Master 1 MoSIG Research Project Report
Learning Job Runtimes in Homogenous Clusters

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Abstract

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1 Introduction

High Performance Computing (HPC) systems are complex machinery at the frontier between research in scheduling and system administration.

The ephemeral nature and broad range of existing architecture of such systems make the development and application of theoretical results difficult. For instance, the topological models of these systems regularly change on a yearly (even weekly, in the case of computing grids) basis, and the task of finding scheduling strategies which are robust to those changes is a current research problem.

In addition, the input data of the decisional part of these systems presents many peculiarities. For instance, and this is the focus of this research project, the run time of a given job on a specific system is seldom known in advance.

As a consequence of these difficulties most free, open-source and commercial resource management software use simple heuristics, which at best provide bounds on their performance, and at worst guarantee a few functional properties. An example of such a strategy is the First Come First Serve (FCFS) strategy to schedule parallel jobs on a homogenous cluster of machines. Among other properties (such as robustness to weak information about job run times), this strategy guarantees the avoidance of starvation.

As hinted previously, one of the frontiers to apply more sophisticated techniques in order to schedule jobs on these systems is the uncertainty in the data provided by the users of those systems. Most resource management software (including the SLURM, OpenPBS, OpenLava and OAR systems) do ask information about jobs to users, such as topological requests in terms of processing units and memory, the name of the executable, miscellaneous functional requirements and, last but not least, the expected run time (the user-provided estimate will be called **walltime** in the rest of the paper) of the job. The the true run time (now reffered as **runtime**) of a job with respect to a given affected topology is of great interest, as the scheduling policies are highly dependent on this data to provide good solutions.

1.1 Problem Set

1.2 Word Processing Software

2 Motivation

2.1 Layout

2.2 Format of Electronic Manuscript

Blind Review

In order to make blind reviewing possible, authors must omit their names and affiliations when submitting the paper for review. In place of names and affiliations, provide a list of content areas. When referring to one's own work, use the third person rather than the first person. For example, say, "Previously, Gottlob [**?**] has shown that…", rather than, "In our previous work [**?**], we have shown that…" Try to avoid including any information in the body of the paper or references that would identify the authors or their institutions. Such information can be added to the final camera-ready version for publication.

2.3 Abstract

Place the abstract at the beginning of the first column 3″ from the top of the page, unless that does not leave enough room for the title and author information. Use a slightly smaller width than in the body of the paper. Head the abstract with "Abstract" centered above the body of the abstract in a 12-point bold font. The body of the abstract should be in the same font as the body of the paper.

The abstract should be a concise, one-paragraph summary describing the general thesis and conclusion of your paper. A reader should be able to learn the purpose of the paper and the reason for its importance from the abstract. The abstract should be no more than 200 words long.

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The main body of the text immediately follows the abstract. Use 10-point type in a clear, readable font with 1-point leading (10 on 11).

Indent when starting a new paragraph, except after major headings.

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When necessary, headings should be used to separate major sections of your paper. (These instructions use many headings to demonstrate their appearance; your paper should have fewer headings.)

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Print section headings in 12-point bold type in the style shown in these instructions. Leave a blank space of approximately 10 points above and 4 points below section headings. Number sections with arabic numerals.

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Print subsection headings in 11-point bold type. Leave a blank space of approximately 8 points above and 3 points below subsection headings. Number subsections with the section number and the subsection number (in arabic numerals) separated by a period.

Subsubsection Headings

Print subsubsection headings in 10-point bold type. Leave a blank space of approximately 6 points above subsubsection headings. Do not number subsubsections.

Special Sections

You may include an unnumbered acknowledgments section, including acknowledgments of help from colleagues, financial support, and permission to publish.

Any appendices directly follow the text and look like sections, except that they are numbered with capital letters instead of arabic numerals.

The references section is headed "References," printed in the same style as a section heading but without a number. A sample list of references is given at the end of these instructions. Use a consistent format for references, such as that provided by BibTEX. The reference list should not include unpublished work.

2.6 Citations

Citations within the text should include the author's last name and the year of publication, for example [**?**]. Append lowercase letters to the year in cases of ambiguity. Treat multiple authors as in the following examples: [**?**] or [**?**] (for more than two authors) and [**?**] (for two authors). If the author portion of a citation is obvious, omit it, e.g., Nebel [**?**]. Collapse multiple citations as follows: [**?**; **?**].

2.7 Footnotes

Place footnotes at the bottom of the page in a 9-point font. Refer to them with superscript numbers.[1] Separate them from the text by a short line.[2] Avoid footnotes as much as possible; they interrupt the flow of the text.

[1] This is how your footnotes should appear.

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Acknowledgments

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A LATEX and Word Style Files

The LATEX and Word style files are available on the IJCAI–11 website, `http://www.ijcai-11.org/`. These style files implement the formatting instructions in this document.

The LATEX files are `ijcai11.sty` and `ijcai11.tex`, and the BibTEX files are `named.bst` and `ijcai11.bib`. The LATEX style file is for version 2e of LATEX, and the BibTEX style file is for version 0.99c of BibTEX (*not* version 0.98i). The `ijcai11.sty` file is the same as the `ijcai07.sty` file used for IJCAI–07.

The Microsoft Word style file consists of a single file, `ijcai11.doc`. This template is the same as the one used for IJCAI–07.

These Microsoft Word and LATEX files contain the source of the present document and may serve as a formatting sample.

Further information on using these styles for the preparation of papers for IJCAI–11 can be obtained by contacting `pcchair11@ijcai.org`.

References