New Complexity Theory Emerges for Quantum Era

Description

Computer science focuses on inputs and outputs. For example, when you multiply two numbers using a calculator, you enter the numbers (inputs), and the calculator shows the result (output). Some problems, like breaking down a number into its prime factors, are more complicated but follow the same idea. Solving problems on a computer often involves changing numerical inputs, usually represented by 0s and 1s, into outputs.

Researchers in computational complexity theory study why some tasks are harder than others. They found that some problems, like finding prime factors, are easier for quantum computers, which use the laws of quantum physics, compared to traditional computers.

For more than 30 years, experts have used this theory to find problems where quantum computers excel. However, there is a group of problems with unique inputs and outputs that still needs research. Henry Yuen, a complexity theorist, is especially interested in these complex problems. He believes a new theory may be necessary to understand them.

Yuen, a professor at Columbia University, has previously worked on significant advancements in complexity theory. His background is inspiring, as he learned programming to create video games despite growing up in a restaurant owned by his refugee family from Cambodia. He is now leading efforts to create a new quantum theory that can better address these unique problems.

Vocabulary List:

1. **Complexity** /kəmˈplɛksɪti/ (noun): The state or quality of being intricate or complicated.
2. **Quantum** /ˈkwɒntəm/ (adjective): Relating to the smallest amount or unit specifically in physics dealing with the behavior of matter and energy on atomic and subatomic levels.
3. **Theory** /ˈθɪəri/ (noun): A system of ideas intended to explain something especially based on general principles independent of the thing to be explained.
4. **Researchers** /rɪˈsɜːrtʃərz/ (noun): Individuals who conduct systematic investigations in a specific area of study.
5. **Inputs** /ˈɪnpʊts/ (noun): Data or information that is put into a system for processing.
6. **Outputs** /ˈaʊtpʊts/ (noun): The result produced by a computer or system as a response to inputs.

Comprehension Questions

Multiple Choice

1. What does computer science primarily focus on?

   Option: Inputs and Outputs
   Option: Programming Languages
   Option: Computer Hardware
   Option: Network Security

2. Which type of computers is found to excel at finding prime factors?

   Option: Traditional Computers
   Option: Quantum Computers
   Option: Analog Computers
   Option: Supercomputers

3. Who is the complexity theorist interested in unique complex problems?

   Option: John Doe
   Option: Henry Yuen
   Option: Thomas Edison
   Option: Albert Einstein

4. Where does Henry Yuen work?

   Option: Harvard University
   Option: Stanford University
   Option: Columbia University
   Option: MIT

5. For how long have experts studied computational complexity theory?

   Option: 10 years
   Option: 20 years
   Option: 30 years
   Option: 40 years

6. What does numerical input often represent in computing?

   Option: Characters
   Option: 0s and 1s
   Option: Letters
   Option: Colors

True-False

7. Quantum computers use traditional laws of physics.

8. Henry Yuen has worked on advancements in complexity theory.

9. Solving problems on a computer only involves inputs, not outputs.

10. Researchers have found some tasks that are easier for traditional computers.

11. Complex problems with unique inputs and outputs need further research.

12. Henry Yuen grew up in a restaurant owned by his family.

Gap-Fill

13. Computer science focuses on _____ and outputs.

14. Some problems, like breaking down a number into its _____ , are more complicated.

15. Researchers study why some tasks are _____ than others.

16. Henry Yuen is especially interested in _____ problems.

17. Yuen believes a new theory may be necessary to understand _____ problems.

18. Henry Yuen learned programming to create _____ games.

Answer

Multiple Choice: 1. Inputs and Outputs 2. Quantum Computers 3. Henry Yuen 4. Columbia University 5. 30 years 6. 0s and 1s
True-False: 7. False 8. True 9. False 10. False 11. True 12. True
Gap-Fill: 13. inputs 14. prime factors 15. harder 16. complex 17. unique 18. video

Answer

CATEGORY

1. Sci/Tech - LEVEL3

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1. B1
2. complexity theory
3. ESL learning
4. esl news
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6. quantum age

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