School of Computer Science Fourth Year Projects

Automated Software to Understand Functional Relationship Between Dynamic Energy and Performance Events

Project ID: 39351

People

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Project URL: http://hcl.ucd.ie

Project Specification

Subject: Data Analytics, High Performance Computing
Prerequisites: Proficiency in at least one mainstream programming language (C, C++, Python)
Project Type: Design and Implementation
Software Requirements: Linux/Unix OS with C/C++/Python software
Hardware Requirements: a computer with Linux/Unix
Preassigned: No

Description

General Information:

A energy model representing a relationship between dynamic energy consumption and performance events (PMCs) is constructed experimentally and the experimental dataset has the following format typically (k events, n records):

$E_1\ x_{11}\ x_{12}\ x_{13}\ \ldots\ x_{1k}$
$E_2\ x_{21}\ x_{22}\ x_{23}\ \ldots\ x_{2k}$
...
$E_n\ x_{n1}\ x_{n2}\ x_{n3}\ \ldots\ x_{nk}$

where E_i is the experimentally obtained dynamic energy consumption of i-th record and x_{ij} are the experimentally obtained performance events (PMCs).

Given such an experimental dataset as an input, the goal is to determine/understand the functional relationship between the dynamic energy consumption and performance events (PMCs).

Two real-life datasets will be provided to the student.
Core:

The goal is to write automated software that will detect the following:

1. Existence of records where the dynamic energy consumption is the same (within an input tolerance) but all PMCs (with the exception of one) have same values. Then the relationship between energy and the one PMC is visualized to see the nature of the functional relationship.
2. Having accomplished step (1), understand the monotonicity of the relationship between dynamic energy consumption and performance events (PMCs).
3. Existence of records where the dynamic energy consumptions are different (within an input tolerance) but all PMCs have same values (within an input tolerance) suggesting the non-existence of a functional relationship.

The software must be written using any one mainstream language but preferably one of the following:
C, C++, Python

The software must be well documented and tested.

Advanced:

Given an experimental energy model dataset as an input, the goal is to write software that performs intelligent but computationally feasible simulations where combinations of inputs are generated to study the existence/non-existence of a functional relationship between dynamic energy consumption and PMCs.

The software must be written using any one mainstream language but preferably one of the following:
C, C++, Python

The software must be well documented and tested.

Reviewing

Project State: Accepted

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