Hints on

HOW TO WRITE A SCIENTIFIC PAPER

Eugénio Oliveira- 2017/2018
MSR- Methodologies for Scientific Research

Source: GETA and Graduate School of Electrical and Communications Engineering course: Introduction to Research Methodology, Helsinki University of Technology,
Selected Websites on writing scientific papers:


Bates College: http://abacus.bates.edu/~ganderso/biology/resources/writing/HTWtoc.html
Scientific publications: a few numbers

more than **89 million publications**, **795 million citations**, and **1.23 billion collaboration** relationships spanning from **1900 to 2015**

shift from individual work to collaborative effort
with over **90%** of the world-leading innovations generated by **collaborations** in the XXI century,

nearly four times higher than they were in the 1900s.

from 1900 to 2015:
- 25 times more **international collaborations**
- 7 times more **citations**

accumulation of citations by the **US + UK + Germany**:
from ~95% to ~50%

*From KDD 2017 Applied Data Science Paper, August, 2017, Halifax, Canada*

Yuxiao Dong et al. Microsoft Research, Redmond, WA
How many years did it take for science to double its volume? The overall volume of publications across all subjects grew exponentially, leading to a **twofold increase every 12 years** for the past 116 years.

In accordance with previous discoveries in individual fields such as **Computer Science** and Physics, the average yearly number of papers produced per author was fairly constant over the past 116 years at roughly **two per year per scientist**.

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*From KDD 2017 Applied Data Science Paper, August, 2017, Halifax, Canada*

*Yuxiao Dong et al. Microsoft Research, Redmond, WA*
Scientific publications: a few numbers

**single-author publications** gradually but substantially shrank from 80% to 20%, and in this century, only **15-20%** of papers have been authored by individuals.

**How many references** did scientists cite in a publication?
In Physics in the beginning of the XX century, each scientific paper on average had only two to three references
In 2015, modern scientists reference on **average 30 papers** in a publication.

**self-citation** rate: over 30% in the 1900s and only 10-15% in the 2000s

average **age** of a paper’s references:
- around 6 years until 1975,
- 11 years in the 2010s.

*From KDD 2017 Applied Data Science Paper, August, 2017, Halifax, Canada*

*Yuxiao Dong et al. Microsoft Research, Redmond, WA*
Plan for writing a scientific paper
A Strategy for Writing Up Research Results

Get Organized: Before starting, develop a list of points to be made in the paper;

A. Balanced Review of the Primary Research Literature

what is known about the topic you are investigating. It may let you avoid unnecessarily repeating work done by others.

B. Write the Introduction: State and refine your Hypothesis

C. Design and Conduct the Experiment:

Keep careful notes on procedures used during the experiment
Plan for writing a scientific paper

D. Analyze and **Interpret the Results**:

Will include data summaries (e.g., calculating means and variances) and **statistical** tests to verify conclusions.

E. Write the **Results Section**:

Remember that the Results section has both text and illustrative materials (Tables and Figures).
F. Write the Discussion:
Interpretation of your results includes discussing how your results modify and fit in with what we previously understood about the problem.

G. Write the Abstract and Title:
The Abstract is always the last section written because it is a concise summary of the entire paper and should include a clear statement of your aims, a brief description of the methods, the key findings, and your interpretation of the key results.

The Title will probably be written earlier, but is often modified once the final form of the paper is clearly known.
Plan for writing a scientific paper

H. Self-Revise Your Paper:

Most authors revise their paper at least 2-3x before giving it out for peer review.

I. Peer Review:

Have knowledgeable colleagues reviewing /criticizing your paper.

J. Prepare the Final Draft:

Carefully proof-read your final draft to make sure it is as well done as possible. Double check that you've properly cited all your sources in the text and in the Literature Cited. Check the formatting one last time.
Literature review

Implies the production of a *written* Report (or paper’s chapter/section)

- Well *organized* and including a comprehensive summary of the *state of the art*

- Describing and *comparing* current research perspectives and technologies with a clearly defined *focus* in a particular *domain* of knowledge

*Tables* for works’ comparison along different dimensions
Literature review

• to obtain the most relevant information it is required that you read
  • the most recent journal articles and
  • conference/Workshop proceedings
technical reports belong to the “grey” literature (avoid citation)

• Research Projects descriptions

In Computer Science / Informatics, leading Conferences
Proceedings are of most importance
In Exact sciences and other fields (only) Journals matter
Literature review

• **Motivation for literature searches** [Sternberg81], [Michaelson90]:

  • full grasp of subject (**large picture**)
  • show originality of own work (**explicitly compare your** work (done or to be done) with the earlier work)
  • list of **references** for your own paper and thesis
  • **ideas** for new research

• Do not forget:

