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Church - Turing Thesis

What does Computable Mean?

The term computable was actually Fuzzy.

1903 - 1995) Alonzo Church - Lambda Calculus

Lambda Calculus was a kind of machine that could perform some computation, He came up with a idea that whatever is able to computed by Lambda Calculus that can be called as Computable.

(1912 - 1954) Allen Turing (TM) It is a machine that can be used to perform computation. He came up with an idea that whatever can be computed using Turing Machine (TM), that is known as computable.

Allen Turing was the Student of Alonzo Church.



## Church-Turing Thesis

A function on natural number is computable if and only if it is computable by Turing machine.

- Anything that can be done by current digital computer can also be done by a Turing machine.
- Currently, there is no problem which can be solved by a digital computer and cannot be solved by a Turing Machine.

Turing model is nothing, its an abstract model of digital computer.

- Many mathematical models are suggested but no one of them is more powerful than the Turing machine.



The Church-Turing Thesis states the equivalence between the mathematical concepts of algorithm or computation and Turing Machine. It asserts that if some calculation is effectively carried out by an algorithm, then there exists a Turing Machine which will compute that calculation.

\* Many Mathematicians were working independently on same problem on which Turing worked.

Alonzo Church - Lambda Calculus

Noam Chomsky - Unrestricted Grammar

Stephen Kleene - Recursive fun. Theory

Emil Post - Production system

Raymond S. : Formal system

All of above formalisms were proved equivalent to one another. This led to

a) Turing Thesis (weak form): A T.M. can compute anything that can be computed by digital computer.

b.) Turing Thesis (strong form): A T.M. can compute anything that can be computed.