RIPPLE ENGLISH Active Learning Program

Workbook for:

"Human Intelligence and Computer Intelligence"

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Human Intelligence and Computer Intelligence

- 1. We are about to undergo the Fourth Industrial Revolution. Historically speaking, Industrial Revolutions have been caused by the arrival of general purpose technologies, or GPTs. For example, the First Industrial Revolution was triggered by the invention of steam engines, which could be utilized for various uses, such as weaving cloths, moving trains, and sailing ships. The upcoming revolution is driven by the development of artificial intelligence. Generative AI, particularly large language models, are dramatically transforming how we work and live. Though it's quite certain that things are changing fast, it is impossible to predict the future. In the face of volatile situations, what we need to do is not to predict the future, but to return to basics and understand the fundamental principles. The specifics are constantly changing, but if you grasp the essence, it will be a reliable foundation to make better decisions. Now that intelligence is no longer a human monopoly, we need to know what intelligence actually is, and understand the potential of AI in comparison with the human brain. What are the similarities and differences between human intelligence and machine intelligence?
- (1) The word "upcoming" in the passage is closest in meaning to A. imminent
 - B. ongoing
 - C. drastic
 - D. outstripping
- (2) According to paragraph 1, what should we focus on in the face of rapidly changing technology during the Fourth Industrial Revolution?
 - A. Predicting specific future technological developments.
 - B. Ignoring the changes and continuing with traditional methods.
 - C. Understanding the basics to make informed decisions.
 - D. Relying solely on human intelligence to navigate the changes.

- 2. Contrary to the general impression, AI is not a perfect and universal solution. In fact, machines cannot perform well without enough and proper learning, like humans. For example, Mark Twain was one of the greatest writers in American literature, but obviously he couldn't even speak a word when he was a new-born baby. He needed to absorb vocabulary and learn grammatical rules by being exposed to English spoken by people around him, listening to his mother read aloud, and having his mistakes corrected by his teacher. He might have said "I goed to the park" and his mother might have corrected him by saying, "You went to the park, right?"
- 3. Similarly, machines cannot generate sentences without sufficient learning. For example, large language models learn vast amounts of text data from various sources; papers, literatures, news articles, descriptions in encyclopedias, and so on. The data size is equivalent to 10 million books. From this massive dataset, the algorithm extracts correct sentence patterns. The same is true for image recognition algorithms. For a machine to identify a certain object in a picture, it has to learn from tens of thousands of image data. As of 2024, at least, AI can only function well when it has properly learned from huge amount of data. By contrast, a human child doesn't have to read a million books to speak a language or train on thousands of pictures of apples to identify the fruit. Some people have the unrealistic expectation that AI can easily solve everything, but to build and fine-tune AI, we have to prepare an enormous volume of data and get machines to efficiently learn from it.

(3) According to paragraph 2, what is a similarity between human learning and machine learning?

A. Both humans and machines can perform perfectly without prior learning.

B. Both require proper learning to perform well.

C. Machines can learn without any input, unlike humans.

D. Humans do not need to be corrected when learning new information.

(4) According to paragraph 3, which of the following is NOT true?

A. Large language models learn from a dataset equivalent to 10 million books. B. Image recognition algorithms require tens of thousands of images to learn to identify objects.

C. AI can learn more efficiently than human children.

D. Human children need far less data to learn to speak a language compared to AI.

- 4. Surprisingly, human intelligence and artificial intelligence process information in similar ways with similar structures. The majority of our cognitive functions are handled by a part of the brain called the neocortex, which is composed of six interconnected layers. Information processing involves moving across different layers and regions, building an abstract and integrated understanding from fragmented pieces of information. Think about the case when you hear someone say "song." First of all, the brain identifies each phoneme captured by the auditory system; namely, your brain perceives the sounds of "s" "o" "n" and "g." This information is sent to other parts of the brain where it is combined and perceived as a word "song." Then, the recognized word is integrated with the entire sentence and the context. If you heard words like "band" or "the Beatles" right before, the brain infers that the word "song" means what humans sing, not a bird's cry. In this way, linguistic information begins with the recognized and comprehensive understanding through multiple layers and regions.
- 5. Next, take a look at how artificial intelligence processes natural languages with a hierarchical structure. The lowest layer identifies specific individual characters or words. As it moves towards the upper layers, the processing becomes more comprehensive and abstract, integrating co-occurring words, the underlying context, and so on.
- 6. Why are they so similar to each other? It is because the foundation of the latest machine learning technologies were inspired by the structure and functions of the human brain. In a sense, the development of computer science is the result of our challenges to **reproduce** human brain functions with silicon and mathematics.