  • Every day more than 1000 papers are published in (for example) Electrical engineering and Electronics (INSPEC), thus you must carefully **select** what you read

  • the amount of scientific papers is **doubled** every ~6 years
Motivation

- Motivation for **writing** scientific papers
- distribution of knowledge
- improves the quality of research
- general aim is the **reproducibility of experiments**
- measure of scientific merit of the researcher (peer reviewing process)

**A kind of altruism…**

**Getting the payback…**
Publishing

• Conferences, Symposia, Workshops, Seminars, Congresses
  • Scope (broad, narrow or specific)
  • Reported work (finished, in progress, tutorials, invited)
    • finished means: results reported and evaluated!
  • Meeting intention (scientific progress, business…)

• “A Conference refers to a formal meeting where participants exchange their views on various topics.” (P. Gupta, 2016)

• “A Symposium …experts present or deliver their opinions or viewpoints on a chosen topic of discussion. It would be correct to label a symposium as a small scale conference”

• A Congress - would typically be held once a year per discipline, highlighting the achievements, notable results,…

• “A Seminar is a form of academic instruction
• A Workshop emphasizes “hand-on-practice” or laboratory work done
Publishing

- **Journals**: see [Journal Citation Reports](https://jcr.citationmetrics.com) and Impact Factors
- **Books** (Chapters, Manual, didactic, thematic)
  - Conferences CORE ranking
  - Steps for publishing:
    - **Before**: Research
    - **During**: Writing
    - **After**: Evaluation

Scientific Research

BEFORE writing a paper:

• A scientific research paper should reflect the research method followed.

• In the classical scientific method we may depict the following steps:
  • Observations (empirical, non-empirical)
  • Hypothesis setting to explain, answer or solve issues coming out of those observations
  • Testing predictions searching for evidences about observations (experimentations → new observations)
  • Test results interpretation
  • Accepting or rejecting Hypothesis
Scientific Research

• In the scope of Computing and Information Systems, describe:

  • **Requirements** (related with the problem in the real world)
  • **Specification/Modelling**
  • **Implementation** (and/or simulation)
  • **Evaluation** (Proof?)
  • **Accepting, rejecting** or go to the new spiral re-starting from Requirements
* Steps for publishing:
  - Before: Research
  - During: Preparing and Writing
  - After: Evaluation

Paper Production

- Related with the research issues
- Paper objectives *
- Paper motivation *
- Paper preparation
- Paper writing
- Paper evaluation

* Related with the research issues

- Good luck!
- Doesn't depend on you...

- Be cautious, synthetic
- Be systematic
- Be concise
- Be clear
Paper **Objectives**

**Conceptualization** of a scientific paper:

Two main *objectives in writing* a paper:

- First, it must clearly and completely *describe the procedures* that were followed and the *results* that were obtained.

- Second, it must place these *results into perspective* by relating them to the existing state of knowledge and by emphasizing their *significance* for future study.

- *different from other researchers’ results?*
- *Far ahead?*
- *Going back to the assumptions?...*
Paper **Motivation**

- Choose the **topic** under investigation to be reported:
  - What are the **issues** to be dealt with,
  - **Questions** to be answered,
  - **Hypothesis** to test?

- Constrained by the permitted **number of pages**

- **Vague** and open topic (or exhaustive **Theme**), may be for a book or a speculative article, but **not** for a 6-12 (or even 12-16) pp. research paper
Paper Motivation

Issues can also be detailed in Research Questions

- Examples of issues to deal with:
  1. “The use of autonomous agents for traffic control management”
  2. “Software Quality measurement through Model checking”
  3. “Dynamic improvement of Communication Networks performance”

- Examples of specific questions (related with the selected topic):
  1. “How to organize Agents in my Multi-Agent System?”
     “What the entities/actors will be and which ones can be agentified?”
     “Shall I use heterogeneous (mix different kinds of) Agents?”
     “What kind of measurements are important to be made?”
  2. “What specific functionalities do I want to test?”
  3. “How to avoid specific network’s nodes overloading?”
Paper **Motivation**

- **Examples of Hypothesis:**

  1-“Making a group of heterogeneous agents to communicate and learn, improves individual agents’ performance”

  2-“For most programs it is possible to do model-checking”

  3- “Data Mining over previous network traffic allows predicting overloaded nodes”

- **Examples of Prediction:**

  “Using a set of heterogeneous agents will improve the measure of the quality of traffic control. Different situations causing traffic congestion will be resolved ”

  2-” Using Model-checking make programs more safe”

  3- “Anticipating overloaded nodes will enable better throughput by means of network reconfiguration”
Paper **preparation**

Before **testing** the hypothesis and predictions:

- Make a **list of main sources** to check before entering the library or the Internet

- Gathering and **Organizing** information
  - *Read each source*
  - *Take notes and summarize.*
  - *Use quotes for transcriptions.*
  - *Add bibliographic information* (author's name, title of the book/article, publication information)
  - *Keep track of this work in a log book* (log page in your web site, Log files, Wiki ...)

