

# Author Instructions

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## Abstract

The aim of this template is to make it more clear what is expected from you. **It is by no means required to follow this exact same structure.** The abstract should be short and give the overall idea: what is the background, the research questions, what are your contributions, and what are the main conclusions. It should be readable as a stand-alone text (preferably no references to the paper or to outside literature).

## 1 Introduction

- Introduce the topic and explain why it is important (motivation!).
- Relate to the most relevant existing work from the literature (use BibTeX), explain their contributions, and (critically) indicate what is still unanswered.
- Explain what the research questions for this work are. This usually is a subset of the unanswered questions.
- Summarize the main contributions/conclusions of this research. NB: Make sure the title of the paper is a good match to the main research question / contribution / conclusion.
- Briefly indicate how the rest of the paper fits together to answer the research question(s).

The literature study is included in the introduction, it mostly focuses on the literature specific for the problem variant.

Make sure the introduction and conclusion are easily understandable by everyone with a computer science bachelor (e.g. your examiner may have a completely different expertise).

Don't go too much into depth with the conclusions of the paper, but rather explain the main contributions of your paper.

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## 2 Methodology or Problem Description

### 2.1 Formal Problem Description

For some types of work in computer science the methodology is standard: analyze the problem (e.g., make assumptions and derive properties), present a new algorithm and its theoretical background, proving its correctness, and evaluate unproven aspects in simulation. Then an explanation of the methodology is often omitted, and the setup of the evaluation is part of a later section on the evaluation of the ideas.<sup>1</sup> In this case, explain relevant (background) concepts, theory and models in this section (with references) and relate them to your research question. Also this section then typically contains a more precise, formal description of the problem.

Do not forget to give this section another name, for example after the problem you are solving.

## 3 Heuristic augmentation of SAT solvers

In computer science typically the third section contains an exposition of the main ideas, for example the development of a theory, the analysis of the problem (some proofs), a new algorithm, and potentially some theoretical analysis of the properties of the algorithm.

Our research is a combination between improvements to an existing idea and experimental work. There already exist approaches to solving RCPSP with SAT solvers, and the research focuses on extending this approach with heuristic variable selection. This extension can only be evaluated by performing experimental work.

### Experimental work

In this case, this section will mostly contain a description of the methods/algorithms you will be comparing. Although not all methods need to be described in detail (providing appropriate references are available), make sure that you reveal sufficient details to a reader not familiar with these methods to: a) obtain a high-level understanding of the method and differences between them, and b) understand your explanation of the results/conclusions.

### Heuristic

This subsection should explain how the heuristic is calculated, and whether it provides an advantage compared to a standard approach to solving the specific sub-problem.

### CNF Encoding

This subsection should describe how the input data is encoded into CNF that will be solved by some SAT solver described in the next subsection. Previous approaches of encoding a RCPSP into CNF might be referenced and compared.

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<sup>1</sup>This already shows that there is no single outline to be given for all papers.

## SAT solver

This subsection should describe how the SAT solver finds optimal solutions. Also explain why certain SAT solvers were selected for solving. If possible cover the inclusion of heuristics for variable selection in the sat solver.

## 4 Experimental Setup and Results

As discussed earlier, in many sciences the methodology is explained in section 2 and this section only discusses the results. However, in computer science, most often the details of the evaluation setup are described here first (simulation environment, etc.). Very important is that any skilled reader would be able to reproduce this setup and then obtain the same results.

Then, results are reported in an accessible manner through figures (preferably with captions that allow them to be understood without going through the whole text), observations are made that clearly follow from the presented results. Conclusions are drawn that follow logically from the previous material. Sometimes the conclusions are in fact hypotheses, which in turn may give rise to new experiments to be validated.

You may want to give this section another name.

## 5 Responsible Research

Reflect on the ethical aspects of your research and discuss the reproducibility of your methods. Note that although in many published works there is no such a section (it may be part of some meta-information collected by the journal, or part of the discussion section), we require you to think (and report) about this as part of this course.

Main topic is the correct way to compare algorithm results. They should all be written by programmers of equal skill and be run on the same system.

Also discuss the importance of making source code publicly available, to make it easier for your work to be reviewed and to improve reproducibility.

## 6 Discussion

Results can be compared to known results and placed in a broader context. Provide a reflection on what has been concluded and how this was done. Then give a further possible explanation of results.

You may give this section another name, or merge it with the one before or the one hereafter.

## 7 Conclusions and Future Work

Briefly summarize the (main) research question(s). Provide your conclusions, the answers to the research question(s). Make statements. Highlight interesting elements, contributions.

Discuss open issues, possible improvements, and new questions that arise from this work; formulate recommendations for further research.

Ideally, this section can stand on its own: it should be readable without having read the earlier sections and accessible to anyone with a bachelor degree in Computer Science.

## A Some further guidelines

- Read the manual for the Research Project. (See e.g. the instructions on the maximum length: less is more!)

### A.1 Reference use

- use a system for generating the bibliographic information automatically from your database, e.g., use BibTex and/or Mendeley, EndNote, Papers, or ...
- all ideas, fragments, figures and data that have been quoted from other work have correct references
- literal quotations have quotation marks and page numbers
- paraphrases are not too close to the original
- the references and bibliography meet the requirements
- every reference in the text corresponds to an item in the bibliography and vice versa
- our own preference would be to use IEEE reference style (check with supervisor)

### A.2 Structure

Paragraphs

- are well-constructed
- are not too long: each paragraph discusses one topic
- start with clear topic sentences
- are divided into a clear paragraph structure
- there is a clear line of argumentation from research question to conclusions
- scientific literature is reviewed critically

### A.3 Style

- correct use of English: understandable, no spelling errors, acceptable grammar, no lexical mistakes
- use of British or American English: pick one individually and use it consistently
- the style used is objective
- clarity: sentences are not too complicated (not too long), there is no ambiguity
- attractiveness: sentence length is varied, active voice and passive voice are mixed
- the author refers to themselves as "we"
- refrain from using "we" as much as possible in all sections except abstract and conclusion
- single-column or double-column format: you can pick your own preference (no strict rule)

#### **A.4 Tables and figures**

- all have a number and a caption
- all are referred to at least once in the text
- all are numbered consecutively in the same order as their appearance in the text.
- if copied, they contain a reference
- can be interpreted on their own (e.g. by means of a legend)
- tables should be provided as editable text, not as images.
- tables can be placed either next to the relevant text in the article, or on separate page(s) at the end.

#### **A.5 Peer review**

- Peers provide feedback to each other by adding notes to their papers. This feedback can range from small errors to structural improvements to sections.
- A summary of the feedback should be given by filling in the rubric (where applicable).
- Reviews should be done in week 4.7 on first draft version of the paper.

A rule of thumb for dealing with the literature is the following: scan about 10–20 contributions: read title, abstract, part of introduction and conclusions; categorize contribution; some of these are studied in more depth: completely read about 5 conference papers or equivalent (summarize contribution in own words); of which studied in-depth about 2 conference papers (the student is able to explain in detail and criticize contributions). This may result in 5–20 references, possibly even more if the project is a literature study.