Optimizing database architecture for machine architecture: is there still hope?

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Extended Abstract

In the keynote, I will give some examples of how computer architecture has strongly evolved in the past decennia and how this influences the performance, and therefore the design, of algorithms and data structure for data management. One the one hand, these changes in hardware architecture have caused the (continuing) need for new data management research. i.e. hardware-conscious database research. Here, I will draw examples from hardware-conscious research performed on the CWI systems MonetDB and Vectorwise.

This diversification trend in computer architectural characteristics of the various solutions in the market seems to be intensifying. This is seen in quite different architectural options, such as CPU vs GPU vs FPGA, but also even restricting oneself to just CPUs there seems to be increasing design variation in architecture and platform behavior. This poses a challenge to hardware-conscious database research.

In particular, there is the all too present danger to over-optimize of one particular architecture; or to propose techniques that will have only a very short span of utility. The question thus is not only to find specific ways to optimize for certain hardware features, but do so in a way that works across the full spectrum of architectural, i.e. robust techniques.

I will close the talk by recent work at CWI and Vectorwise on robustness of query evaluator performance, describing a project called "Micro-Adaptivity" where database systems are made self-adaptive and react immediately to observed performance, self-optimizing to the combination of current query workload, observed data distributions, and hardware characteristics.