- **Experiments:**
  - *What method, what kind of data using which assumptions*
Paper preparation

Summarizing:

- Select small concrete topic(s) related with your research interests
- Summarize the state of knowledge on the general topic
- Define (one or several) hypotheses that can be tested
- Relate your work to general body of knowledge on the topic
- Make predictions based on the Hypotheses

  - Recall the research you already made on the subject
  - Gather and Organize all the existing information
  - Revisit your Notes
  - Interpret the results.
  - Extract the conclusions.
  - Accept/reject the Hypothesis

Prepared ??
Steps for publishing:

- Before: Research
- During: Writing
- After: Evaluation

Writing the Paper

WRITING A SCIENTIFIC PAPER (the FORMAT):

- A paper is composed of:
  - Title
  - Abstract
  - (Key words)
  - Introduction
  - Procedures, Methods and Techniques
  - Results and Discussion
  - Acknowledgements (give credits)
  - Bibliographic list of sources

- There are “standard formats” from Springer, IEEE, ACM,...
Writing the Paper

WRITING A SCIENTIFIC PAPER OR THESIS (the FORMAT):

IMRAD Structure of a Paper [Day98]

I. Introduction
   • **What** question or problem was studied?
   • Write the whole **literature review here, do not continue** it elsewhere.

II. Methods (model)
   • **How** was the problem studied?
   • Describe the whole **system model here (parameters presented with symbols)**, do not continue the system model description elsewhere.

III. Results
   • **What** were the findings?
   • These must be your own results.
   Plagiarism (also self-plagiarism up to a certain degree) strictly forbidden. Give **numerical values of** all parameters (guarantee repeatability).

IV. Discussion
   • **What** do these findings mean?
Writing the Thesis

Thesis and dissertation writing: an examination of published advice and actual practice,


Paltridge's Four Thesis Types

Traditional Simple
1. Introduction
2. Literature Review
3. Materials and Methods
4. Results
5. Discussion
6. Conclusions

Traditional Complex
1. Introduction
2. Literature Review
3. Materials and Methods
4. General Methods
5. Study 1
   1. Introduction
   2. Methods
   3. Results
   4. Discussion
6. Study 2
   1. Introduction
   2. Methods
   3. Results
   4. Discussion
7. Study 3+
   1. Introduction
   2. Methods
   3. Results
   4. Discussion
8. Discussion
9. Conclusions

Topic Based
1. Introduction
2. Topic 1
3. Topic 2
4. Topic 3
5. Conclusions

Compilation Based
1. Introduction
2. Background to the Study
3. Research Article 1
   1. Introduction
   2. Literature Review
   3. Materials and Methods
   4. Results
   5. Discussion
   6. Conclusions
4. Research Article 2
   1. Introduction
   2. Literature Review
   3. Materials and Methods
   4. Results
   5. Discussion
   6. Conclusions
5. Research Article 3
   1. Introduction
   2. Literature Review
   3. Materials and Methods
   4. Results
   5. Discussion
   6. Conclusions
6. Conclusions

Multi-disciplinary

Not advisable … …
Writing the Paper

WRITING A SCIENTIFIC PAPER (the FORMAT):

Ref: Structure of an IEEE paper [*Spectrum65]*
From: VTT TECHNICAL RESEARCH CENTRE OF FINLAND 9.5.2007
Aarne Mämmelä

Abstract
1. What the author has done.
2. How it was done (if it is important).
3. Main results (numerically, when possible).
4. Significance of the results.

I. Introduction
1. Nature of the problem.
2. Background of previous work.
3. Purpose and significance of the paper/research.
4. Method by which the problem is approached.
5. Organization of the paper.

II. Materials and methods (Model)

III. Results

IV. Conclusions
1. What is shown by this work and its significance.
2. Limitations and advantages.
3. Application of the results.
4. Recommendations for further work.

Acknowledgments
References
Photograph and biography
Writing the Paper

WRITING A SCIENTIFIC PAPER (the FORMAT):

Do not overload!
Keep the balance between text and graphical info.
Writing the Paper

WRITING A SCIENTIFIC PAPER (the FORMAT):

Authors’ names and affiliations:

Always use the same name (*your signature*) to avoid any confusion with other researchers in the same Community.

Eugénio Oliveira
Eugénio C. Oliveira
Eugénio da Costa Oliveira

Identify the author for correspondence with *

Also give the complete name and address of the institution or Labs the authors belong to.

