

# How to Write Good Research Articles

Xiaohua Jia

City University of Hong Kong

# Types of Scientific Publications

- Conference Publications

  - For quick dissemination of research results

  - Focus on a piece of work with limited discussion

- Journal Publications

  - More complete (extensive) discussion

- PhD/MPhil Thesis

  - Aspects to be assessed for a Thesis:

    - background knowledge
    - **original contributions** (must be clearly stated in the thesis)
    - methodology
    - amount of work

- Monographs / Book chapters / Text books



# Where to Publish Your Work

- Conferences

  - Ranking of conferences (H-index, impact factor)

  - Review process of conferences

- Journals

  - Ranking of journals (impact factor, reputation)

  - Review process of journals (longer publication cycle)

- Read papers from good venues

  - Submit your papers to good venues



# Top-ranked Journals & Conferences

- **Database**

  - IEEE Trans on Knowledge and Data Engineering

  - ACM Trans on Database Systems

  - Int'l Conf on VLDB

- **Software Engineering**

  - IEEE Trans on Software Engineering

  - ACM Trans on Software Eng. and Methodology

  - IEEE Int'l Conf on Software Engineering

- **Distributed Systems**

  - IEEE Trans on Mobile Computing

  - ACM Trans on Computer Systems

  - IEEE Int'l Conf on Distributed Computing Systems

- **Computer Networks**

  - IEEE/ACM Trans on Networking

  - IEEE INFOCOM

  - ACM SIGCOMM, ACM Mobicom, etc.

  - .....



# Plan Your Writing

- Ask yourself two questions before start:
  - 1) What are original contributions of your work?
  - 2) What are you going to write?
- Stick on your main contribution throughout the whole paper
  - Highlight the originality and significance
  - Repeat important keywords **at least 4 times**
- Make your writing professional
  - Remove all unnecessary parts that are not closely related to your main contribution
  - No elementary stuff, unnecessary discussions, etc.

# Do Nots in Writing

Purpose of your writing:

disseminate new discoveries and new results

- Don't write if you don't have a good story to write
- Don't hide technical details
- Don't make a simple problem complicated



# Reader-oriented Writing

Reader-oriented vs. writer-oriented:

Don't simply put out whatever comes to your mind

- Always think how readers would follow or interpret your writing
  - Assume you're the reader (**or the reviewer**)
- Give sufficient and clear explanations
  - Never leave readers to guess
  - Use examples or diagrams to help
- Present your idea accurately
  - Leave no ambiguity



# Use Simple English

Key of technical writing:

express your idea accurately & clearly

- Use plain explanations
- Use short sentence /simple sentence structure
- Use simple words
- Avoid **excessive use** of notations and definitions



# A Typical Review Form of a Journal

## Section I. Overview

### A. Reader Interest

1. Which category describes this manuscript?  
 Practice/Application/Case Study/Experience Report  
 Research/Technology  
 Survey/Tutorial/How-To
2. How relevant is this manuscript to the readers of this periodical?

Please explain your rating.

- Very Relevant  
 Relevant  
 Interesting - but not very relevant  
 Irrelevant

### B. Content

1. Please explain **how this manuscript advances this field of research and/or contributes something new to the literature.**

.....

2. Is the manuscript technically sound? Please explain your answer.  
 Yes  
 Appears to be - but didn't check completely  
 Partially  
 No



# A Typical Review Form of a Journal (cont'd)

## C. Presentation

1. Are the title, abstract, and keywords appropriate? Please comment.

\_X\_Yes

\_No

2. Does the manuscript contain sufficient and appropriate references?

Please comment.

\_References are sufficient and appropriate

\_X\_Important references are missing; more references are needed

\_Number of references are excessive

.....

3. Does the **introduction state the objectives of the manuscript in terms that encourage the reader to read on?** Please explain your answer.

\_X\_Yes

\_Could be improved

\_No

4. How would you rate the organization of the manuscript? Is it focused? Is the length appropriate for the topic? Please comment.

\_X\_Satisfactory

\_Could be improved

\_Poor

.....

5. Please rate and comment on the readability of this manuscript.

\_Easy to read

\_X\_Readable - but requires some effort to understand

\_Difficult to read and understand

\_Unreadable



# A Typical Review Form of a Journal (cont'd)

## Section II. Summary and Recommendation

### A. Evaluation

Please rate the manuscript. Explain your choice.

- Award Quality
- Excellent
- Good
- Fair
- Poor

### B. Recommendation

Please make your recommendation and explain your decision.

- Accept with no changes as a regular paper
- Accept if certain minor revisions are made
- Author should prepare a major revision for a second review
- Resubmit as new
- Reject

## Section III. Detailed Comments

- A. Public Comments (these will be made available to authors)
- B. Comments to editors (these will not be available to authors)



# Structure of a Paper

- Title
- Abstract
- Key words
- Introduction
- Related Work
- System Model & Problem Definition
- Methods / Solutions
- Simulations / Experiments
- Conclusion
- References

Average number of pages of a journal paper: > 10

Average number of pages of a conference paper: 6 ~ 12



# Choose a Specific Title

- The title should be very specific, not too broad
- The title should be substantially different from others:
  - “Topology control for multihop wireless networks”, *IEEE Trans. on Comm*, 93.
  - “Topology control of multihop wireless networks using transmit power adjustment”, *infocom'00*.
  - “Distributed topology control for power efficient operation in multihop wireless networks”, *infocom'01*.
- Avoid too general / big titles:
  - “Research on data mining”,
  - “A new framework for distributed computing”,
  - .....