(5) According to paragraph 4, which of the following is true?

A. The neocortex is composed of three layers.

B. Language processing is done all at once in one region.

C. Language processing involves multiple parts of the brain.

D. Human intelligence and artificial intelligence process information in entirely different ways.

(6) According to paragraph 5, how does artificial intelligence process natural language?

A. It starts with abstract concepts and moves to specific details.

B. It processes all information at the same hierarchical level.

C. It focuses on the context without considering individual characters or words.

D. It begins with identifying individual characters or words and moves to more comprehensive and abstract processing.

(7) The word "reproduce" in the passage is closest in meaning to

- A. manufacture
- B. duplicate
- C. verify
- D. improve

(8) According to paragraph 6, why are human intelligence and machine intelligence so similar?

A. Because they both rely on silicon and mathematics for processing.

B. Because the latest machine learning technologies were prompted by the human brain's structure and functions.

C. Because artificial intelligence and human intelligence has converged in the similar form by evolving independently.

D. Because both types of intelligence process information in the same way naturally.

- 7. Computers have 4 distinctive abilities that humans can never have; variety of perception, connectivity, **replicability**, and updatability.
- 8. First, machines can perceive information that humans cannot. For example, a human driver can only rely on visible light within the range of infrared and ultraviolet to understand the surroundings. However, a self-driving car detects a wide variety of information, such as laser light and supersonic waves when it's equipped with necessary devices.
- 9. Second, computers can be connected to each other. Since humans are separate individuals, human drivers cannot communicate to each other instantaneously. When two vehicles are about to collide, the drivers cannot avoid it by telling each other to turn right. Unlike human drivers, self-driving algorithms are not separate entities. They are part of a single network connected on the Internet, so they can communicate to each other to drive safely, smoothly, and efficiently. Even if you are the best driver in the world, you will fall far short of self-driving algorithms for a single reason that you are not connected with other vehicles.
- 10. Thirdly, machines can be replicated. Imagine how much it would cost to produce one capable doctor. He or she takes more than 20 years to mature and has to finish the whole expensive course at a medical school. Despite such a huge cost, the doctor has to retire after 40 to 50 years. Therefore, society has to spend the cost of producing a capable doctor all over again. By contrast, machines and algorithms can be replicated instantly and inexpensively. It may take years and billions of dollars to train an algorithm for medical diagnosis, but once the final product is achieved, it can be mass-produced and deployed at hospitals all over the world.
- 11. Furthermore, every time a new medical paper is published, these algorithms can easily be updated simultaneously, while human doctors are too busy working, playing with their children, and doing the housework to read all these papers. In the face of such substantial differences in performance, where will there be room left for human workers.

- (9) The word "replicability" in the passage is closest in meaning to
 - A. The nature of being commonly widespread in the world.
 - B. The ability to be easily adapted to the given situation.
 - C. The ability to be quickly and cheaply duplicated for widespread use.
 - D. The ability to automatically produce its own copy.

(10) According to paragraph 8, what is an advantage of machines over humans in perceiving information?

A. Machines rely only on visible light like humans.

B. Machines can detect a wider range of information, such as laser light and supersonic waves.

C. Humans can perceive more types of information than machines.

D. Self-driving cars can only detect information within the range of infrared and ultraviolet light.

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

A. Human drivers can communicate instantaneously to avoid collisions.

B. Self-driving algorithms are separate entities that function independently.

C. Self-driving algorithms can communicate with each other to enhance driving safety.

D. The best human drivers are as efficient as self-driving algorithms because they can connect with other vehicles.

(12) According to paragraph 10, what is an advantage of machines over humans in terms of production and deployment?

