Writing Research Papers

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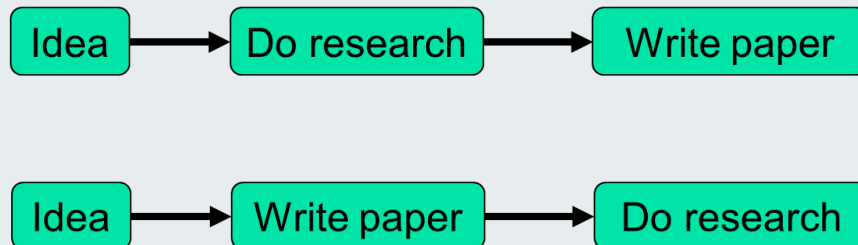
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Contents

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- Writing Good Research Papers
  - What is a research paper ?
  - The importance of Outlines
  - Steps in writing a paper
  - A Peep into the Review Process
  - Conference OR Journals ?
  - Reviewing Again
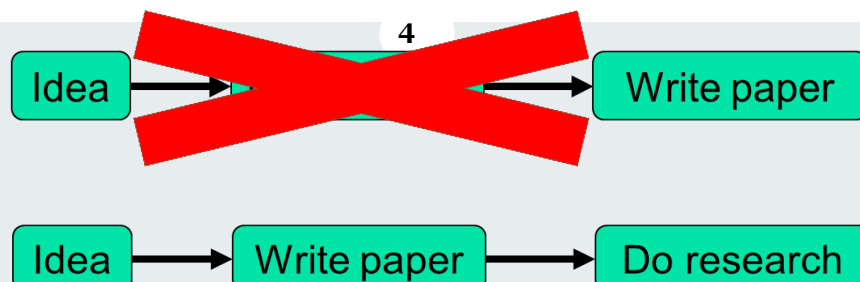
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Writing Papers: Two Models

3

```
[ Idea ] ──▶ [ Do research ] ──▶ [ Write paper ]
```

```
[ Idea ] ──▶ [ Write paper ] ──▶ [ Do research ]
```

3

Writing Papers: Model2 is the one to follow!!!!

4

```
[ Idea ] ──▶ [ ✗ ] ──▶ [ Write paper ]
```

```
[ Idea ] ──▶ [ Write paper ] ──▶ [ Do research ]
```

- Benefits
  - Forces us to be clear, focused
  - Crystallises what we don't understand
  - Opens the way to dialogue with others: reality check, critique, and collaboration

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Types of Papers

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- Review/Survey Paper
- Research Paper
    - Fundamental Research
    - Experimental Research
    - Applied Research

- Proposing a new model, method, technique, tool to
    - to develop, structure, restructure, reuse, analyze, evaluate, measure, understand….software artifact or a process

- Proposing a new Algorithm
- Proposing a new Framework

6

How to write ?

8

- Writing style
    - Paper writing is not business writing
    - Paper should include background, related work, problem definition, results etc.

- Respect Copyright and IPR
    - Cannot copy even a single sentence verbatim from a paper or a website…even when citing it !!!

- All ideas (expressed in own words) must be attributed to original works

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Do not be intimidated

9

Fallacy   You need to have a fantastic idea before you can write a paper. (Everyone else seems to.)

Write a paper,
and give a talk, about
any idea,
no matter how weedy and insignificant it may seem to you

9

Do not be intimidated

10

Write a paper, and give a talk, about any idea, no matter how insignificant it may seem to you

- Writing the paper is how you develop the idea in the first place
- It usually turns out to be more interesting and challenging that it seemed at first

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What to write ?

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- Any research publication, particularly in Engg., must clearly state
  - What is new in it…..
  - How is it better…..
  - For both, comparison with existing works is essential…
  - This is often lacking in papers from India or industry….

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The Idea

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Idea A re-usable insight, useful to the reader

- Figure out what your idea is

- Make certain that the reader is in no doubt what the idea is. Be 100% explicit:
  - "The main idea of this paper is…."
  - "In this section we present the main contributions of the paper."

