



南京邮电大学
Nanjing University of Posts and Telecommunications



Technical Paper Writing

Speaker: Bin Xia

Nanjing University of Posts and Telecommunications
Jiangsu Key Laboratory of Big Data Security & Intelligent Processing

I How to Write a Research Paper

II Common Technical Written Issues



How to Write a Research Paper

Caveats

How to Write a Research Paper

- 01 Key research contributions **DECIDE** paper's acceptance
- 02 **NO** single standard way of writing research papers
- 03 Quality/impact **OVER** quantity of papers

Before you write a research paper...

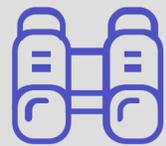
How to Write a Research Paper

- I Desirable **Characteristics**
- II Key **Questions** to Double Check
- III Know What Your **Audience** is

Desirable Characteristics

Before you write a research paper...

Element One



Interesting
idea(s)

Element Two



Interesting
claim(s)

Element Three



Valid
evidence

Interesting? Interesting!

Desirable Characteristics

Before you write a research paper...

Type One

Interesting
Research

Type Two

Novel
Research

Type Three

Inspiring
Research

Type Four

Impact
Research

Type Five

Significant
Research

Type Six

Validated
Research

Desirable Characteristics

Before you write a research paper...

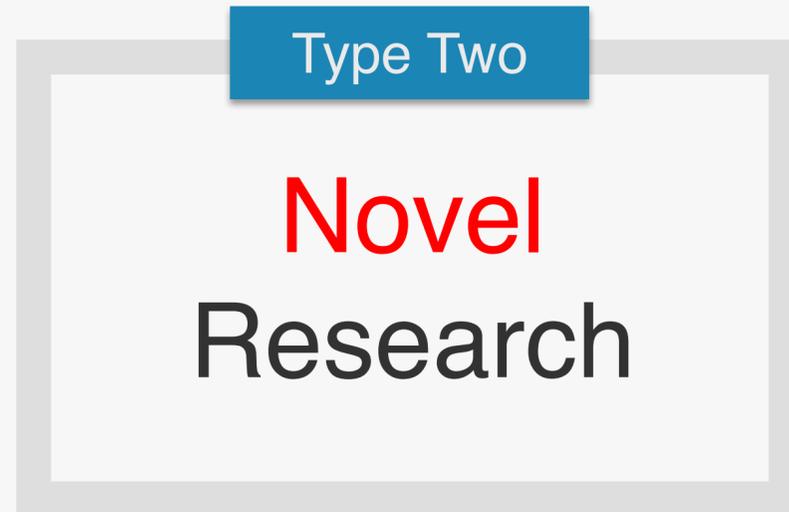
Type One

Interesting
Research

- 01 Ask interesting **questions**
- 02 Have interesting **ideas** in solution
- 03 Have interesting **findings** in evaluation

Desirable Characteristics

Before you write a research paper...



- 01 New **problem**
- 02 New **solution**
- 03 New **findings**

Desirable Characteristics

Before you write a research paper...

Type Three

Inspiring
Research

- 01 General ideas/solutions
- 02 General/abstract problem definition could describe **other concrete problems**
- 03 General idea could be used **elsewhere**

Desirable Characteristics

Before you write a research paper...



- 01 Impactful problem and solution
- 02 **Real** problem
- 03 Effective/efficient solution to well address the problem

Desirable Characteristics

Before you write a research paper...

01 **NOT EASY** problem to solve

02 Technical challenges

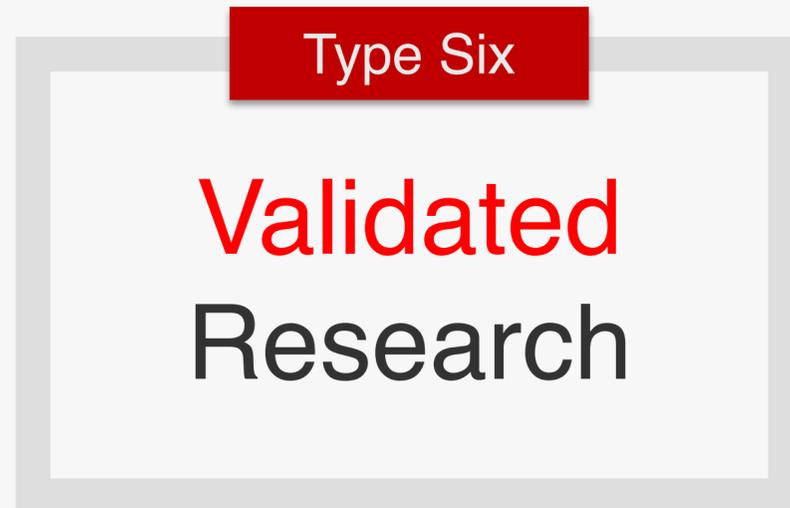
03 Solution level

Type Five

Significant
Research

Desirable Characteristics

Before you write a research paper...