A. Machines and algorithms require more time and money to produce than humans.

B. Machines and algorithms can be replicated instantly and inexpensively once developed.

C. Human doctors can be mass-produced like machines.

D. It is less expensive to train a human doctor than to develop an algorithm.

- 12. One of the most profound differences between human and computer intelligence is whether they understand meanings. If you ask machines to translate a word "apple" or identify apples within a picture, they will do the job perfectly for you. However, computers don't understand what an apple actually is. We humans hear the word "apple" and immediately remember how it tastes and feels in our mouths, or possibly associate it with a certain technology company or a legendary hero of Switzerland.
- 13. Computers never act this way, but, up till now, this doesn't seem to matter. Alan Turing, the great mathematician who laid the foundations of modern computer science, already had insight into this matter back in 1950. He proposed the idea called the "Turing test." When you talk with a machine in a natural language, if you feel that you are talking to a real person, the machine has intelligence. In other words, he shifted the matter of whether the machine has intelligence or not onto the matter of subjective perceptions of human beings. The Turing test seems right. For example, large language models don't understand the meaning of the text they generate; they are simply sequencing words that are statistically most likely to follow the previous word in the given context. Whether you ask for career counseling or tutoring in quantum physics, ChatGPT and Google Gemini will give you better answers than the vast majority of the human population. However, they are merely pretending to understand, and never know the dilemma in difficult career decisions and mysterious behavior of quanta. Yet, they are capable enough for commercial use.
- 14. In conclusion, it makes little sense to consider which intelligence is better than the other. The CEO of NVIDIA, Jensen Huang, said, "Some worry that AI may take their jobs. Someone who is an expert with AI will." What truly makes sense is to utilize computer intelligence to effectively complement human intelligence, which requires a profound understanding of the features and differences of these two types of intelligence.

(13) According to paragraph 12, which of the following is NOT true?

A. Computers understand the meaning and associated experiences of an apple.

B. Computers can identify apples within a picture.

C. Computers can perfectly translate the word "apple."

D. Humans can associate the word "apple" with personal experiences and memories.

(14) According to paragraph 13, what was Alan Turing's significant insight regarding machine intelligence?

A. Machines must fully understand the meaning of their responses.

B. The intelligence of a machine is determined by its ability.

C. The perception of intelligence in a machine is based on what humans feel.

D. Large language models understand the meaning of the text they generate.

(15) According to paragraph 14, what is the key to effectively utilizing AI in the workplace?

A. Determining which type of intelligence is superior.

B. Ensuring that AI and human intelligence are kept separate.

C. Using AI to complement human intelligence through a deep understanding of both.

D. Replacing human intelligence entirely with AI.

(16) Within the whole passage, all of the following are mentioned, EXCEPT,

A. Large language models learn from vast amount of text data, including papers, news articles, transcriptions of documentaries, and descriptions in encyclopedias.

B. AI requires vast amounts of data for proper learning and functioning.

C. Human workers are sometimes too busy to catch up with all the updates in one's professional realm.

D. Generative AI, especially large language models, are transforming work and life dramatically.

Answers

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

(11) C (12) B

(13) A (14) C

(15) C

(16) A

(1) 文中の"upcoming (来たるべき)"と意味が最も近いのは
A. imminent (差し迫った)
B. ongoing (進行中の)
C. drastic (劇的な、抜本的な)
D. outstripping (追い越す)

(2)1段落によると、第4次産業革命の時代に急速に変化する技術に直面して、私たちは何に重点を置くべきか?

A. Predicting specific future technological developments.(特定の将来の技術開発を予測する。)

B. Ignoring the changes and continuing with traditional methods. (変化を無視して従来の方法を続ける。)

C. Understanding the basics to make informed decisions. (情報に基づいた決定を下すために基本原則を理解する。)

D. Relying solely on human intelligence to navigate the changes. (変化を乗り越えるために人間の知性だけに 頼る)

(3)3段落によると、人間の学習と機械学習の類似点は何か?