- Many papers contain good ideas, but do not distil what they are.

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Your narrative flow

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- Here is a problem
- It's an interesting problem
- It's an unsolved problem
- Here is my idea
- My idea works (details, data)
- Here's how my idea compares to other people's approaches

I wish I knew how to solve that!

I see how that works. Ingenious!

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How to start after clicking an idea ?

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- It is most efficient to write papers from outlines for both you and your supervisor

- What is an outline ?
  - An outline is a written plan of the organization of your paper, including the data on which it rests
  - It is a carefully collected and organized set of data with attendant objectives, hypotheses and conclusions
  - An outline contains little text
    - if agreed upon, the supporting text can be easily filled in.

A good outline for the paper is also a good plan for the research program............

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How to write an outline ?

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- Start with a blank piece of paper and write down in any order all the important ideas that occur to you concerning the paper e.g.
  - Why did I do this work ?
  - What does it mean ?
  - What hypotheses did I mean to test ?
  - What ones did I actually test ?
  - What were the results ?
  - Did the results/approach signify anything new that improves the current state-of-the-art ?

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How to write an outline ?...

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- After penning all the aspects, organize them into three sections viz.
  - Introduction
    - Why did I do the work ?
    - What were the central motivations ?
    - How does it improve the current state-of-the-art ?
  - Results and Discussions
    - What were the results ?
    - What was measured ?
  - Conclusions
    - What does it all mean ?
    - What is the impact ?

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An illustration

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- *With the increase in the amount of data collected by organizations; there arises the inclination to perform collaborative data mining among various competing parties*
- *Privacy of an individual is sacrificed in the process*
- *Hence, it is essential to have efficient and robust algorithms to maintain the privacy of these co-opetative parties across different domains and in different scenarios.*
- *Therefore, we aim to propose two techniques for privacy preservation while finding global cycles when mining cyclic association rules in a distributed setup.*
- *The proposed techniques should be based on Paillier's homomorphic encryption and Shamir's secret sharing that can help us decipher partial and total global cycles along with maintaining privacy in a distributed setup.*
- *We shall carry out a theoretical and empirical comparative analysis between these two techniques.*

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An illustration...

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- *Moreover, in real life parties tend to be selfish and rational. These rational parties may try to attain maximum gain without trying to sabotage the protocol.*
- *However, these parties if cautioned would correct themselves to have maximum individual gain in the future. Hence to resolve this problem in the [m,m] secret sharing scheme, we will empirically evaluate and analyse a novel game theoretic approach among rational parties which comprises of three punishment policies which aim at ensuring corrective behaviour in the bad rational parties.*
- *The solution mentioned above however would not resolve the attack by malicious adversaries in the repeated [m,m] secret sharing scheme.*
- *Hence to combat malicious adversaries we would extend Pedersen's verifiable secret sharing scheme to a ratings based systematic verification scheme in a game theoretic setting. This is a consolidated scheme that avoids both malicious and rational parties from disrupting the protocol.*

Which questions are answered and which aren't ?

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In case of diversions

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- Often the objectives of the paper when it is finished are different from those used to justify starting the work….

- Do not worry in such cases….

- A research is something that evolves as it progresses – if the results were predictable, it is not research…!!!!!!

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Structure (conference paper)

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- Typical contents
  - Title (1000 readers)
  - Abstract (4 sentences, 100 readers)
  - Introduction (1 page, 100 readers)
  - The problem (1 page, 10 readers)
  - My idea (2 pages, 10 readers)
  - The details (5 pages, 3 readers)
  - Related work (1-2 pages, 10 readers)
  - Conclusions and further work (0.5 pages)

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Title

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- Summarize the paper in 2-10 words
- As short as possible yet, that is catchy, enticing
- Goal: encourage the reader to read the paper
- Examples for discussion
  - Privacy Preservation
  - An approach for Privacy Preservation
  - A novel approach for Privacy Preservation
  - Privacy Preserving Distributed K-means Clustering in Malicious Adversary Model
  - A novel approach for Privacy Preserving Distributed K-means Clustering in Malicious Adversary Model

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The abstract

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- I usually write the abstract last
- Used by program committee members to decide which papers to read
- Four sentences [Kent Beck]
  1. State the problem
  2. Say why it's an interesting problem
  3. Say what your solution achieves/your contributions
  4. Say what follows from your solution
- Be factual, but comprehensive.

