38. ROLE OF SUPERCOMPUTERS IN THE DEVELOPMENT OF ARTIFICIAL INTELLIGENCE

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The crucial role of supercomputers in simplifying calculations of complex algorithms and massive data processing, contributing to the rapid development of artificial intelligence is discussed in this paper.

In 1955 the proof of concept of AI was initialized through Allen Newell, Cliff Shaw, and Herbert Simon's, Logic Theorist. The Logic Theorist was a program designed to mimic the problem-solving skills of a human and was funded by Research and Development (RAND) Corporation. And even then, he was creating better proofs than human mathematicians [1].

To quantify and compare the computing capabilities of developing computer architectures, the concept of Floating Point Operations Per Second (FLOPS) was introduced. This value serves as a standardized measure, determined by running a specific test program on a reference computer and measuring the time required to perform a predefined set of operations. Nowadays, among various tests, Linpack performance tests have become the standard for ranking supercomputers [2].

Using this unit of measurement, we can compare the computing power of different machines. Figure 1 shows how the power of supercomputers grew from 1993 to 2021. Now home computers produce up to 1 teraflop, and, for example, the Frontier supercomputer already produces 100,000 times more power. Scientists estimate the human brain at 1 ronnaflop, which is a million times more than any supercomputer.
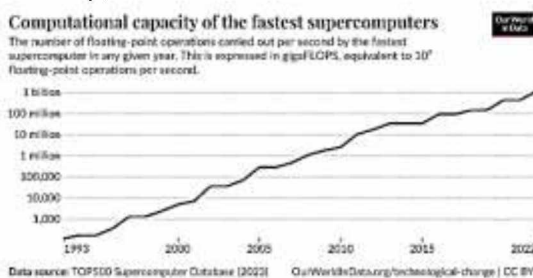

Figure 8 – Increasing the power of supercomputers

Unlike traditional computers, supercomputers use more than one central processing unit (CPU). These processors are grouped into computing nodes consisting of a processor or a group of processors and a memory block. A supercomputer contains tens of thousands of nodes. With interconnects communication capabilities, these nodes can work together to solve a specific problem. Nodes also use interconnects to communicate with I/O systems such as data warehouse and network.

With the advent of supercomputers, artificial intelligence based on supercomputers appeared. AI supercomputers are special computing systems designed to meet the enormous computing needs of artificial intelligence. Unlike traditional computers, these are designed to work with complex artificial intelligence algorithms, deep learning models, and massive datasets. Artificial intelligence supercomputers have special technologies and memory that help them process data quickly and get answers to questions faster. The processing power of AI supercomputers in achieving such results is explained by the ability to divide complex tasks into smaller, more manageable components, thereby providing parallel processing by multiple processors. This strategy optimizes computational efficiency by distributing workload across multiple computing nodes, each of which at the same time handles a subset of the overall task. Parallel data processing facilitates the rapid solution of complex computational tasks using the common computing power of distributed processors.

The introduction of supercomputers into AI allows researchers to create more complex Artificial Intelligence models. The models are trained on a huge amount of raw data for a short period of time that helps to develop AI capabilities faster.

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