Logics in Computer Science
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Classical logic has its origin in Aristotelian philosophy. Alan Turing invented Turing Machines to settle whether satisfiability in this logic was solvable. Kurt Godel introduced primitive recursive functions in his proof of incompleteness theorems, which were used as a definition for the notion of "effectively computable" objects in David Hilbert's Program. Alonzo Church proved the undecidability of arithmetic, and proposed what is known today as Church's thesis: every effectively computable function, in the intuitive sense, is recursive.

So, the computability theory was born by the works of logicians, and later grew as a separate field. Finite state automata and push-down automata were developed as simplifications of Turing machines and found their way into the mainstream of the new field known as "computer science". It is worth noting that the winners of the TIME100 Project (the greatest scientists of the 20th century) in the fields of mathematics and computer science were both logicians (K. Godel and A. Turing, respectively).

In this short course, we will review some basics of mathematical logic with emphasize on recursion theory as one of its subfields. We will argue that logic provides a suitable framework for the notion of computability, and accommodates many of its related concepts. We will have a look at intuitionistic logic and constructive mathematics which, we believe, are getting more and more attention in this computer era. Intuitionisitc logic also came out of philosophical thoughts of its founder, L.E.J. Brouwer, but was long ignored before offering some applications to computer science. In case time permits, we may also review some modal logics and applications of logical methods in the theory of automata and formal languages.

References:

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