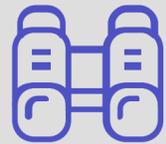


- 01 Clear and strong (empirical) **evidence**
- 02 Validate/justify the **claims**

Key Questions to Double Check

Before you write a research paper...

Element One



Interesting
idea(s)

Element Two



Interesting
claim(s)

Element Three



Valid
evidence

Know What Your Audience is

Before you write a research paper...

- 01 **Explicitly** explain how your paper is **relevant**
- 02 **Explicitly** explain some basic **assumptions/concepts** underlying your work

Ready? Ready!

Logic Flow

How to Write a Research Paper

- 01 Logic flow between **sentences** in a para
- 02 Logic flow between **paragraphs** in a section
- 03 Logic flow between **sections** in a paper
- 04 Pay extreme attention to abstract and intro; **Read aloud** as a reading group

Typical Paper Structure

How to Write a Research Paper

- I Title/Abstract
- II Introduction
- III Background
- IV Formal Problem Definition
- V Related Work
- VI Example
- VII Approach/Framework
- VIII Implementation
- IX Evaluation and Discussion
- X Conclusions and Future work

Typical Paper Structure

How to Write a Research Paper

- I Title/Abstract
- II Introduction
- III Background
- IV Formal Problem Definition
- V Related Work
- VI Example
- VII Approach/Framework
- VIII Implementation
- IX Evaluation and Discussion
- X Conclusions and Future work

Title

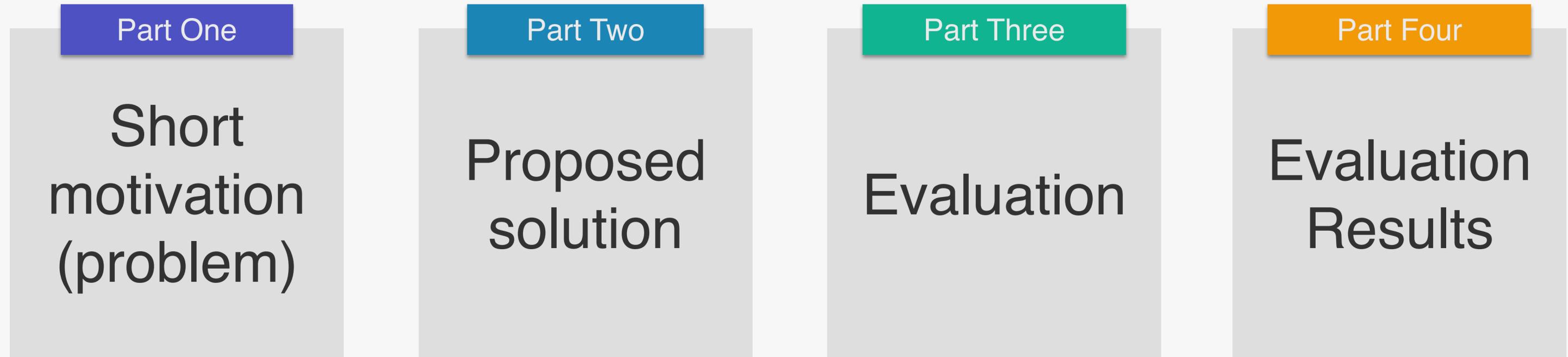
How to Write a Research Paper

- 01 Do not put uncommon **buzzwords** there
- 02 Be **specific** enough but not too specific
- 03 Name your approach with a **cute** name
- 04 **FIU-Miner** (a fast, integrated, and user-friendly system for data mining) and its applications

Abstract

How to Write a Research Paper

Four-part Structure



- 01 **DO NOT** put unexplained or undefined terms
- 02 **DO NOT** get into too much detail of solutions

Introduction

How to Write a Research Paper

Part One

What is the **problem**?

Part Two

Why is it **interesting** and **important**?

Part Three

Why is it **hard**? (E.g., why do **naive approaches** fail?)