Do not forget emails!
Writing the TITLE

Title

• specific enough to immediately show what kind of information will be found on the paper, but not so specific that you include unnecessary information;

• short, usually not more than 70 (max limit 100 characters);

• a professional, rather than conversational tone;

Kind of Outcome / for what / using what

• Ex(+pos)


"Virtual Enterprise Normative Framework within Electronic Institutions"

in M.-P. Gleizes, A. Omicini & F. Zambonelli (eds.),
Engineering Societies in the Agents World V, LNAI 3451, Springer,

• Ex(-neg?)

Luis Sarmento, Daniel Moura, Eugénio Oliveira,

"Fighting Fire with Fear"

in Proceedings of EUMAS-04, 2nd European Workshop
on Multi-Agent Systems, Ed. C.Ghidini, P.Georgini, Wiebe

Colloquial...

No reference to the technology
Writing the TITLE

Title

Maria C. Neves and Eugénio Oliveira

"Integrating Fuzzy Logic and Neural networks in the Design of Navigation Competencies of an Autonomous Mobile Robot"

in *Proceedings of International Conference on Computational Intelligence Modelling, Control and Automation (CIMCA'99)*, Vienna, Austria, Feb 1999

Maria C. Neves and Eugénio Oliveira

"Fuzzy Neural networks for Robot Navigation"
Writing the ABSTRACT

Abstract

• What researchers/referees read or inspect to select readings among tenths of papers

• Write the abstract only after you have written the rest of the paper. Extremely concise synthesis of your entire paper.

• It should contain:
  • the major question(s), or hypothesis,
  • the basic approach to answering that question,
  • key results and/or data
  • a brief conclusion about what you discovered
  • About one-half page (of double-spaced) text (sometimes, even less)
Writing the ABSTRACT

• Ex( ~ pos)

ABSTRACT

During the last two decades, researchers have collected a decisive amount of experimental evidence about the fundamental role of Emotion on cognitive processing. Emotional phenomena have been correlated with effective decision-making processes, memory, learning and other high-level cognitive capabilities and skills (e.g. risk assessment). In this paper we will describe an ongoing work that aims to design new Agent Architectures influenced by what has been learned in psychology and neurosciences about Emotion-cognition interaction. Specifically, we will present an Agent architecture that includes several emotional-like mechanisms, namely: emotional evaluation functions, Emotion–based processing, emotional tagging and mood congruent memory. These emotional-like mechanisms are intended to increase the performance and adaptability of Agents operating in real-time environments. We will also introduce Pyrosim, a MAS platform we have developed to serve as an appropriate test-bed for Emotional-based Architectures.

Pyrosim simulates a forest fire in a complex 3D environment where Emotional Agents must take decisions about multiple concerns in real-time.
Writing the ABSTRACT

• Ex(+ pos)

ABSTRACT

Agents that buy and sell goods or services in an electronic market need to adapt to the environment's prevailing conditions if they are to be successful. Here we propose an online, continuous learning mechanism that is especially adapted for agents to learn how to behave when negotiating for resources (goods or services). and led to Nash equilibrium when faced with other adaptive opponents.

Taking advantage of the specific characteristics of the price adaptation problem, where the different price states are ordered, we propose a specific reinforcement learning strategy that simultaneously allows good stability and fast convergence. Our method works by positively reinforcing all the lower value states if a particular state is successful and negatively reinforcing all the higher value states when a failure occurs. The resulting adaptive behaviour proved, in several different market situations, to perform better than nonadaptive agents and led to Nash equilibrium when faced with other adaptive opponents.

<table>
<thead>
<tr>
<th>Topic</th>
<th>Methods</th>
<th>Hypothesis</th>
<th>Results</th>
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Writing the ABSTRACT

- Ex(neg)

ABSTRACT

The present paper aims to contribute to the research on depth perception mechanisms by using a biologically inspired model of stereoscopic vision. Stereogram images show that human beings are able to perceive depth just from the differences between the images coming from the retinas of both eyes. The research made aspires at finding support for the idea that the way stereogram images are perceived by human beings is just a consequence of the way they see on real world environments; that is, to show that the information received by the brain for generations is perfectly enough to make us interpret stereogram images as having differences on depth.

Usually, to implement a stereoscopic depth mechanism on robots two parallel cameras are used. The images supplied by these cameras are very difficult to match by means of a biologically inspired algorithm since these ones require the use of local information, and the extension of information needed to mach the images from two parallel cameras is too large. Human beings have the ability to move their eyes and when they look at a real world object both eyes converge to that object. The disparity method built is expected to make use of this behaviour (eye convergence) in order to reduce the disparity computation to local and much simpler algorithms.