# Write a Concise Abstract

The purpose of an abstract:

- Giving readers a paper-summary before going into details

An abstract should tell:

- What is the problem to be discussed
- What is the technique used
- What are original findings / contributions / advantages

An abstract usually does NOT have:

- Reference numbers
- Multiple paragraphs

Cut the “Introduction” short into an “abstract”!

# Choose a Set of Keywords

- The purpose of keywords:
  - for database search
  - for editors to select reviewers
- The keywords must be specific and, as a whole, represent the main topic of the paper.
- Avoid using words that are **not your main contributions or too general**:
  - “dynamic programming”, “linear programming”, “simulations”, etc.



# Examples of an abstract / keywords

## Joint Access Point Placement and Channel Assignment for 802.11 Wireless LANs

*Abstract*—To deploy a multi-cell 802.11 wireless local area network (WLAN), access point (AP) placement and channel assignment are two primary design issues. For a given pattern of traffic demands, we aim at maximizing not only the overall system throughput, but also the fairness in resource sharing among mobile terminals. A novel method for estimating the system throughput of multi-cell WLAN is proposed. An important feature of this method is that co-channel overlapping is allowed. Unlike conventional approaches that decouple AP placement and channel assignment into two phases, we propose to jointly solve the two problems for better performance. Due to the high computational complexity involved in exhaustive searching, an efficient local searching algorithm, called patching algorithm, is also designed. Numerical results show that for a typical indoor environment, patching algorithm can provide a close-to-optimal performance with much lower time complexity.

*Keywords*—wireless local area networks; 802.11; access point placement; channel assignment

## Optimal Routing, Link Scheduling and Power Control in Multi-hop Wireless Networks

*Abstract*—In this paper, we study the problem of joint routing, link scheduling and power control to support high data rates for broadband wireless multi-hop networks. We first address the problem of finding an optimal link scheduling and power control policy that minimizes the total average transmission power in the wireless multi-hop network, subject to given constraints regarding the minimum average data rate per link, as well as peak transmission power constraints per node. Multi-access signal interference is explicitly modeled. We use a duality approach whereby, as a byproduct of finding the optimal policy, we find the sensitivity of the minimal total average power with respect to the average data rate for each link. Since the minimal total average power is a convex function of the required minimum average data rates, shortest path algorithms with the link weights set to the link sensitivities can be used to guide the search for a globally optimum routing. We present a few simple examples that show our algorithm can find policies that support data rates that are not possible with conventional approaches. Moreover, we find that optimum allocations do not necessarily route traffic over minimum energy paths.

*Index Terms*—Wireless Networks, Multi-hop Networks, Routing, Scheduling, Power Control.

# Top-down Approach

- Planning sections and subsections (standard)
- Sketching: write the key-sentences (phrases) to represent the points in each subsection
- Writing: expend the key-sentences into paragraphs
- Adjustment (avoid too long paragraphs/sections):
  - break-down / merge paragraphs
  - add / merge subsections

N.B. **Good logical flow** from section to section, paragraph to paragraph, and sentence to sentence.



# Introduction: the most important part

## Purpose of introduction:

Introducing readers to your paper

## An introduction usually contains:

- Importance of the problem / topic
- Existing work (brief), **leading to the motivation of your work**
- Description of your problem and main techniques of your solution (brief)
- Original contributions / significance

**Start with introduction and end by introduction!**



# Related Work and Reference List

Proper selection of references: show your knowledge in the field

- Cite top venue papers (**particularly when citing your own papers!**)
- Cite recent papers
- Cite papers from the journal you submit to

Related work should:

- Be organized to serve your topic
- Emphasize on the significance / originality of your work

Format of references:

- **Consistency with the format, ordering**, etc.
- Do NOT use non-standard abbrev.
- Standard format of books / journal papers / conference papers:

X. Jia, X.D. Hu and D.Z. Du, *Multiwavelength Optical Networks*, Kluwer Academic, 2002.

J. Li, Yi Pan, and X. Jia, "Analysis of Dynamic Location Management for PCS Networks," *IEEE Trans on Vehicular Technology*, Vol. 51, No. 5, Sep 2002, pp.1109-1119.

X. Jia, D. Li, X.Hu and D. Du, "Placement of Read-Write Web Proxies in the Internet," *IEEE Int'l. Conf. on Distributed Computing Systems*, Phoenix, USA, Apr 2001, pp.687-690.

