**Writing Research Papers**

**IA 643**

“A research paper is the culmination and final product of an involved process of research, critical thinking, source evaluation, organization, and composition. A research paper is not simply an informed summary of a topic by means of primary and secondary sources. It is neither a book report nor an opinion piece nor an expository essay consisting solely of one's interpretation of a text nor an overview of a particular topic.” OWL, Purdue University

Types of Research Papers

1. Experimental/empirical paper

To validate or test hypotheses /a new system design/method/algorithm

1. Theoretical/conceptual paper

To offer new theory/framework/model/guidelines/critical insights

Structure of Research Papers

Title

Reflects the research work

Summarizes the hypothesis of the paper

Abstract

States the hypothesis or research questions or purpose of your study

Justifies your research study  
Summarizes your research findings (add this when you are done with your research)

Mentions the key contributions of the paper

Introduction

Provide context

Motivation of your research

Questions addressed

What is the problem?

Why is the problem important?

What has so far been done on the problem?

What is the contribution of the paper on the problem?

Is the contribution original? Explain why

Is the contribution non-trivial? Explain why

Ends with a short summary of the paper’s organization. For example,

“The rest of the paper is structured as follows: In Section 2 we ... “

Main Body (Vary depending on the type of paper)

This part of the paper consists of Sections with names of your choice. For example, If a

paper is fairly large and has an extensive amount of background material, you may add a

section of Literature Review below.

Literature Review (optional)

1. Provide a broad and general account of the field, which helps to create a context for your research contribution. For example,

What are the rival approaches?

What are the drawbacks of each?

How has the battle between different approaches progressed?

What are the major outstanding problems? (This is where you come in)

1. Background

describes previous work in more technical detail, as far as needed for a proper understanding of the contribution of the paper

(c ) Theory

describes the underlying theory of techniques or system where appropriate, uses a

mathematical style of definitions, lemmas, propositions, theorems, etc. illustrates

the main definitions and theorems with simple but meaningful examples.

Most Scientific research papers contain these sections: Methodology, Results,

Discussion.

Methodology

States research method used. Survey study is mostly used in social science disciplines. Experimental study is often used in computer science and engineering fields.

Specification (optional)

Describe survey instrument and its development

Describe survey subjects, procedure of data collection and analyses

or

Formally specifies techniques that underlie the implementation

States the requirements of the implementation

Implementation (optional)

Describe how the survey was administered; response rate

Or

Describes only the final state of the implementation

Identifies the major design decisions and gives their reasons

Describes the overall structure of the system and key algorithms in abstract form

Illustrates the main algorithms with simple but meaningful examples

Results

Statistical analyses of data collected from the survey or computational data from the experiment are presented

Results are often best presented graphically.

Discussions

Use the results to support or refute the hypothesis. The following is a case of a computational study,

Technique/system X automates task Y for the first time

Technique/system X automates task Y better, along some dimension, than

each of its rivals, where the dimensions are typically:

1. Behavior: X has a higher success rate or produces better quality outputs
2. Coverage: X is applicable to a wider range of examples
3. Efficiency: X is faster or uses less space
4. Dependability: X is more reliable, safe or secure than its rivals
5. Maintainability: X is easier to adapt and extend than its rivals
6. Usability: Users find X easier to use than its rivals

Conclusions

Summarizes the research and discusses its significance

1. The hypothesis and the evidence for and against it are briefly restated
2. The original motivation is recapitulated
3. The state of the field in the light of this new contribution is reassessed

References

ICCL Team (2012). How to Write a Research Paper in Computer Science, Technische Universitat Dresden, Germany

Shoop, Libby (2016). A Guide for Writing a Technical Research Paper, Macalester College

<http://www.macalester.edu/~bressoud/capstone/TechPaperHowTo.pdf> (November 15, 2016).

Turner, Jon (2016). How to Write a Great Research Paper, Washington University in St. Louis. <http://www.arl.wustl.edu/~pcrowley/cse/591/writingResearchPapers.pdf> (November 15, 2016).