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An Example Abstract

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Abstract - Many papers are badly written and hard to understand. This is a pity, because their good ideas may go unappreciated. Following simple guidelines can dramatically improve the quality of your papers. Your work will be used more, and the feedback you get from others will in turn improve your research.

Identify the following in this abstract…..
1. State the problem
2. Say why it's an interesting problem
3. Say what your solution achieves
4. Say what follows from your solution

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An Example Abstract

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Identify the following in this abstract…..contd.

1. Many papers are badly written and hard to understand
2. This is a pity, because their good ideas may go unappreciated
3. Following simple guidelines can dramatically improve the quality of your papers
4. Your work will be used more, and the feedback you get from others will in turn improve your research

1. State the problem
2. Say why it's an interesting problem
3. Say what your solution achieves
4. Say what follows from your solution

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An Example Abstract: Caution…

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- The first sentence of your paper must summarize the paper…..
  - The knowledgeable reader must not feel is reading an essay before realizing what the paper is about e.g.

There have numerous algorithms proposed in the literature for sorting. These algorithms can be comparison based or non-comparison based. The examples of comparison based sorting algorithms are Quicksort, Insertion sort, Mergesort etc. All these algorithms have a worst case upper bound of $O(n \lg n)$. However, it is important to explore whether with some assumptions is it possible ti improve upon this upper bound in the worst case. With this backdrop in our mind we propose ……………

OR

In this paper, we propose a new algorithm for external multipass merge sort that reduces the complexity of the sort from $O(n \lg n)$ to $O(n)$. However, our algorithm assume a bounded unsortedness. ….

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Tutorial #1

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- Revisit the abstract that you have written earlier in Part I of this presentation……..and revise it…..if need be.

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Case Studies #0: Tutorial #2

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- Look at these abstract and state how can it be improved.

Abstract - Preserving Privacy is crucial in distributed environments wherein data mining becomes a collaborative task among participants. Solutions proposed on the lines of cryptography involve use of classical cryptographic constructs in data mining algorithms. Applicability of solutions proposed depends on the adversary model in which it is able to preserve privacy. Existing cryptography based solutions for privacy preserving clustering aim to achieve privacy in presence of semi honest adversary model. For the practical applicability of the solutions in real world settings, support of malicious adversary model is desirable. As per our literature survey, the existing research lacks any fool proof solution for privacy preserving distributed clustering in malicious adversary model. In our previous seminar, we proposed the solution to the malicious attacks due to inconsistent share distribution in proposed approach. We proposed Verifiable Secret Sharing scheme to incorporate in proposed appraoch and discussed the theoretical analysis of the same. In this seminar, we show the empirical evaluation of the proposed approach in presernce of malicious adversary model using Pederson's Verifiable Secret Sharing scheme.

Our proposed approach performs better in terms of computational cost as compared to the existing approaches and hence is scalable to large datasets. However, the higher communication cost makes it infeasible to apply in the practical scenario with number of parties. For such scenario, the approach that is efficient in terms of communication cost is desirable. In this report, we propose a novel approach to privacy preserving clusteirng using Elliptic Curve Cryptography over horizontally partitioned data. We show the reduction in the communication cost from $O(n^2)$ (for our proposed approach using Shamir's secret sharing) to $O(n)$.

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Compare your answer with this one !!!