# Examples of reference lists

- [3] J. L. Carter and M. N. Wegman, "Universal classes of hash functions," *J. Comput. Syst. Sci.*, vol. 18, no. 2, pp. 143–154, 1979.
- [4] Y. Chen, J. Edler, A. Goldberg, A. Gottlieb, S. Sobti, and P. Yianilos, "A prototype implementation of archival intermemory," in *Proc. 4th ACM Conf. Digital Libraries*, Berkeley, CA, Aug. 1999, pp. 28–37.
- [5] I. Clarke, "A distributed decentralised information storage and retrieval system," Master's thesis, Univ. Edinburgh, Edinburgh, U.K., 1999.
- [6] I. Clarke, O. Sandberg, B. Wiley, and T. W. Hong, "Freenet: A distributed anonymous information storage and retrieval system," in *Proc. ICSI Workshop Design Issues in Anonymity and Unobservability*, Berkeley, CA, June 2000, [Online]. Available: <http://freenet.sourceforge.net>.
- [7] R. Cox, A. Muthitacharoen, and R. Morris, "Serving DNS using Chord," in *Proc. 1st Int. Workshop Peer-to-Peer Systems*, Cambridge, MA, Mar. 2002.
- [8] F. Dabek, "A cooperative file system," Master's thesis, Massachusetts Inst. Technol., Cambridge, 2001.
- [9] F. Dabek, F. Kaashoek, D. R. Karger, R. Morris, and I. Stoica, "Wide-area cooperative storage with CFS," in *Proc. ACM Symp. Operating Systems Principles*, Banff, Canada, 2001, pp. 202–215.
- [10] "Secure Hash Standard," U.S. Dept. Commerce/NIST, National Technical Information Service, Springfield, VA, FIPS 180-1, Apr. 1995.
- [11] Gnutella. [Online]. Available: <http://gnutella.wego.com/>
- [12] D. B. M. ... ..
- [13] ... ..
- [14] J. Hagenauer, "Rate compatible punctured convolutional codes (RCPC) and their applications," *IEEE Trans. Commun.*, vol. 36, pp. 389–400, Apr. 1988.
- [15] L. Qian, D. L. Jones, K. Ramchandran, and S. Appadwedula, "A general joint source-channel matching method for wireless video transmission," in *Proc. Data Compression Conf.*, Snowbird, UT, 1999, pp. 414–423.
- [16] V. Chande and N. Farvardin, "Progressive transmission of images over memoryless noisy channels," *IEEE J. Select. Areas Commun.*, vol. 18, pp. 850–860, June 2000.
- [17] P. G. Sherwood, X. Tian, and K. Zeger, "Channel code block length and rate optimization for progressive image transmission," in *Proc. Wireless Communications and Networking Conf.*, New Orleans, LA, 1999, pp. 978–982.
- [18] S. B. Wicker, *Error Control Systems*. Englewood Cliffs, NJ: Prentice-Hall, 1995.
- [19] N. Seshadri and C.-E. W. Sundberg, "List Viterbi decoding algorithms with applications," *IEEE Trans. Commun.*, vol. 42, pp. 313–323, Feb.–Apr. 1994.

# Major Revisions and Review Responses

- Revise paper following reviewers comments
  - Constructive vs. insurmountable comments
- Response to reviewers' comments:
  - **Avoid arguing with the reviewers**
    - explain your position
  - **Avoid providing long explanations**
    - incorporate the response into the revision of paper
    - simply refer to the paper where you revised
  - Common phrases in response:
    - “it’s revised”, “it’s corrected”, “more explanation is added. See page xx.”



Reviewer: 2

Recommendation: Author Should Prepare A Major Revision For A Second Review

Comments:

.....

2) Another area that needs better justification is sparsity assumption and its consequences. For instance, why is the data sparse? Does the sparsity remain fixed or changes over time? If sparsity changes with time, that will affect the number of measurements  $M$ . How do the authors deal with the case when  $M$  is not enough to guarantee recovery (assuming that sparsity has changed)?

Response: a) The sensor data in the sensor networks has spatial or temporal correlations. The correlated data is sparse in some transform domain, such as the wavelet domain and Fourier domain [5, 8]. We have added this point in the paper (beginning of section 2). b) It is possible that the sparsity of sensor data changes over time. When the sparsity changes as time goes, the number of measurements  $M$  can be dynamically adjusted. We have added the discussion in section V.A.

.....

4) Aside from these missing justifications and details noted above, the main technical problem I have with the result is that it does not seem to be valid when the compressive ratio  $\rho < 1.5$ , i.e. when  $M > 2N/3$ . One expects the analytic results to provide meaningful insights even in the extreme cases such as when  $M=N$ , however, it seems that in cases when  $M > 2N/3$  Equations (7)-(8)-(9) break down (square root of a negative number). Which is surprising since the authors make no assumption on the relation between  $M$  and  $N$  while deriving those equations. Thus makes one question the validity of the result.

Response: We have added detailed discussion about the case when  $M$  is getting close to  $N$  in Section 4.

5) When compared to the optimal tree with hybrid CS, the authors note that their algorithm is fault-tolerant. This claim needs more justification.

Response: More discussions regarding this point are added in Section 7.2.

# Tips for Good Writing

- Reader-oriented writing (good organization, logical flow, etc.)
- Standard and consistent format (professional, tidy and good looking)
- **Learning from other people's writing**





# Q&A