A. Both humans and machines can perform perfectly without prior learning. (人間も機械も、事前の学習がなくても完璧に実行できる)

B. Both require proper learning to perform well. (どちらも、うまく機能するには適切な学習が必要だ) C. Machines can learn without any input, unlike humans. (機械は人間とは異なり、インプットなしで学習で きる)

D. Humans do not need to be corrected when learning new information. (人間は新しい情報を学習するときに 修正する必要はない。)

(4) 3段落の内容に合致しないのは?

A. Large language models learn from a dataset equivalent to 10 million books. (大規模言語モデルは、1,000 万 冊の本に相当するデータセットから学習する)

B. Image recognition algorithms require tens of thousands of images to learn to identify objects. () 画像認識アル ゴリズムは、物体を識別するために学習するために数万枚の画像を必要とする
C. AI can learn more efficiently than human children. (AIは人間の子供より効率的に学習できる)
D. Human children need far less data to learn to speak a language compared to AI. (人間の子供は、AI と比較し て、言語を話すことを学ぶのにはるかに少ないデータしか必要としない)

(5) 4段落の内容に合致するのは?

A. The neocortex is composed of three layers. (大脳新皮質は3層で構成されている)

B. Language processing is done all at once in one region. (言語処理は1つの領域で一挙に行われる)

C. Language processing involves multiple parts of the brain. (言語処理は複数の脳部位が関わっている)

D. Human intelligence and artificial intelligence process information in entirely different ways. (ヒトの知能と人 工知能はまったく異なる方法で言語を処理している)

(6)5段落によると、人工知能は自然言語をどのように処理するか?

A. It starts with abstract concepts and moves to specific details. (抽象的な概念から始まり、具体的な詳細に進む)

B. It processes all information at the same hierarchical level. (すべての情報を同じ階層レベルで処理する)

C. It focuses on the context without considering individual characters or words. (個々の文字や単語を考慮せず に文脈に焦点を当てる)

D. It begins with identifying individual characters or words and moves to more comprehensive and abstract processing. (個々の文字や単語を識別することから始まり、より包括的で抽象的な処理に進む)

(7)文中の "reproduce" と意味が最も近いのは
A. manufacture (製造する)
B. duplicate (複製する、再現する)
C. verify (検証する、証明する)
D. improve (改善する)

(8)6段落によると、人間の知能と機械の知能はなぜそれほど似ているのか?

A. Because they both rely on silicon and mathematics for processing. (どちらも処理にシリコンと数学に依存しているから)

B. Because the latest machine learning technologies were prompted by the human brain's structure and functions. (最新の機械学習技術は人間の脳の構造と機能にヒントを得たから)

C. Because artificial intelligence and human intelligence has converged in the similar form by evolving independently. (人工知能と人間の知能は独立して進化することで、同様の形に収束したから)

D. Because both types of intelligence process information in the same way naturally. (どちらのタイプの知能も 自然に同じように情報を処理するから)

(9) 文中の "replicability" の意味をもっともよく言い表しているのは

A. The nature of being commonly widespread in the world. (世界中で広く普及している性質。) B. The ability to be easily adapted to the given situation. (与えられた状況に容易に適応できる能力)

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C. The ability to be quickly and cheaply duplicated for widespread use. (広範囲に使用できるように迅速か つ安価に複製できる能力)

D. The ability to automatically produce its own copy. (自動的に独自のコピーを作成する能力。) BとDが紛らわしいが、今回の文脈だと、機械が自己複製するわけではないのでDは誤り。

(10)8段落によると、情報を認識する上で機械が人間より優れている点は何か?