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Abstract - *Privacy Preservation is crucial in distributed data mining applications. There are two main approaches of privacy preserving data mining, viz. the Randomization based approach and the Cryptography based approach. As per the existing literature, the cryptography based approach provides higher level of privacy. Due to this, the cryptography based approach is mainly applicable to the critical applications where the security is utmost important. Applicability of cryptography based solutions depends on the adversary model such as the semi-honest model and the malicious model. In literature, various privacy preserving clustering algorithms in semi honest model are proposed. However, for the practical applicability of the solutions in real world settings, support of malicious adversary model is desirable.*

In this seminar, we empirically evaluate and analyze our approach that was proposed earlier i.e. Privacy Preserving Distributed K-means Clustering in Malicious Model usig Verifiable Secret Sharing. Our experiments shows fair conduction of our protocol in presence of malicious adversaries.

In addition to this, we propose a novel approach to privacy preserving clusteirng using Elliptic Curve Cryptography. In the process, we aim to reduce the communication cost of our earlier proposed appraoch i.e. Privacy Preserving Distributed K-Means Clustering usig Shamir's Secret Sharing. Our empirical analysis shows reduction in the communication cost from $O(n^2)$ (for Privacy Preserving Distributed K-Means Clustering usig Shamir's Secret Sharing) to $O(n)$.

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Tutorial #2...

29

- Seeing the comparison of the two versions side by side through MS-Word split………...

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Case Studies #1 : Tutorial #3

30

- Look at these abstract and state how can it be improved.

Abstract - It is essential to have efficient and robust algorithms to maintain the privacy of these co-opetative parties across different domains and in different scenarios. Understanding this need in a temporal setup as well; we implement two techniques proposed by us for privacy preservation while finding global cycles when mining cyclic association rules in a distributed setup that are based on Paillier's homomorphic encryption and Shamir's secret sharing that can help us decipher partial and total global cycles along with maintaining privacy in a distributed setup. We show a theoretical and empirical comparative analysis between these two techniques by performing the experiments for these techniques on a real and a synthetic temporal dataset.

We also empirically evaluate and implement a new approach for the secret sharing scheme among rational parties which comprises of three punishment policies. The aim of the protocol is to calculate the sum privately in distributed association rule mining. This approach is based on the game theoretic framework and is applicable to a number of scenarios in privacy preserving distributed association rule mining where we consider the participants to be rational which may try and attain maximum gain without disrupting the protocol. Also these parties if cautioned would correct themselves to have maximum individual gain in the future.

Apart from this we have proposed a new scheme which also considers malicious adversaries which is an extension of the previous game theoretic scheme for rational parties and incorporates verifiable secret sharing in a game theoretic setting instead so as to avoid malicious and rational parties from disrupting the protocol.

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Compare your answer with this one !!!

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Abstract - With the increase in the amount of data collected by organizations; there arises the inclination to perform collaborative data mining among various competing parties without sacrificing the individual's privacy. Hence, it is essential to have efficient and robust algorithms to maintain the privacy of these co-opetative parties across different domains and in different scenarios. Understanding this need in a temporal setup as well we propose two techniques for privacy preservation while finding global cycles when mining cyclic association rules in a distributed setup. The proposed techniques are based on Paillier's homomorphic encryption and Shamir's secret sharing that can help us decipher partial and total global cycles along with maintaining privacy in a distributed setup. We show a theoretical and empirical comparative analysis between these two techniques. The experiments for these techniques have been implemented on a real and a synthetic temporal dataset. However, in real life parties tend to be selfish and rational. These rational parties may try to attain maximum gain without trying to sabotage the protocol. However, these parties if cautioned would correct themselves to have maximum individual gain in the future. Hence to resolve this problem in the [m,m] secret sharing scheme, we have empirically evaluated and analysed a novel game theoretic approach among rational parties which comprises of three punishment policies which aim at ensuring corrective behaviour in the bad rational parties. The solution mentioned above however does not resolve the attack by malicious adversaries in the repeated [m,m] secret sharing scheme. Hence to combat malicious adversaries we extend Pedersen's verifiable secret sharing scheme to a ratings based systematic verification scheme in a game theoretic setting. This is a consolidated scheme that avoids both malicious and rational parties from disrupting the protocol.

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Tutorial #3...

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- Seeing the comparison of the two versions side by side through MS-Word split………...

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Case Studies #2 : Tutorial #4

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- Look at these abstract and state how can it be improved.