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Eugénio Oliveira- 2016

MIC- Metodologias de Investigação Científica
MSR- Methodologies for Scientific Research
Writing the INTRODUCTION

Introduction

- A chance to explain the research motivation (including relevance).
- Present your ideas in a clear and orderly fashion.
- The reader will follow your logic and anticipate what happens throughout the rest of your paper.

Includes:

1) why did you undertake this study?

2) what is the state of existing knowledge?

3) what specifically are you going to present and highlight:
Writing the INTRODUCTION

• **Observations** - **General**: What brought you to this area of research? What did you observe that caused you to begin this study? (Start with a general observation, and then get more specific).
  
  **Specific**: Set of observations during experiments/analysis

• **Hypothesis** - Based on your observations, what is your hypothesis?

• **Structure** – Name and briefly describe all the **sections** of the paper

• **Prediction** - What is the **prediction(s)** that accompanies your hypothesis?

• **Expected results** - As you conclude your introduction, write what you **expected** to see **prior** to beginning your research.
  
  • The **introduction** might have two or three pages (for a 12-16 pp. paper)
Writing the Descriptive part

Procedures, Methods and Techniques

• Although it can be done, it is not necessary to explicitly discuss the approach in philosophical terms.

• Justify the use of the selected methods, techniques and algorithms.

In this section you tell your reader exactly what you have done to test your hypothesis, but don't write unnecessary details.

• provide enough description to make it possible to repeat your experiment (mainly for reports, thesis, book chapters...)

For the Thesis, you should elaborate upon both the research method and Data.
Writing the Descriptive part

Take into consideration:

• *Explain how you tested your hypothesis* - This is the main goal

• *Write in paragraph form* - Don't make a list of procedures or equipment.

• *Write in past tense* – the work has been done…

• *Decision making* - Include at least a paragraph on data analysis and how did you arrived at your decisions regarding your hypothesis.

• Give enough information such that one could replicate what you have done … or justify why is it not possible.
Results section  Reporting the Results

• Here you report the results of your experiment/System.

• Describe the chosen scenaria (advantages and limitations)

• Be strict about your observed results. Do not discuss them here.

• Include graphics OR tables.

• If a figure can be used to show data, use the figure (e.g. a graphic) instead of a table. Most people understand graphics better than tables.

• Don't present same data in several ways, choose the one best way.

• Every graphic, figure, or table you include should be referred to in the text of your results section.
Reporting the Results

Remember the following:

- **First** - Show **updated** data
- **Second** - Include results of any **statistical** tests
- **Third** - State whether your hypothesis was **accepted or rejected**
- **Write in past tense** - You've already found the results
  
  **Tables and Graphics** - Include these only in the results Section
  
  Do always some **explanation** in your text about figures
  
  **Don't interpret here the results** - You'll interpret your results in the discussion section.
Reporting the Results

Details:

- **Table captions** are always *above* a *table*,

- while **figure captions** are placed *below* a graphic, picture, or sketch.

- Each table or figure should be inserted in order immediately *following the text page* it is first cited on.

- **Captions** are never grammatically complete sentences, but if the caption and the legend are run together the caption ends with a period.

- **Legends** are explanations consisting of one or more sentences, usually placed *after* captions.
DISCUSSION part

Discussion

- **Interpret** the results (or discuss, comparing to other researchers results).
- Start with a **specific conclusion** about your results.
- **Enlarge** the overview of what those results mean.
- Consider the following:
  - **Conclusions** - Did you accept or reject your **hypothesis**?
    - What does this allow you to conclude about your **questions**?
    - Is this what you **expected** to see, or is it very different from what you expected?
  - **Interpretation** - If your results were not what you expected, consider possible **reasons** for this.

**Compare with other systems**

Mainly for the THESIS
DISCUSSION part

Mainly for the THESIS

- Do you need to collect more data?
- Identify sources of error or inadequacy of the research.
  -- Did anything go wrong while you performed the experiment?
  -- Were there problems with the methods that may have made it difficult to test your hypothesis effectively?

- Does the whole issue need to be reexamined based on your unexpected results?
- If your results were what you expected, what is the significance of this?
- How do your results fit in with what other researchers have found?
- Do your results and conclusions generate new questions and predictions?
DISCUSSION part

• *The bigger picture:*

  - What have you, and the research community *gained* from this research?

  - What is the real *impact* of the research?

  - Speculate upon *broader meaning* of the conclusions

• Discussion should be around *two to three* double-spaced pages (for a paper in a journal or in a book)

  always more than \( \frac{3}{4} \) of page for short papers
Others

- **Acknowledgments:**

  *(optional, depending on the study, the project, the team)*

  give **credits** to those who helped in your research through either general or technical advice, work, permission, suggestions, funding and logistic support, etc.

  Names, Institutions, projects, grants,…
Others

- Literature Cited (quoted)

- Start a new page with the heading "References“ (thesis), alphabetize your sources (or order of appearance in the text), and list them in the correct form.
- Remember to include only the sources that you actually used.