Part Four

Why hasn't it been **solved** before?

Part Five

What are the **key components** of my approach and results?

Introduction

How to Write a Research Paper

- 01 Do not **over** claim
- 02 Do not over **criticize** other's work
- 03 Put **unjustified points** in conclusion or discussion section
- 04 Do not claim your own approach to be "**NOVEL**"

Introduction

How to Write a Research Paper

- 01 Abstract and introduction section are very **important**
- 02 Need tell an interesting, intriguing, **engaging** story
- 03 Offer pleasant “**surprise**” (not boredom) to readers

TIPS

Tell a

Good Story

in Introduction

Related Work

How to Write a Research Paper

- 01 Do not simply list related work without **RELATING** to your own work!
- 02 Do not make unjustified unobvious **criticisms** on related work
- 03 Do not **overclaim** your work without justification
- 04 Do not intentionally **leave out** your own very related previous papers

TIPS

Put in

PC members'

work if relevant

Approach/Framework

How to Write a Research Paper

- 01 Generalize your work in an **abstraction**
- 02 Try to **separate** the ideas from (a particular) concrete implementation
- 03 Explain some details with **examples**

TIPS

Focus on the
key techniques

Implementation

How to Write a Research Paper

- 01 What **libraries** you used
- 02 Detailed **implementations** of each step in your framework
- 03 List **complications** of implementation and how you get around them

TIPS

Reproducible

Experiments

Evaluation

How to Write a Research Paper

- 01 Write research **question** first
- 02 Do not just **describe** the results
- 03 Do not use **a simple** alternative solution as the baseline for comparison
- 04 Construct a project **web** including the evaluation subjects, evaluation results

TIPS

Experiments
and Case
Studies

Discussion

How to Write a Research Paper

- 01 **Limitations** and **issues** you currently cannot address
- 02 Possible **applications** of your approach

TIPS

Do not hide
limitations

Conclusions and Future work

How to Write a Research Paper

- 01 Broader **impacts** of your approach and your vision
- 02 Describe **limitations** and future work here

TIPS

Often easy

to write

Typical Paper Structure

How to Write a Research Paper



Title/Abstract



Introduction



Background



Formal Problem Definition



Related Work



Example



Approach/Framework



Implementation



Evaluation and Discussion



Conclusions and Future work

Common Barriers for Beginners

How to Write a Research Paper

01 Feel nothing to say...

02 Write too much low-level boring implementation details...



Common Technical Written Issues

Do not make readers a hard time in reading your papers.
Your technical content is already hard enough.

Be Concise

Common Technical Written Issues

- 01 **Only one** main idea per sentence
- 02 Keep your sentences to a reasonable **length**
- 03 Delete **unnecessary** words and replace them with more specific words
 - **X** due to the fact that   because
 - **X** alternative choices   alternatives
 - **X** in as few words as possible   concisely

Use Formal Language

Common Technical Written Issues

01 Colloquialisms or slang terms

- ~~X~~ sort of   somewhat
- ~~X~~ basically   fundamentally

02 Demonstrate Balance in Your Writing

- ~~X~~ always   often
- ~~X~~ Research proves that   Research suggests that
-  obviously, clearly, apparently

Use Formal Language

Common Technical Written Issues

03 Signaling Words

- furthermore, moreover, additionally...
- similarly, in comparison...
- but, yet, however...
- particularly, significantly...

04 Abbrev n't

- ~~X~~ can't, can not   cannot
- ~~X~~ don't   do not

Figure 1, Table 1, Section 1, ...

Common Technical Written Issues

01 Bad examples

- ~~X~~ the Figure 1
- ~~X~~ figure 1
- 🤔 Figure one, Table one

02 Common usage

- 😊 Figures 1-3, Tables 1 and 6
- 🤔 the first figure, the first table

Also, And ...

Common Technical Written Issues

01 Also

- Beginning:

✗ Also ➔ ✓ In addition, Additionally

- Middle:

✗ Also we implemented a tool...

✓ We also implemented a tool...

02 And

- 😱 Don't put "And" in the **beginning** of the sentence

As below / as follows

Common Technical Written Issues

01 Examples

- ✗ The paper makes: first contribution as...
- ✓ We list the main contributions **as follows / as below**...

