Oyedare Adeola

ENG1804798

Computer Engineering

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THE BRAIN OF A NINE YEAR OLD AND A SUPER COMPUTER, WHICH IS FASTER, POWERFUL AND MORE INTELLIGENT

The rising power of computers and advances in Artificial Intelligence has reenergized the debate of intelligence of computers relative to humans.

For the time being, people and computers seem to have complementary skills. This means that computers are very good at tasks that humans are bad at, and humans are exceptionally good at certain kinds of tasks that computers simply cannot perform yet.

Computers are extremely fast, so when a task can be translated (by a human!) into an algorithm (a set of step-by-step instructions), a computer will typically accomplish it much more quickly and accurately than the average human. This kind of task includes mathematical calculations, and also repetitive tasks that humans quickly get bored by.

Computers can take in and process certain kinds of information much faster than we can. They can swirl that data around in their “brains,” made of processors, and perform calculations to conjure multiple scenarios at superhuman speeds. For example, the best chess-trained computers can at this point strategize many moves ahead, problem-solving far more deftly than can the best chess-playing humans. Computers learn much more quickly, too, narrowing complex choices to the most optimal ones. Yes, humans also learn from mistakes, but when it comes to tackling the kinds of puzzles computers excel at, we’re far more fallible.

Computers enjoy other advantages over people. They have better memories, so they can be fed a large amount of information, and can tap into all of it almost instantaneously. Computers don’t require sleep the way humans do, so they can calculate, analyze and perform tasks tirelessly and round the clock. Notwithstanding bugs or susceptibility to power blackouts, computers are simply more accurate at pulling off a broadening range of high-value functions than we are. They’re not affected or influenced by emotions, feelings, wants, needs and other factors that often cloud the judgement and intelligence of us mere mortals.

Humans are spectacular at several things, including pattern recognition, language abilities, and creative thinking. Computers are rapidly improving at pattern recognition, but most programs still don’t do as well as children. A classic example of pattern recognition is face recognition. We are capable of recognizing faces in a variety of contexts. We can even recognize faces that have aged, or are disguised, or are obscured by facial hair. Computers are not nearly as good as humans at such tasks.

So computers are more powerful that humans when it comes to executing simple step-by-step instructions. Humans are more powerful than computers at tasks that are not easily broken into simple steps. The fields of computer science, artificial intelligence, and machine learning are aimed at breaking down problems into ‘byte-sized’ chunks that are ‘digestible’ by computers. So for now computers are informational babies — they cannot ‘cook’ for themselves.

Computers can outperform humans on certain specialized tasks, such as playing [the game] go or chess, but no computer program today can match human general intelligence,” says Murray Shanahan, Professor of Cognitive Robotics for the Department of Computing at Imperial College in London. “Humans learn to achieve many different types of goals in a huge variety of environments. We don’t yet know how to endow computers with the kind of common sense understanding of the everyday world that underpins human general intelligence, although I’m sure we will succeed in doing this one day.”

People possess creativity and intuition, both qualities that computer code doesn’t have, but more importantly may never have, according to John Grohol, founder & CEO of PsychCentral.com.

To keep things simple, we’ll limit the comparisons to four areas:

1.Storage

2.Processing speed

3.Memory

4.Energy efficiency

Storage

For day-to-day usage, most computer users will get by with 500GB of storage. Creatives, gamers, and other data-heavy users will often rely on additional storage on the cloud or on a portable SSD. For the sake of argument, we’ll give the computer an average of 1TB of storage space.

What about the brain’s storage capacity? Well, it’s complicated.

Estimates vary on how many nerve cells, or neurons, exist in a typical brain. Many studies rely on 100 billion neurons, while a Stanford University study estimates that the brain actually has 200 billion neurons.

You might be thinking, “Wait, the computer has bytes and the brain has neurons. How do we compare the two?”

One marked difference between the human brain and computer flash memory is the ability of neurons to combine with one another to assist with the creation and storage of memories. Each neuron has roughly a thousand connections to other neurons. With over a trillion connections in an average human brain, this overlap effect creates an exponentially larger storage capacity.

Based on our understanding of neurons today, which is very limited, we would estimate the brain’s storage capacity at 1 petabyte, which would be the equivalent of over a thousand 1TB SSDs.

Advantage: Human Brain.

Memory

So far, it’s an even contest. The human brain has significantly more storage than an average computer. And a computer can process information exponentially faster than a human brain.

How about accessing memory? Can a human recall information better than a computer?

Well, it depends on what kinds of information we’re talking about.

For basic facts, the answer is unequivocally no. If a computer “knows” that the capital of Nevada is Carson City, that fact will always be accessible. A human, on the other hand, may get confused or forget that fact over time, particularly after a long weekend in Vegas.

Where computers lag behind humans is the ability to assign qualitative rankings to information. For a computer, all information is exactly the same. Humans, on the other hand, have many different types of memories and prioritize memories based on their importance. You will undoubtedly remember numerous details about your wedding day, but you probably forgot what you had for lunch last Thursday. (It was a tuna sandwich on rye, in case you were wondering.)

Humans also relate memories to one another, so your memory of New Year’s Eve will tie to all of your other New Year celebrations over the course of your life. A computer lacks this ability, at least for now.

Advantage: COMPUTER

Energy Efficiency

The contest is still a toss-up. Computers are faster and more precise, while humans have more storage capacity and nuance in accessing memories.

What about energy efficiency? Here is where it gets really fun.

A typical computer runs on about 100 watts of power. A human brain, on the other hand, requires roughly 10 watts. That’s right, your brain is ten times more energy-efficient than a computer. The brain requires less power than a lightbulb.

We may not be the brightest bulbs in the box, but then again, we don’t have to be.

Advantage: Human Brain

Conclusion

Ultimately, there is no clear winner overall. Human beings and computers have their own advantages, depending on the category. If you want precision and raw processing speed, a computer is the clear choice. If you want creativity, energy efficiency, and prioritization, a human is your best bet.