- Example:

Others

- Other format:
  the author, title of the article, title of the Journal/Book, the volume number, page numbers, date. Or...


- Other format:
  the authors, title of the Book, Series, volume, Chapter, Editor, ISBN, page numbers, date.


  DOI 10.1007/978-94-007-5583-3_15

  refers to the paper in the book
Others

- **Harvard System:**
  - Start with Names and Year for reference in the text
  
  - Example:
  "…these results agree with the previous works (Cardoso,H and Oliveira E, 2009)."

- Other format:

  - Vancouver System:
    It uses a numerical sequence
    "…these results agree with the previous works [1] and [2]"
Others

• Use **concise** terms.

**Instead of:**

- prior to
- due to the fact that
- in a considerable number of cases
- the vast majority of
- during the time that
- in close proximity to
- it has long been known that …

**Write:**

- before
- because
- often
- most
- when
- near
- *I'm too lazy to look up the reference*
### Others

- **Use** **concise** terms.

<table>
<thead>
<tr>
<th><strong>Instead of:</strong></th>
<th><strong>Write:</strong></th>
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<tbody>
<tr>
<td>possess</td>
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<td>sufficient</td>
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<td>assistance</td>
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<td>terminate</td>
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“WRITING A SCIENTIFIC RESEARCH ARTICLE”
Others

• Use **concise** terms.

• Do not use either too short or very long **paragraphs**,

• Do not use very long complex **sentences**

• Start a paragraph with a **topic sentence** or some other indication of the subject

• Divide long **text sections** into smaller parts with headings
“You've written the paper, and now it's time to submit it to a scientific journal.

The journal editor will pick the referee most likely to be offended by your paper, because then at least the referee will read it and get a report back within the lifetime of the editor.

Referees who don't care one way or the other about a paper have a tendency to leave manuscripts under a growing pile of paper until the floor collapses, killing the 27 English graduate students who share the office below (Schulman, Cox, & Williams 1993).

Be aware that every scientific paper contains serious errors.”

How to Write a Scientific Paper
E. Robert Schulman
Charlottesville, Virginia
Others

• Does the paper answers the following **Questions**??.

  • **WHY**? At least in the *Introduction*
  
  • **HOW**? In the *Methods*
  
  • **WHAT** did you find out? In the *Results*
  
  • **WHAT** does it mean? In the *Discussion/Interpretation*
## Table of Contents for a Doctoral Thesis

*monography* Writing a Doctoral Dissertation by Gordon Davis

- Abstract
- Preface
- Table of Contents/index
- List of Abbreviations
- List of Symbols
- List of Figures
- List of Tables
- 1. Introduction
- 2. Literature Review /Stateof the Art/ Related work
- 3. Methods
- 4. Results
- 5. Discussion (may be combined with results)
- 6. Conclusions
- References
- Appendices

- Length of the thesis is up to 200 pages
Another site of the Galois Group about writing a doctoral dissertation:

http://galois.math.ucdavis.edu/UsefulGradInfo/HelpfulAdvice/WritingYourThesis
Papers Reviewing process
Papers Evaluation

- Scientific writing involves peer **reviewing** and constructive criticism

- Scientific paper evaluation **forms**

- Each conference and Journal have their own forms
<table>
<thead>
<tr>
<th>Score</th>
<th>Title:</th>
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<td>descriptive and appropriate</td>
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<td><strong>Introduction:</strong></td>
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<td>sufficient background information so purpose of study is clear?</td>
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<td>hypothesis and/or objective(s) of study clearly stated</td>
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<td><strong>Procedure or Materials and Methods:</strong></td>
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<td>are methods clearly described?</td>
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<td>research design is appropriate</td>
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<td><strong>Results:</strong></td>
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<td>clear text description of results</td>
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<td>figures and/or tables referred to in text</td>
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<td>figures and/or tables are essential, proper format, and “stand alone” with clear captions</td>
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<td>all relevant data is presented?</td>
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<td>are results adequately analyzed by appropriate statistical methods?</td>
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<td><strong>Discussion:</strong></td>
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<td>all relevant data discussed?</td>
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<td>data justifies conclusions/interpretations?</td>
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<td>facts, calculations, and interpretations correct?</td>
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<td>interpretations/conclusions compared with published works?</td>
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<td>sufficient and appropriate (related) for scope of study?</td>
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<td>correct citation methodology in body of text (author date format)?</td>
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<td>correct bibliographic format?</td>
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<td><strong>Overall:</strong></td>
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<td>report is clearly written and logically</td>
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Papers Evaluation

<contin.>
**Papers Evaluation**

**PRO-VE**  
IFIP Working Conference on Virtual Enterprises  
[http://www.pro-ve.org](http://www.pro-ve.org)

**PAPER REVIEW FORM**  
Paper #: 097  
Title: “P2P Infrastructure for Tourism Electronic Marketplace”  
Author(s): XXX, YYY

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## Papers Evaluation

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### OVERALL RATING

#### COMMENTS TO THE AUTHORS

Suggestions for improvement, corrections, text reduction (limit 8 pages), etc.