- ✗ They are described below:
- ✓ They are described **as below**:

Uncountable Words

Common Technical Written Issues

- 01 Software, research, work, ...
- 02 Common usage
 - **X** several works, several researches, several softwares
 - **✓** several research **projects**
 - **✓** several **pieces** of work
 - **✓** several **lines** of research
 - **✓** several software **programs**
 - **✓** several software **applications**

Abbreviation

Common Technical Written Issues

01 Common usage

- ~~X~~ **CBSE** (Computer-based software engineering)
- **✓** Computer-Based Software Engineering (**CBSE**)

02 Remember to put a space before “(“

Article usage

Common Technical Written Issues

- 01 If a noun is **countable** (and singular), there must be a preceding “**a**”, “**the**”, or sth like “my”

- 02 Common usage
 - **X** following definition defines...
 - **✓ the** following definition defines...

 - **X** Machine learning is **the** subset of artificial intelligence...
 - **✓ a** Machine learning is **a** subset of artificial intelligence...

The authors...

Common Technical Written Issues

- 01 Better to use “**We**”...
 - **X** The authors also extract many requirements...
 - **✓ We** also extract many requirements...

- 02 But in acknowledgment...
 - 😊 **the authors** would like to thank...

Using hyphen “-”

Common Technical Written Issues

01 Examples

- 🤔 third party libraries
- ✓ third-party libraries

- 🤔 model checking algorithms
- ✓ model-checking algorithms

- 🤔 test generation tools
- ✓ test-generation tools

Explicitly write out things

Common Technical Written Issues

01 Don't let readers **guess**

Example: I just got a pet and gave her a name. **This is cute.**

- **!?** This **pet** is cute?
- **!?** This **name** is cute?
- **!?** This get **acquisition** process is cute?
- **!?** This **naming** process is cute?

Dangling modifiers

Common Technical Written Issues

01 Examples

- **X** To improve his approach, the experiment was done.
- **✓** To improve his approach, **he** did the experiment.

- **X** To capture the new semantics, the tool is extended with...
- **✓** To capture the new semantics, **we** extend...

Repetition and Consistency is Good

Common Technical Written Issues

01 Repetition

- 🤔 We conducted an **experiment** to do... This **evaluation** does provide insights...

02 Consistency

- 🤔 Section 1 introduces... Section 2 gives... We also give an example in **Section 3**. Finally, we explain... in Section 4
- 👍 ...**Section 3** gives an example. Finally Section 4...

Fixing long sentences

Common Technical Written Issues

✗ In ABC, the Project Plan module responsible for making plan can access the Process Pattern **Manager, which can** choose proper process patterns from Process Pattern Base, utilize the value of estimated parameter vector in quantitative context models to assist the estimation in project plan, and build project plan skeleton based on the solution part of selected process patterns. 😱😱😱

✓ which can ➡ This manager can

Toolkits

Common Technical Written Issues

01 Use LaTeX, Use LaTeX, and Use LaTeX !!! !!! !!!

02 Excellent Online Dictionary

- <https://www.merriam-webster.com/>
- Has good sample sentences
- Google



李涛 (1975-2017) , 2004年7月获美国罗彻斯特大学 (University of Rochester) 计算机科学博士学位。2004年至2017年先后任美国佛罗里达国际大学 (Florida International University, FIU) 计算机学院助理教授、副教授 (终身教授)、正教授 (Full Professor)、研究生主管 (Graduate Program Director), FIU计算与信息学院数据挖掘实验室主任, 博士生导师。**2016年入选创新类国家“千人计划”特聘专家。** 李涛博士的研究兴趣主要包括数据挖掘、机器学习、信息检索及生物信息学等领域, 在基于矩阵方法的数据挖掘和学习, 音乐信息检索, 系统日志数据挖掘, 数据挖掘的各种应用等方面做出了有影响力的研究。由于在数据挖掘及应用领域成效显著的研究工作, 他曾多次获得各种荣誉和奖励, 其中包括美国国家自然科学基金委颁发的杰出青年教授奖 (NSF CAREER Award, 2006-2010) 和 2010 IBM大规模数据分析创新奖 (Scalable Data Analytics Innovation Award)。同时, 他还是数据挖掘国际权威期刊《ACM Transactions on Knowledge Discovery from Data》, 《IEEE Transactions on Knowledge and Data Engineering》, 和《Knowledge and Information Systems》杂志的副主编。李涛博士在国际著名会议及期刊上已发表超过两百篇文章。**根据 Google Scholar 的统计, 李涛博士的引用指标 H-index=63, 总引用次数超过15824次。**



Thank you!