6. 写好研究方法和实验结果

写好研究方法

Method Sections

- The method sections in a research paper are the major part of the paper and the “meat” to the reader.
- The method part usually contains
  - Preliminaries,
  - Problem statement,
  - Overview of existing methods and shortcomings,
  - Ideas of your method to solve the problem,
  - Your theory,
  - The steps or the procedure of your method,
  - Your algorithm,
  - Analysis of your method and algorithm,
  - Others.

Method Sections

- Analysis of your method or algorithm
  - Complexity
  - Advantages
  - Weakness and limits

How to write the method part

- The ways to write the method part depend on the problem and the method to solve the problem.
  1. Define a new problem and propose an original method;
  2. Propose an original method to solve an existing problem;
  3. Propose to use an existing method to solve a new problem;
  4. Propose a new method, which is an extension or revision to an existing method, to solve an existing problem.

Define a new problem and propose an original method

- State the problem clearly and precisely;
- Explain the importance and challenges of the problem;
- Present your original idea to tackle the problem;
- Describe your method to solve the problem in details, better using steps in a logical order;
- Analyze your method.

Propose an original method to solve an existing problem

- State the problem clearly and precisely;
- Explain why the problem has not been solved completely and successfully;
- Present your original idea to tackle the problem;
- Describe your method to solve the problem in details, better using steps in a logical order;
- Analyze your method to show why your method is superior to the existing methods.

Propose to use an existing method to solve a new problem

- State the problem clearly and precisely;
- Explain the importance and challenges of the problem;
- Present the existing method to solve the problem;
- Discuss the significance of using the existing method to solve the problem;
- Analyze pros and cons of the solution.

Propose a new method, which is an extension or revision to an existing method, to solve an existing problem

- State the problem clearly and precisely;
- Briefly present the existing method and its shortcomings and limits in solving the problem;
- Describe your method, and in particular your extensions or revisions to the existing method, to reduce the shortcomings and remove the limits;
- Analyze your extensions.

Tools to present your method

- Mathematical model
- Figures
- Diagrams
- Graphs
- Images
- Pseudo code

Tips for writing your method

1. Section titles
2. Subsections
3. logical order
4. Self-containing
5. Trade-off between details and concise
6. Easy to understand
7. Use mathematics properly, not too heavy.

写好实验结果

The experiment result sections

- The majority of computer science papers is about technologies and applications. Very few are pure theoretical works.
- Experimental and simulation results are used to demonstrate the advantages of the proposed method.
- Multiple and extensive experiments are conducted on both simulated and real life data to show the properties of the proposed method.
- The results need to be presented clearly and objectively, and discussed thoroughly and critically.
- Both advantages and limits have to be discussed.

Design of Experiments

- Experiments have to be designed before being carried out because experiments may take a long time to accomplish and consume a lot of resources.
- Design of experiments includes
  - What kinds of experiments need to be conducted to show what properties of the proposed method.
  - The data sets to be used.
  - The experiment environment.
  - The scales of the experiments, i.e., the experiment settings.
  - The methods or algorithms to be compared.
  - The result evaluation methods.
  - The experiment plan or working schedule.

The result sections

1. Simulated results and discussions
2. Experiment results on real data sets and discussions
3. Results of real applications and discussions

- Depending on the contents of the experiments, the above three parts can be put in one experiment section or three separate sections.
- The third part appears in the paper on application of an existing method to a new problem and an existing problem.

Writing simulated results and discussions

- Section title: Simulations or Experiments on Synthetic Data.
- State the objective.
- Present the methods to generate the synthetic data sets.
- Present the synthetic data sets—in tables-- and their characteristics.
- Experiment settings.
- Evaluation methods.
- Experiment results.
- Result explanations and discussions.

Experiment results on real data sets and discussions

- Section title: Experiments or Experiments on Real Data.
- State the objective.
- Present the real data sets—in tables-- and their characteristics. State the data sources and reasons to select these data sets.
- Experiment settings.
- Evaluation methods.
- Experiment results.
- Result explanations and discussions.

Results of real applications and discussions

- Section title: A Real Application or An Application Example
- Describe the application scenario and its importance
- State the objective and the data collection process
- Present the data sets—in tables-- and their characteristics.
- Experiment settings.
- Evaluation methods.
- Experiment results.
- Result explanations and discussions.
- Use one or two examples to show the use of the results in the real environment and impact.