Abstract – The frequency of Denial of service (DoS) and distributed denial of service (DDoS) attacks which are a serious threat to the Internet is increasing day by day. IP traceback is one of the approaches to trace the source of DoS/DDoS attack. IP traceback is very difficult problem because attackers always spoof the source IP address of the packet. Various approaches has been proposed for IP traceback. In this seminar, we focus on Probabilistic Packet Marking (PPM) approach.

PPM approach suffers from high computation overhead at victim for fragments combination for IP recovery, large number of packets requirement and false-positive error rate. Sparsely-tagged fragmentation marking scheme use tag and sparsely marking approach to improve the PPM. Sparsely-tagged scheme do not require IP fragment combine process to recover IP address at victim hence no false-positive error. However, Sparsely-tagged fragmentation scheme require large number of packets to recover IP address. In this report, we propose a sparsely-tagged dynamic marking approach. Our approach requires less than half number of packets than existing sparsely-tagged marking approach to recover the IP address. Our method recovers the IP address quickly with zero false positive in the presence of multiple attackers.

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33

Compare your answer with this one !!!

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Abstract - Denial of Service (DoS) and Distributed Denial of Service (DDoS) attacks are serious threats to the Internet. The frequency of DoS and DDoS attacks is increasing day by day that may impose heavy casulaties on the victim, economically or otherwise. With the increasing sophistication in the technology these days, automated tools are at easy disposal to the technical semiliterates also who could then implement such attacks easily. Hence, it is not only important to prevent such attacks but also need to traceback the attackers. IP traceback is one of the approaches to trace the source of DoS/DDoS attack. Various approaches have been proposed for IP traceback. Probabilistic Packet Marking (PPM) is one of the effective approaches to resolve the IP traceback problem. PPM approach does not need an additional data structure and incur minimum network overhead. Hence, we focus on Probabilistic Packet Marking(PPM) approach.

However, PPM approach suffers from high computation overhead at victim to recover IP addresses and false-positives in presence of multiple attack paths.Tag based PPM (TPPM) is one of the ways to reduce the high computational at victim. However,TPPM suffers from false-positives when number of routers grows on attack path. Sparsely-Tagged Fragmentation Marking Scheme(S-TFMS)optimizes the computation overhead at victim and achieves zero false-positives butitrequire large number of packets to recover the IP addresses.

Therefore, we propose S-TFMS with dynamic marking approach. Our approach requires less than half number of packets than existing S-TFMS approach to recover the IP addresses. Our method recovers the IP address quickly with zero false-positives in the presence of multiple attackers.

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Tutorial #4…

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- Seeing the comparison of the two versions side by side through MS-Word split…………..

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Tutorial #5

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- Modify now the abstract that you wrote earlier (Tutorial #0) and compare the revised version with the first one.

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Structure

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- Abstract (4 sentences)
- **Introduction** (1 page)
- The problem (1 page)
- My idea (2 pages)
- The details (5 pages)
- Related work (1-2 pages)
- Conclusions and further work (0.5 pages)

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Writing Introduction: A Glance

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- The introduction should do the following
    - Open up the subject.
    - Survey past work relevant to this paper.
    - Describe the problem addressed in this paper, and show how this work relates to, or augments, previous work.

- Assumptions and Results
    - Describe the assumptions made in general terms,
    - State what results have been obtained.
        - This gives the reader an initial overview of what problem is addressed in the paper and what has been achieved.

- Overview the contents of the paper.
    - "Section II contains our formulation of the problem. Section III contains the experimental data…"

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The introduction (1 page)

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1. Describe the problem
   - Start with the objectives
   - Give a backgound
     - It is useful to justify the problem/objectives in terms of citations of the already published state-of-the-art literature.
     - Making a mention of a large number of such standard citations conveys you have done solid ground work before claiming something to be a problem.
   - State why is it important and interesting
   - State why is it hard (i.e. why the naïve approaches fail ?)
   - State why hasn't it be solved earlier (how previous solutions need improvement ?)
2. Guidance to the reader
   - What to watch for, interesting points, outline of the strategy
3. State your contributions

..............and that is all

…………………………ALL THESE CONTENTS SHOULD BE IN ONE PAGE!!!!!!!!

