most likely taken by the opponent.
 - B. Computer algorithms depends on powerful calculation capacity to solve difficult problems.
 - C. Stable Diffusion gives you a text description based on given images.
 - D. Algorithms for medicine figure out the best treatment based on skin images of a patient.
- (5) Which of the following text best expresses the essential information in the highlighted sentence?
- ..but these two board game algorithms were built quite differently.**
- A. Deep Blue was programmed by expert chess players and AlphaGo was programmed by strong amateurs.
 - B. Deep Blue had human teachers and AlphaGo was taught by computers.
 - C. Deep Blue was taught how to play chess, while AlphaGo was taught how to play go.
 - D. Deep Blue was programmed how to play chess, while AlphaGo was programmed to learn how to play go by itself.
- (6) The word “beauty” in the passage is closest in meaning to
- A. grace
 - B. virtue
 - C. allure
 - D. profit

6. One of the technologies that have been accelerated by the latest machine learning is image labeling, which is essential for self-driving cars. In order to drive safely, the machine has to be able to tell the difference between a plastic bag, which can be run over, and a cat on the road, which should definitely be avoided.
7. Previously, if you wanted an algorithm to identify a strawberry, for example, the only choice was to teach machines what exactly is a strawberry. We had to mathematically define the fruit; red, almost cone-shaped with shiny texture and regular dots, and so on. But what if it's not ripe? What if it's bitten and not the shape of a cone? You have to predict every possible case, including very unusual ones, and put them into the algorithm. Machine learning gets humans free from this ridiculously troublesome work. Instead of teaching machines by human hands, we feed vast amount of pictures as training data. Some of them have to include strawberries. Then the machine figures out distinctive characteristics of the fruit and self-learns how to identify the object.
8. Machine learning seems to possess infinite possibilities, but we have to be aware of its limitations. First, machines don't understand. They successfully identify the object, not by understanding what it means, but by relying on statistics and pattern recognition. They only know that the new image is similar to previously seen images that are labeled "strawberry." The same is true for machine translation algorithms. When you type in "strawberry" on Google translate, soon you get the result. But it doesn't know what exactly is strawberry. It only learned from data to give back "ichigo" when asked the translation of "strawberry." Second limitation is that they depend on enormous amount of data. For human infants to learn how to identify strawberries, they only have to see the object several times. But computers require millions of images as training data. The drastic increase in machine learning capability in the last decade is due to the easier and cheaper access to big data.

(7) According to paragraph 7, image recognition was difficult without machine learning NOT because

- A. we had to feed huge amount of data to the algorithm.
- B. it was hard to stipulate the object in detail by human hand.
- C. strawberries, for instance, are not always red.
- D. we had to define the object in mathematical languages.

(8) According to paragraph 8, which of the following is NOT true?

- A. Huge amount of data is indispensable to machine learning.
- B. Even human infants are smarter and more intelligence than the latest machine learning algorithms.
- C. Machine translation algorithms don't understand what the given text means though they can produce the right translation.
- D. We should be careful not to overestimate the machine learning capabilities.

9. There is a type of algorithm called “reinforcement learning,” which doesn’t require training data and learns from trial and error alone. Just one year after AlphaGo beat Lee Sedol, the team developed a much more elegant algorithm named AlphaZero. Unlike its previous version, AlphaZero knows nothing beyond the rules of the game and learns literally from scratch. Instead of learning from human data, it simply plays against itself completely randomly and continually improves from every game it plays. In 2018, AlphaZero defeated Stockfish8, the 2016 top algorithm in chess. Can you guess how long it took AlphaZero to learn chess from scratch, prepare for the match against Stockfish? Only four hours. Not four years or four days. Just four hours of self-reinforcement learning brought AlphaZero to be the strongest chess algorithm in the world. Reinforcement learning is fit to any tasks which can clearly state its goal and limiting conditions. In self-driving, for example, the goal is to move from point A to point B as quickly as possible. Limiting conditions include not crushing with other cars and not hitting the wall. Then you let the simulation run for a number of times. At first, cars on the software drive completely randomly and perform quite miserably. However, they gradually learn to drive safe and eventually outperform human drivers.

10. Machine intelligence still falls far short of human intelligence. Though machines can learn to avoid a cat on a road, they don’t understand what a cat is, and never find cats adorable. A Human driver can go home and make pancakes for his daughter and read books, while a self-driving algorithm can do nothing else but drive. However, all we want for a taxi is to bring us to the destination as quickly, safely and cheaply as possible. What will the labor market in the future look like when computers outperform humans in specific tasks like driving a car, diagnosing cancer and even drawing a picture?

(9) According to paragraph 9, which of the following is true?

- A. Self-driving algorithms can learn from human data and quickly outperform human drivers.
- B. AlphaZero defeated Stockfish8 in a match within only 4 hours.
- C. Algorithms can learn to drive by itself because it is suitable for reinforcement learning.
- D. AlphaZero learned the rule of go by itself.

(10) Within the whole passage, all of the following were mentioned, EXCEPT

- A. Development of computer algorithms in recent years is in part driven by increases in computing power and accessible data.
- B. How we work and what we do may possibly be quite different in the future.
- C. Computers can outperform humans in some specific skills.
- D. Machine intelligence has already prevailed over human intelligence.

