Lecture 1: Overview of Computer Science

What is explained in this lecture is my personal view. Obviously there must be many different opinions.

Computer Science, What is it for?

Computer Science is one academic discipline covering huge areas in science and engineering related to computers and computer networks. Of course, it is impossible to describe this discpline in one short statement (and it may be even dangerous to do so because such a statement may cause several misunderstandings); but still let me dare to express this whole area as follows:

> Computer Science is the research area aiming for realizing various things on all sorts of computer systems, thereby providing better academic/social/living environments with human beings.

I will explain this idea a bit more carefully in my lecture; see the ppt file of today's lecture for its outline. In fact, following this explanation, I will also give the outline of this course and topics we will cover in this course.

Ten Great Discoveries in Computer Science

In order to give more concrete ideas on Computer Science, let us go through the history of Computer Science by visiting great discoveries achieved in this discipline.

Let me first give **five** great discoveries in the whole area of computer science following (approximate) chronological order.

- Formal definition of *Computation*
- Invention of *Computers* $\longrightarrow$ innovations for *New Society wit Computers*
- Introduction and various advancement of *Programming Languages*
- Introduction of *Computational Security*
- Realization of the importance of *Computer Network*

Now let us move on to a bit more specific research area — Theory of Computation, the area I will cover in my four lectures. Of course, there are many important discoveries and achievements in this area (including some of those mentioned above). Let me select the following five important topics.

- Establishment of *Formal Language Theory*
- Introduction and advancement of formal specification/verification methods
- Discoveries of various important algorithmic ideas
- Establishment of *Computational Complexity Theory*
        Discovery of P $\neq$ NP conjecture
- Establishment of various fields called *Computational XXX*