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Describe the problem

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1   Introduction

There are two basic ways to implement function application in a higher-order language, when the function is unknown: the *push/enter* model or the *eval/apply* model [11]. To illustrate the difference, consider the higher-order function `zipWith`, which zips together two lists, using a function **k** to combine corresponding list elements:

```
zipWith :: (a->b->c) -> [a] -> [b] -> [c]
zipWith k []      []      = []
zipWith k (x:xs) (y:ys) = k x y : zipWith xs ys
```

Here **k** is an *unknown function*, passed as an argument; global flow analysis aside, the compiler does not know what function **k** is bound to. How should the compiler deal with the call **k x y** in the body of `zipWith`? It can't blithely apply **k** to two arguments, because **k** might in reality take just one argument and compute for a while before returning a function that consumes the next argument; or **k** might take three arguments, so that the result of the `zipWith` is a list of functions.

Use an example to introduce the problem

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State your contributions

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- Contributions
  - Write the list of contributions first
  - The list of contributions drives the entire paper
    - the paper substantiates the claims you have made
  - Reader thinks "*gosh, if they can really deliver this, that's be exciting; I'd better read on*"

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State your contributions

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Which of the two is best in practice? The trouble is that the evaluation model has a pervasive effect on the implementation, so it is too much work to implement both and pick the best. Historically, compilers for strict languages (using call-by-value) have tended to use eval/apply, while those for lazy languages (using call-by-need) have often used push/enter, but this is 90% historical accident — either approach will work in both settings. In practice, implementors choose one of the two approaches based on a qualitative assessment of the trade-offs. In this paper we put the choice on a firmer basis:

- We explain precisely what the two models are, in a common notational framework (Section 4). Surprisingly, this has not been done before.
- The choice of evaluation model affects many other design choices in subtle but pervasive ways. We identify and discuss these effects in Sections 5 and 6, and contrast them in Section 7. There are lots of nitty-gritty details here, for which we make no apology — they were far from obvious to us, and articulating these details is one of our main contributions.

In terms of its impact on compiler and run-time system complexity, eval/apply seems decisively superior, principally because push/enter requires a stack like no other: stack-walking

Bulleted list of contributions

Do not leave the reader to guess what your contributions are!

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Contributions should be refutable

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NO!	YES!
We describe the WizWoz system. It is really cool.	We give the syntax and semantics of a language that supports concurrent processes (Section 3). Its innovative features are...
We study its properties	We prove that the type system is sound, and that type checking is decidable (Section 4)
We have used WizWoz in practice	We have built a GUI toolkit in WizWoz, and used it to implement a text editor (Section 5). The result is half the length of the Java version.

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Introduction : Do not do this

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- Avoid philosophical sentences......e.g.

The problem of ensuring security in Wireless Sensor Networks has attracted considerable interest in the community...

- Avoid the repetition of standard paragraphs that would have appeared in hundreds of papers on the same topic. e.g.

The recent advances in the technology of Micro Electro Mechanical Systems (MEMS) and Nano Electro Mechanical Systems (NEMS) has generated significant interest in the area of Wireless Sensor Networks (WSNs). However, because of the deployment in the unattended environment, resource constrained sensor nodes and inherently resource intensive security algorithms it is really challenging to design a secure WSNs. [Claim ????]

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Introduction : Do not do this

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- Sell your work but do not lie ….
  - Support all the claims with experiments, proofs etc.
  - Avoid grandiosity e.g.

  We propose a framework for…………
  - State the assumptions clearly

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No "rest of this paper is…"

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- Not:

  > "The rest of this paper is structured as follows. Section 2 introduces the problem. Section 3 … Finally, Section 8 concludes".

- Instead, use forward references from the narrative in the introduction.

- The introduction (including the contributions) should survey the whole paper, and therefore forward reference every important part.