- (1) A
- (2) C
- (3) D
- (4) B
- (5) D
- (6) B
- (7) A
- (8) B
- (9) C
- (10) D

(1) 文中の “indistinguishable” に意味がもっとも近いのは

- A. **identical** (まったく同じの、一致する)
- B. unclear (はっきりしない)
- C. better (よりよい)
- D. opposite (反対の)

(2) 文中の “prevail” に意味がもっとも近いのは

- A. persist (存続する)
- B. spread (広まる)
- C. **triumph** (勝利する)
- D. persuade (説得する)

(3) 2段落によると、アルゴリズムについてもっともよく説明しているのは

- A. An algorithm is the result of solving a problem (アルゴリズムは問題解決の結果だ)
- B. An algorithm is a set of steps to calculate the average between two numbers (アルゴリズムは2つの数の平均を計算する一連のステップのことだ)
- C. An algorithm is a method to perform calculations correctly (アルゴリズムは計算を正しく行うための方法のことだ)
- D. **An algorithm is a process to generate an outcome depending on what's given** (アルゴリズムは、与えられたものに基づいて結果を生み出すプロセスのことだ)

(4) 3段落の内容として正しいのは

- A. Algorithms for board games predict the next move opponent that most likely taken by the opponent.
 - B. **Computer algorithms depends on powerful calculation capacity to solve difficult problems.**
 - C. Stable Diffusion gives you a text description based on given images.
 - D. Algorithms for medicine figure out the best treatment based on skin images of a patient.
- A: 本文では、次の相手の手を予測するのではなく、次の自分の打ち手の中でもっとも勝利につながりそうなものをアウトプットすると行っているので誤り。B: 本文”But they work on much more complicated problems by harnessing its massive computing power.” に合致。C: 逆。D: 本文では、導き出すのは治療法ではなく診断結果と述べているので誤り。

(5) 下線部の内容をもっとも正しく説明しているのは以下のうちどれか？

- ..but these two board game algorithms were built quite differently.
- A. Deep Blue was programmed by expert chess players and AlphaGo was programmed by strong amateurs. (Deep Blueはチェスのプロによってプログラムされたが、AlphaGoはアマチュアによってプログラムされた)
 - B. Deep Blue had human teachers and AlphaGo was taught by computers. (Deep Blueは人間の先生によって教えられたが、AlphaGoはコンピュータに教えられた)
 - C. Deep Blue was taught how to play chess, while AlphaGo was taught how to play go. (Deep Blueはチェスのしかたを、AlphaGoは囲碁のしかたを教えられた)
 - D. **Deep Blue was programmed how to play chess, while AlphaGo was programmed to learn how to play go by itself.** (Deep Blueがチェスのしかたをプログラムされたのに対し、AlphaGoは囲碁のしかたを独習するようプログラムされた)

(6) 文中の “beauty” に意味がもっとも近いのは

- A. grace (美しさ、優美さ)
- B. **virtue** (美点、長所)
- C. allure (性的魅力)
- D. profit (利益)

(7)7段落によると、機械学習を用いない場合に画像認識が難しかった理由として不適切なのは

- A. **we had to feed huge amount of data to the algorithm.** (アルゴリズムに大量のデータを与えなければならないから)
 - B. it was hard to stipulate the object in detail by human hand. (対象物を人の手で規定するのが難しいから)
 - C. strawberries, for instance, are not always red. (たとえばいちごは必ずしも常に赤色ではないから)
 - D. we had to define the object in mathematical languages. (対象物を数学的な言語で定義しなければならないから)
- Aのみ、機械学習を用いた場合の画像認識の話をしているので誤り。

(8) 8段落の内容として誤りなのは

- A. Huge amount of data is indispensable to machine learning. (機械学習には膨大なデータが必要)
 - B. **Even human infants are smarter and more intelligence than the latest machine learning algorithms.**
 - C. Machine translation algorithms don't understand what the given text means though they can produce the right translation. (機械翻訳は正確な翻訳を出せるものの、与えられたテキストの意味はわかっていない)
 - D. We should be careful not to overestimate the machine learning capabilities. (機械学習の可能性を過大評価しないよう注意すべきだ)
- B: ヒトの幼児ははるかに少ない学習経験から学べるとは言っているが、「ヒトの幼児のほうが機械学習アルゴリズムより賢くて知的だ」とまでは言っていない。

(9) 9段落の内容に合致するのは？

- A. Self-driving algorithms can learn from human data and quickly outperform human drivers. (自動運転アルゴリズムは人間のデータから学びすぐに人間のドライバーを凌駕する)
 - B. AlphaZero defeated Stockfish8 in a match within only 4 hours. (AlphaZeroはたった4時間の試合時間でstockfish8を打ち破った)
 - C. **Algorithms can learn to drive by itself because it is suitable for reinforcement learning.** (運転は強化学習に向いているのでアルゴリズムは独習することができる)
 - D. AlphaZero learned the rule of go by itself. (AlphaZeroは囲碁のルールを独習した)
- A: 強化学習においては人のデータは必要としていない。B: 4時間は試合時間ではなく、強化学習に要した時間。D: 囲碁のルールだけは人に教えられている。

(10) 全パッセージの内容にそぐわないものは

- A. Development of computer algorithms in recent years is in part driven by increases in computing power and accessible data. (近年のコンピュータ・アルゴリズムの発展は、演算能力と入手できるデータの増加によるところがある)
 - B. How we work and what we do may possibly be quite different in the future. (将来私たちがどのように働き何をしているかは大きく変わっている可能性がある)
 - C. Computers can outperform humans in some specific skills. (コンピュータはいくつかの特定のスキルにおいて人間を凌駕する)
 - D. **Machine intelligence has already prevailed over human intelligence.** (機械知性はすでに人間の知性を凌いでいる)
- A: 5段落、8段落の内容に合致。B: 10段落”What will the labor market in the future look like when computers outperform humans in specific tasks like driving a car, diagnosing cancer and even drawing a picture?” に合致。C: 9、10段落に合致。D: 特定のスキルにおいて人よりうまくやれるだけで、人間の知性を超えているとは言及していない。