The text should be revised for English correctness.
Some figure references are incorrect, namely on pages 4 and 6.
The titles of sections 2 and 5 should be capitalized.
Sections 2 and 3 look rather small. I suggest them to merge as subsections of a single section.
In figure 4 (offer publishing and searching), I wonder if the arrows identified with 5 and 6 should connect directly
to the “Web Browser” peer.
The text in section 4.3.3 and the last paragraph of section 4.4 suggest this.

Reviewer: ZZZ [The reviewer’s name will be kept confidential]
Papers Evaluation

Other typical evaluation form

<table>
<thead>
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<tbody>
<tr>
<td>Title:</td>
<td>A Case Study of Agent-Based Virtual Enterprise Modeling</td>
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<td>Author(s):</td>
<td>M O</td>
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<td>Assigned Program Committee member:</td>
<td>E O</td>
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<td>Referee’s full name if different from PC member (needed for list of outside reviewers)</td>
<td>HHHHHHH</td>
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Confidential comments for Committee use only:
This paper exceeds the allowed number of pages, as its length is 12 pages.

7 Strong accept (award quality)
6 Accept (I will argue for this paper)
5 Weak accept (vote accept but won’t object)
4 Neutral (not impressed, won’t object)
3 Weak reject (vote reject but won’t object)
2 Reject (I will argue against this paper)
1 Strong reject
### Papers Evaluation

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<td><strong>Referee’s expertise on the topic</strong></td>
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<td><strong>Amount of rewriting required</strong></td>
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Papers Evaluation

A specific example of a Review Form from the Easychair.org

Easychair.org
Papers Evaluation

Comments to the Authors (mandatory)

Eg.
The paper addresses an important topic. However, several references are missing on the use of MAS to model the creation of virtual enterprises. The paper explains the integration of MAS and VE, which has been done before.

Furthermore, other authors have proposed similar approaches to include learning in the process of VE formation.

In page 3, it is arguable whether a Facilitator/Matchmaker should be part of an agent-based VE. It definitely helps on its formation, but I believe it is not part of the VE. The concept of Consortium Agent is also not clear.

The notion of leveled commitment contracts lacks a reference to the work by Sandholm. At the bottom of page 4, what kinds of norms do you mean?
In page 5, figure 3 looks very high-level. I wonder if this figure adds something to that explained in the text…
Papers Evaluation

Comments to the Authors (mandatory) Eg.:

Other authors have proposed the use of utility functions for evaluating bids, which makes this approach not new (again, references to the literature are missing).

In section 3.1., the concept of monitoring should be explained deeply: what is to be monitored and how?

Section 3.3. presents learning capabilities, which have also been proposed in the past by other authors to the process of VE formation (e.g. Rocha & Oliveira).

The employed learning method is barely explained. Equation (3) looks cumbersome. Section 4, page 9: are there two CFP? Do they happen in sequence? The text is very confusing…

Experimental results are not detailed appropriately.

Minor typos:
instead of “te …” it should be “the…”

etc
Papers Evaluation

Main contributions

The paper addresses an increasingly important topic, that of virtual organization formation. It also includes directions on how learning could be added to the formation of a virtual enterprise.

Positive aspects:
Illustration of a relevant case-study for MAS in VE formation.

Negative aspects:
Lack of novelty, and lack of appropriate references to the available literature. Not clear presentation of the case-study, which makes the paper hard to follow.

Further comments
Papers Evaluation

======== EUMAS 2003 REVIEW FORM ==========
Please motivate all your choices concisely - as authors we all know how unhelpful it is to receive marks with no comments!!

================================
Paper ID:EUMASL111

Title of Paper: Supporting multi-lateral semantic information viewpoints when accessing heterogeneous distributed environmental information
Authors: Landong Zuo and Stefan Poslad

================================
SUMMARY OF PAPER (Main Topics and Key Contributions)

In the scope of the EDEN-IW (Environmental Data Exchange Network for Inland Water) Project, the authors aim at providing a so-called "intelligent interface" for users to query heterogeneous information resources. They propose a Multi-agent system architecture and a (partially) common ontology facility to enable all the needed translations between the different repositories.
Papers Evaluation

=================================
Interest/Appropriateness for EUMAS

NOTE: Please take into account the heterogeneous nature of the EUMAS workshop from researchers from AI, distributed systems, pervasive computing, databases through to people from the industrial sector.

