Topic for a Bachelor/Master’s Thesis:

Predictive modeling of non-functional software properties

Intelligent Systems Group
Department of Computer Science
University of Paderborn

Machine learning has been used successfully in various fields of application, not only outside but also inside computer science itself. In particular, exploiting the predictive power of models induced by machine learning methods, the possibility of “anticipating” the behavior of systems or algorithms prior to execution turns out to be of great advantage. Examples include query optimization in databases [1] and runtime prediction in algorithm selection [2].

The goal of the thesis is the development of machine learning methods for the prediction of non-functional software properties, such as runtime, availability, reliability, RAM requirements etc. Following a feature-based approach, this includes the generation of a set of predictive features for characterizing the software and the use of appropriate machine learning techniques for inducing models based on these features.

Another requirement is the specification of a suitable test bed. One option is the performance prediction of smartphone applications: Given an application (such as the “Pokémon Go” game), one would like to know whether it is possible to run it smoothly on a particular smartphone. From a machine learning point of view, this question could be considered as a simple binary classification problem. Thus, for a given set of application features (e.g., number of threads, RAM allocation, energy consumption etc.) and a set of smartphone features (e.g., number of cores, amount of RAM, battery level etc.), the goal is to induce a model that predicts a binary “yes/no” target. For obvious reasons, an accurate model would be of great interest for users as well as application developers.

Prerequisites: Expertise in machine learning and software engineering; programming skills.

For more information, please contact Prof. Eyke Hüllermeier (eyke@upb.de) or Vitalik Melnikov (melnikov@mail.upb.de).

References