A. Machines rely only on visible light like humans. (機械は人間と同様に可視光のみに頼っている)

B. Machines can detect a wider range of information, such as laser light and supersonic waves. (機械はレー ザー光や超音波など、より広範囲の情報を検出できる)

C. Humans can perceive more types of information than machines. (人間は機械よりも多くの種類の情報を認識できる)

D. Self-driving cars can only detect information within the range of infrared and ultraviolet light. (自動運転車は 赤外線と紫外線の範囲内の情報しか検出できない)

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

A. Human drivers can communicate instantaneously to avoid collisions. (人間の運転手は衝突を避けるために 瞬時に通信することができる)

B. Self-driving algorithms are separate entities that function independently. (自動運転アルゴリズムは独立して 機能する別個のエンティティだ)

C. Self-driving algorithms can communicate with each other to enhance driving safety. (自動運転アルゴリズムは、運転の安全性を高めるために互いに通信することができる)

D. The best human drivers are as efficient as self-driving algorithms because they can connect with other vehicles. (最高の人間の運転手は他の車両と接続できるため、自動運転アルゴリズムと同じくらい効率的だ)

(12) 10段落によると、生産と展開の面で機械が人間より優れている点は何か?

A. Machines and algorithms require more time and money to produce than humans. (機械とアルゴリズムは、人間よりも生産に時間と費用がかかる)

B. Machines and algorithms can be replicated instantly and inexpensively once developed. (機械とアルゴリズムは、一度開発されると、即座に安価に複製できる)

C. Human doctors can be mass-produced like machines. (人間の医師は、機械のように大量生産できる)

D. It is less expensive to train a human doctor than to develop an algorithm. (アルゴリズムを開発するよりも、 人間の医師を訓練する方が費用がかからない)

(13) 12段落の内容に合致しないのは?

A. Computers understand the meaning and associated experiences of an apple. (コンピュータはリンゴの意味とそれに関連する経験を理解できる)

B. Computers can identify apples within a picture. (コンピュータは画像内のリンゴを識別できる)

C. Computers can perfectly translate the word "apple." (コンピュータは「リンゴ」という単語を完璧に翻訳できる)

D. Humans can associate the word "apple" with personal experiences and memories. (人間は「リンゴ」という 単語を個人的な経験や記憶と関連付けることができる) A. Machines must fully understand the meaning of their responses. (機械は応答の意味を完全に理解する必要がある)

B. The intelligence of a machine is determined by its ability. (機械の知能はその能力によって決まる)

C. The perception of intelligence in a machine is based on what humans feel. (機械に知能を認識するかどうかは、人間の感覚に基づいている)

D. Large language models understand the meaning of the text they generate. (大規模言語モデルは、生成したテキストの意味を理解している)

(15)14段落によると、職場でAIを効果的に活用するための鍵は何か?

A. Determining which type of intelligence is superior. (どのタイプの知能が優れているかを判断すること)

B. Ensuring that AI and human intelligence are kept separate. (AIと人間の知能を区別すること)

C. Using AI to complement human intelligence through a deep understanding of both. (両方を深く理解する ことで、AIを使用して人間の知能を補完すること)

D. Replacing human intelligence entirely with AI. (人間の知能を完全にAIに置き換えること)

(16) 全パッセージの内容に含まれていないものは?

A. Large language models learn from vast amount of text data, including papers, news articles, transcriptions of documentaries, and descriptions in encyclopedias. (大規模言語モデルは、論文、ニュース記事、ドキュ メンタリーの書き起こし、百科事典の説明など、膨大な量のテキストデータから学習する) B. AI requires vast amounts of data for proper learning and functioning. (AIが適切に学習して機能するには、

B. Ar requires vast amounts of data for proper learning and functioning. (Arか過のに子音して機能) 膨大な量のデータが必要だ)

C. Human workers are sometimes too busy to catch up with all the updates in one's professional realm. (人間の労働者は忙しすぎて、専門分野の最新情報をすべて把握できないことがある)

D. Generative AI, especially large language models, are transforming work and life dramatically. (生成AI、特に 大規模言語モデルは、仕事と生活を劇的に変えている)

ドキュメンタリーの書き起こし学習用データのソースとしては言及されていないのでAの内容が誤り。