YES, as far as MAS are concerned, this paper is of interest to EUMAS.

How to make different heterogeneous pieces of information be considered for coherent integration is very relevant for MAS related R&D.

=================================
Papers Evaluation

================================
Originality
NOTE: EUMAS has no proceedings and accepts multiple submissions, either recently published work, currently submitted or for future submission. Therefore, the originality of the work should not be judged in terms of multiple submissions but in terms of how much the work is innovative and adds something to the state of the art.

X Somewhat original
An interesting architecture and Ontology services organisation have been introduced and some technical solutions have been presented.

=================================
Technical Quality (PLEASE MOTIVATE!!!)
NOTE: EUMAS aims at being a quality technical forum disseminating the highest European achievements in MAS and related areas. However, in addition to well established research work, it also particularly welcomes preliminary work. If the work appears promising and innovative, and the quality of the writing is satisfactory, we would like to have it included even if is only in the preliminary stages (e.g., lacking of formalization, evaluation, or leaving several open issues).

X Very sound
Although there is a lack of formalization, the description made points to a coherent and sound approach based on a multi-lateral view of a domain ontology.
Papers Evaluation

Suggestion (PLEASE MOTIVATE!!!!)
X Accept as Long Presentation (30 Minutes)
First, the problem in hands is not trivial at all. Coherent integration of heterogeneous resources based information poses a huge number of problems that are addressed in the paper. Secondly, the work is directed towards an interesting and relevant application domain. Third, it would be interesting to discuss current, and not yet completely solved, problems, as well as possible solutions during the meeting.

=================================
COMMENTS TO AUTHORS:
The problem you have addressed is indeed very relevant for the MAS community. However, the paper could be improved:
- There is a lack of formalization of the described models.
- Examples are not fully described and they are also not fully representative of the different steps involved in the information translation, selection and retrieval processes.
- It is not clear what has to be shared (through Global terms) and what (or how much) can be private and specific of each agent.

- There are some misspells:
  pg3- "the uses DAML..."
  pg4- "used...co-ordinate"
  pg5- "whishes to uses..."
  pg6- "it expected there will be"
  pg8- "...to translated"
  pg9- "formulizing"
and others.

=================================
PRIVATE INFORMATION (not returned to authors):
Your critique/Review should contain the following elements:

1. Provide a complete citation of the article (Title, authors, journal, volume, year and pages).

2. What are the research questions/hypotheses?

3. What are the major theories that it examines (be sure to briefly explain the theory)?

4. What is the research methodology (empirical or not. Simulation or not. Kind of data. Qualitative or quantitative results)?

5. Summarize the major results

6. What does the author say is the major contribution of the study?

7. What would you say are the strengths and weaknesses of the study with a focus on its methodology?
Bibliography

• GETA and Graduate School of Electrical and Communications Engineering course Introduction to Research Methodology, Helsinki University of Technology,

Writing instructions

Bibliography:

Research methods, systems engineering, and philosophy of science
Largest Databases on papers in Engineering

• **Engineering Village**
  - most comprehensive databases in engineering, no citations

• **COMPENDEX (9.2 million), INSPEC (8.8 million), NTIS (2.3 million)**
  - altogether 20.3 million abstracts (much overlap)

• **ISI Web of Science (since1986)**
  - most comprehensive citation search
  - Science Citation Index Expanded (SCIExpanded,17.5 million),
  - Social Sciences Citation Index (SSCI), Arts & Humanities
    Citation Index
  - altogether 21.5 million abstracts (2005)

• **SCOPUS (1966, references 1996)**
  - Competitor of Web of Science, largest database available
  - Chemistry, Physics, Mathematics, and Engineering; Life and Health Sciences; Social Sciences; Psychology and Economics; Biological, Agricultural and Environmental Sciences; General Sciences
  - altogether 28 million abstracts (2006)

Ref: VTT TECHNICAL RESEARCH CENTRE OF FINLAND 9.5.2007 Aarne Mämmelä 44
Largest Databases on papers in Engineering

Taxonomy of Databases

1. Bibliographies
   • best way to find knowledge if available
   • See Science Citation Index, General Search, Document type: Bibliography or Review
   • See SCOPUS, Document type: Review

2. Electronic libraries (whole papers included as .pdf files)
   • IEEE/IET Electronic Library (IEL) from 1950 (user interface is IEEE Xplore), 1.3 million publications, 133000 new publications/year
   • ACM Digital Library, portal.acm.org/dl.cfm
   • SPIE Digital Library, spiedl.org
Other References for this presentation


- 2005 *Journal Citation Reports (JCR), Science Edition. Institute for Scientific Information (ISI)*, isi01.isiknowledge.com/portal.cg.


