

Research Summary on the Theory of Computation

Around the 1930's mathematicians and logicians began attempting to define the concept of computation. From what I understand, the main purpose of the theory of computation is to be able to accurately and mathematically represent the capabilities of computers. In other words, the main question that drives the field is whether or not there is a way to know if a problem can be solved by a computer, if that way will be efficient and if it is possible, what is the most efficient way to do it.

When people think of computer science as a field of study, the first thing that comes to mind would probably not be the theory of computation. However, the theory of computation, along with the theory of programming, can be considered the foundations of computer science. These two fields constitute what is known as theoretical computer science.

The theory of computation is often divided into three parts:

- Complexity theory focuses on the reasons some computations are easier than others. A question that is often posed in this field is the classification of different problems according to their difficulty and then proving mathematically that the difficult problems are indeed difficult and why.
- Computability theory focuses on whether or not certain problems can be solved by a computer. A question often posed in this field is classifying problems according to exactly that, if they can or can't be solved by a computer.
- Automata theory focuses on the study of different ways of computing a problem and determining the capabilities as well as the limitations of those different types. A question often posed in this field is the comparison of the different types of computation.

Advancements made in this field are very important as they, in a way, shape the future of the field of computer science as a whole. Furthermore, all the resources that are put into research in the theory of computing and theoretical computer science in general are very beneficial.

Websites I used:

<http://cglab.ca/~michiel/TheoryOfComputation/TheoryOfComputation.pdf>

<http://www.wisdom.weizmann.ac.il/~oded/toc-bi.html>

https://en.wikipedia.org/wiki/Theory_of_computation#Automata_theory

<https://www.cse.buffalo.edu/~selman/report/Report.html>