

Research Topics in Informatics for a College Teacher

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Abstract

David Hilbert announced 10 problems in Paris on August 8th 1900 at Sorbonne on the Congress of Mathematicians. These 10 problems is a subset of the 24 problems, which we know as Hilbert's problems. All of these problems were unsolved at that time and had a great influence for 20th century. I am not Hilbert, and this is not Sorbonne, but still, I would like to follow this tradition, and highlight 3 problems which might be considered as a nice research topics for College Teacher. These are:

- Digital Ownership, Digital Data Treasure, Informationbank
- Western Canon of Software Engineering
- Smart SAT Solving

By “College Teacher” I mean a researcher how has high load of teaching activities, and do research, because he or she lives doing research. A consider myself as a member of this group. The name College Teacher is a bit sarcastic, at least here in Hungary, because all the formal colleges become universities, but this did not change our unbalanced workload between teaching and research. Since we do research by stilling time from our family, we need research problems, which have high motivation level, easy to understand, easy to contribute, but difficult to solve. I think these 3 topics meet those conditions in the field of informatics.

The 1st topic is Digital Ownership, which means that if you buy a product or a service then you become not only the owner of the very product, but you gain access to all the information which describes that product. The set of all such information is called Digital Data Treasure, which is stored in an Informationbank. The goal of this topic is to define the ethics of Dig Data, and the use cases of Internet of Things.

The 2nd topic is Western Canon of Software Engineering. The term Western Canon means those artworks, which are commonly considered as the base of our culture. For example in case of literature it means those books which are worth to read, moreover which you should read. The canon is fixed. It is evolving, and each school might have its own canon, so there is a constant dialog what is the canon. In case of software engineering western canon means the way how to do we design, implement, test and maintain an IT systems. Some years ago RUP was considered as the best software development methodology, nowadays Scrum is used almost everywhere, but Kanban seems to be the new hype. So what shall we teach? Which book? Which principles?

The 3rd topic is Smart SAT Solving. This topic is more specific, but the recipe can be used also in other fields. By SAT we mean the satisfiability problem of propositional formulae in conjunctive normal form. State-of-the-art SAT solvers can solve problems with millions of clauses and hundred-thousand variables. There are lot of SAT problem classes, like the class of Pigeon Hole problems. Some SAT solvers are more effective for some specific classes, others for other classes. Moreover, each SAT solver has lots of switches. It is an interesting problem to find the best SAT solver with the best switches for each classes. To solve this problem we can use a neural network to classify an unknown SAT problem, and then we just look up a table, which was boiled down by trying each SAT solver, with each switch combination on instances of each class, which SAT solver to use. The same recipe can be used in other fields where there are different problem classes and different solvers.