Ravan: A Data-Driven Approach for Automatically Generating Heterogenous Processors

Abstract

As greater energy efficiency becomes a higher priority in hardware design, heterogeneous cores have been getting a significant amount of attention. One of the key problems with heterogeneous hardware is designing a series of cores that both provides the energy savings desired as well as maintaining a sense of breadth in the classes of applications that can run adequately on the final product. While progress has been made in both the design of cores and how threads run on these cores, the search space for these cores has been relatively limited.

In this paper, we present Ravan, a performance estimation methodology that scans a search space of possible hardware configurations and gives a set of processor cores tailored for a set of applications. By providing a limited training set and allowing the model to continuously train to handle evolving workloads, Hydra significantly cuts down the time in making intelligent core design decisions from more exhaustive search methods. Using the model allows us to predict the performance of a core and select energy efficient cores with an error of less than 10%, while still performing on with better efficiency than a baseline processor configuration.

1. Introduction

This document provides the formatting instructions for submissions to the 46th Annual IEEE/ACM International Symposium on Microarchitecture, 2013 [1]. In an effort to respect the efforts of reviewers and in the interest of fairness to all prospective authors, we request that all submissions to MICRO-46 follow the formatting and submission rules detailed below. Submissions that (grossly) violate these instructions may not be reviewed, at the discretion of the program chair, in order to maintain a review process that is fair to all potential authors.

An example submission (formatted using the MICRO-46 submission format) that contains the submission and formatting guidelines can be downloaded from here: Sample PDF. The contents of this document are the same as the contents of the submission instructions that appear on this website.

All questions regarding paper formatting and submission should be directed to the program chair.

2. Preparation Instructions

2.1. Paper Formatting

All submissions should contain a maximum of 12 pages of single-spaced two-column text. If you are using LATEX to typeset your paper, then we suggest that you use the template available here: LATEX Template. (This document was prepared with that template.) If you are using a different software package to typeset your paper, then please adhere to the guidelines mentioned in Table 1.

Field	Value
Page limit	12 pages
Paper size	US Letter 8.5in × 11in
Top margin	1in
Bottom margin	1in
Left margin	0.75in
Right margin	0.75in
Separation between columns	0.25in
Body font	10pt
Abstract font	10pt, italicized
Section heading font	12pt, bold
Subsection heading font	10pt, bold
Caption font	9pt, bold
References	8pt

Table 1: Formatting guidelines for submission.

Please ensure that you include page numbers with your submission. This makes it easier for the reviewers to refer to different parts of your paper when they provide comments.

2.2. Content

Author List. All submissions are double blind. Therefore, please do not include any author names in the submission. You must also ensure that the metadata included in the PDF does not give away the authors. If you are improving upon your prior work, refer to your prior work as a third person and include references to your past work.

Figures and Tables. Ensure that the figures and tables are legible. Please also ensure that you refer to your figures in the main text. Many reviewers print the papers in gray-scale. Therefore, if you use colors for your figures, ensure that the different colors are distinguishable in gray-scale.

Main Body. Avoid bad page or column breaks in your main text, i.e., last line of a paragraph at the top of a column or first line of a paragraph at the end of a column. If you begin a new section or sub-section near the end of a column, ensure that you have at least 2 lines of body text on the same column.

3. Documents to be Uploaded to the Submissions Site

In addition to your paper, you can optionally upload past reviews and author response to past reviews for this submission (PDF file). This document will be used at the discretion of the program chair during the review process.

Specifically, authors can submit a PDF file that includes any combination of the following:

- what conference(s) this paper was previously submitted to, if any,
- the past reviews received for the paper from the review process in those conferences,
- how the submission has addressed the past reviews,
- how the submission has improved upon the previously submitted versions of the paper.

This furnished information **may** be used at the discretion of the program chair only after the paper rebuttal period and during the program committee meeting (see below for more information). We encourage the authors to provide this information especially if they would like to 1) respond to past reviews and did not feel they got a chance to do so, 2) proactively address potential concerns about the paper that are similar to concerns in past reviews that get brought up after the paper rebuttal period and during the program committee meeting.

Note: Your submission will still undergo a full new review process that is independent of this PDF file you submit. MICRO-46 reviewers will complete their reviews independently of this PDF file, and will not see this PDF file until after the paper rebuttal period ends. The sole purpose of asking for this PDF file is to provide the authors a chance to rebut potential reviewer concerns that could arise during the paper discussion period and the program committee meeting that happens after the MICRO-46 rebuttal period ends.

4. Submission Instructions

4.1. Paper Authors

Declare all the authors of the paper upfront. Addition/removal of authors once the paper is accepted will have to be approved by the program chair.

4.2. Conflict Responsibilities

The authors should register all their conflicts into the paper reviewing site. Conflicts are needed to resolve assignment of reviewers. If a paper is found to have an undeclared conflict that causes a problem, the paper may be rejected.

Please declare a conflict of interest with the following for any author of a paper:

1. PhD advisor
2. Other past or current advisors
3. Current or past students
4. People with the same affiliation

5. People whom you co-authored papers with in the last 5 years
6. People whom you co-authored funded proposals with in the last 5 years.

There may be others with whom you know a conflict of interest exists. However, you will need to justify this conflict of interest. Please be reasonable. For example, just because a reviewer works on similar topics as the paper you are submitting is on, you cannot declare a conflict of interest with them. We will carefully check the justification of conflicts and take action when authors seem to be blacklisting reviewers without sufficient justification.

You will have to declare all conflicts with PC members as well as non-PC members that may serve as external reviewers with whom you have a conflict of interest. When in doubt, contact the program chair.

4.3. Concurrent Submissions and Resubmissions of Already Published Papers

By submitting a manuscript to MICRO-46, the authors guarantee that the manuscript has not been previously published or accepted for publication in a substantially similar form in any conference or journal. The authors also guarantee that no paper which contains significant overlap with the contributions of the submitted paper is under review to any other conference or journal or workshop, or will be submitted to one of them during the MICRO-46 review period. Violation of any of these conditions will lead to rejection.

Extended versions of papers accepted to IEEE Computer Architecture Letters can be submitted to MICRO-46. If you are in doubt, contact the program chair.

5. Submission Site

The submission site is located at: http://micro46.stanford.edu

References

[1] M. Farrens *et al.*, "MICRO'46 Conference Site," 2013. Available: http://www.microarch.org/micro46/