

FUTURE OF COMPUTATION

By Konduri Naga Lakshmi Rekha

Rollno.:12140930

INTRODUCTION:

Well, the history of computers has always been astonishing because of the different developments and ideas made in inventing new things every time with more or less advancements than that of previous inventions. From manually operated Abacus, Napier's Bones to Punch Cards, First Generation computers (Eniac), the world have observed a huge advancement and development in terms of technology. Later came the Stored Program Computers, Edvac, Second, Third and Fourth Generation Computers, Microprocessors, integrated circuits and many more that made our lives easier by computing faster with greater efficiency.

Even at present many researchers are working on future of computation to make it much easier than it already is. There can be many innovations for the future of computing and researchers are working on new computing frontier using carbon, DNA strands and other means to limit the usage of silicon. Moreover, the future of computation focuses on the ability to create deep learning software which will have nothing to do with the transistor speed. This researches if successful can make the supercomputers which redefine computing itself. The development of technology in fields of Artificial Intelligence, robotics, nanotechnology, machine learning has been incredible and playing a major role in exponential growth of computing.

With the end of Moore's Law (which tells that the number of transistors on microprocessor can double every two years) approaching, the computing community is constantly working on new technologies to enable continued performance improvements. As silicon-based transistor became so tiny day-by-day leading to doubt that they bump up against the laws of physics and ultimately the present manufacturing techniques can no longer keep up. Here are some of the future modes of computation and a brief idea about them.

QUANTUM COMPUTING:

Quantum computing has the most scope of development as generally the present generation powerful computers can only assign either zero or one to each bit where as in Quantum Computing, the computers can use quantum bits(qubits) which can be zero, one, both at a time or some point in between, all simultaneously. Currently these Quantum computers are loud and unreliable, but in the upcoming years with few modifications in their hardware and software technologies, they can have a great influence in creating unhackable channels of communication which is what exactly we needed in today's digital world and also help in designing new materials. Quantum Computing basically works on the principles of Quantum Mechanics. It focuses on Superposition, Entanglement, Interference which are basis of Quantum Mechanics. In short, we can say that this quantum mode of computation has the potential to change the world.

NEUROMORPHIC COMPUTING:

Neuromorphic Computing focuses on creating a computer similar to that of human brain's architecture and this promises to open new exciting possibilities in computing. It is based on the principles of biological neural computation and uses the algorithmic approach similar to human levels of problem solving. This may also include to invent a new chip architecture that can work on memory and processing simultaneously on each individual neuron. A neuromorphic chip processes information in much efficient way such that each individual neuron can perform either processing or memory depending on the task it is allocated. This kind of computing stresses on fast and low power consumption. It even has the ability to improve efficiency of current

neural networks. Its main aim is to create artificial neural systems inspired by biological structures. Neuromorphic Computing focuses on two main objectives: first being the creation of device that can learn, retain information alongside make logical deduction like human brain, and second objective being acquiring new information and proving a ration theory about how human brain works.

OPTICAL COMPUTING:

Optical Computing is also one of the future modes of computation which uses photon to compute. It can be done by mapping data to light intensity levels and further performing calculations based on it. It is still not yet developed much and is still under the process of research but if it succeeds, it helps in computing at the speed of light that too with unbelievable efficiency. This computation basically uses the wave propagation and interference pattern of waves to determine the desired outputs. It also has the perk of photons being massless as they require very less energy to excite them. Moreover, optical computing has the advantage of higher bandwidth with very low data loss transmission and it is free from electric short circuits but the size is very bulky and this computation is too high to afford.

DISTRIBUTED COMPUTING:

In this mode of computation, the distributed computer system consisting of multiple software components that are on multiple computers, but run as single system. As there are multiple components it can have a wide range of possible configurations like mainframes, workstations. Its main objective is to make a network as a single computer. Scalability (expansion of system by adding more machines) and Redundancy (Absence of one machine providing some service doesn't result in stopping work as there will be some other machine in system providing same service) are main advantages of distributed computing over centralized systems. These machines that forms single computer can run on various operating systems and various communication protocols can be used (i.e., like some hardware might use windows OS and other might use Linux or UNIX). It is not necessary that all the computers in distributed system should be definitely close to

each other connected by local network instead they can be geographically distant but connected to one another by wide area network.

DNA DATA COMPUTING:

DNA data storage or DNA Computing is one of the branches of biomolecular computing where DNA is used as carrier of information to make arithmetic and logical operations. The main advantage of this computation is that a little bit of it can store extremely lot of information and also some researchers working on it even believe that “We could meet world’s entire data storage needs for a year with a cubic meter of powdered e-coli DNA and moreover, this kind of computation has been proved remarkably stable. DNA computers can be used to solve huge, complicated mathematical problems but research on these computers is still going on and it takes few more years to be developed in much more efficient way.

Thus, technology being accelerated day-by-day, preparing for the worst possible situations like approaching the limits of what silicon chips can do, leading to world-shaking advancements and invention of effective modes of future of computation.

RESOURCES:

<https://insights.sap.com/6-surprising-innovations-for-the-future-of-computing/#:~:text=The%20future%20of%20computing%20is,what%20amounts%20to%20distributed%20supercomputers>

https://www.forbes.com/sites/honeywell/2021/01/04/the-future-of-computing-is-here-are-you-ready-for-it/#amp_tf=From%20%251%24s&aoh=16630635875412&referrer=https%3A%2F%2Fwww.google.com