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Tutorial #6

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- Study the Introductions of the sample papers given to you and explore how can these be improved…….discuss the improvements in open forum.

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Structure

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- Abstract (4 sentences)
- Introduction (1 page)
- ~~Related work~~
- The problem (1 page)
- My idea (2 pages)
- The details (5 pages)
- Related work (1-2 pages)
- Conclusions and further work (0.5 pages)

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No related work yet!

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Your reader

Related work
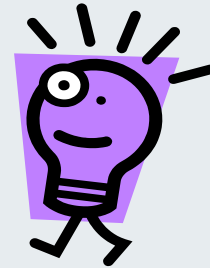
Your idea

We adopt the notion of transaction from Brown [1], as modified for distributed systems by White [2], using the four-phase interpolation algorithm of Green [3]. Our work differs from White in our advanced revocation protocol, which deals with the case of priority inversion as described by Yellow [4].

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No related work yet

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- Problem 1: the reader knows nothing about the problem yet; so your (carefully trimmed) description of various technical tradeoffs is absolutely incomprehensible

- Problem 2: describing alternative approaches gets between the reader and your idea

I feel stupid

I feel tired

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Structure

- Abstract (4 sentences)
- Introduction (1 page)
- The problem (1 page)
- My idea (2 pages)
- The details (5 pages)
- Related work (1-2 pages)
- Conclusions and further work (0.5 pages)

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Presenting the idea

3. The idea
Consider a bifurcated semi-lattice D, over a hyper-modulated signature S. Suppose p_i is an element of D. Then we know for every such p_i there is an epi-modulus j, such that $p_j < p_i$.

- Sounds impressive...but
- Sends readers to sleep
- In a paper you MUST provide the details, but FIRST convey the idea

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Overview

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- Sometimes it is helpful to give an overview of the work so that reviewer can quickly get the your approach.

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Presenting the idea

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- Explain it as if you were speaking to someone using a whiteboard
- Conveying the intuition is primary, not secondary
- Once your reader has the intuition, he/she can follow the details (but not vice versa)
- Even if he/she skips the details, he/she still takes away something valuable

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Putting the reader first

55

- Do not recapitulate your personal journey of discovery. This route may be soaked with your blood, but that is not interesting to the reader.

- Instead, choose the most direct route to the idea.

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The payload of your paper

56

> Introduce the problem, and your idea, using
>
> EXAMPLES
>
> and only then present the general case

56

Using examples

57

2 Background

To set the scene for this paper, we begin with a brief overview of the *Scrap your boilerplate* approach to generic programming. Suppose that we want to write a function that computes the size of an arbitrary data structure. The basic algorithm is "for each node, add the sizes of the children, and add 1 for the node itself". Here is the entire code for gsize:

```
gsize :: Data a => a -> Int
gsize t = 1 + sum (gmapQ gsize t)
```

The type for gsize says that it works over any type a, provided a is a *data* type — that is, that it is an instance of the class Data[1] The definition of gsize refers to the operation gmapQ, which is a method of the Data class:

```
class Typeable a => Data a where
   ...other methods of class Data...
   gmapQ :: (forall b. Data b => b -> r) -> a -> [r]
```

Example right away

57

The details: evidence

58

- Your introduction makes claims
- The body of the paper provides evidence to support each claim
- Check each claim in the introduction, identify the evidence, and forward-reference it from the claim
- Evidence can be: analysis and comparison, theorems, measurements, case studies

58

Details : Proposing a new algorithm

59

- When proposing a new algorithm….it is necessary
  - to design and show the pseudocode
  - to follow consistent CLRS notations for writing the code
  - to give the theoretical correctness proof of the algorithm proposed
  - to do the asymptotic complexity analysis of the code.

- If the algorithm proposed is in the area of IS ….it is necessary
  - to specify the attack model clearly
  - to do the security proof precisely..

- First, describe the approach informally briefly and then describe formal treatment in details.

Experimentations and Analysis

60

- Broadly a section titled Experimental Evaluation and Analysis
  - Methodology of Evaluation
  - Tools used
  - Performance Metrics
  - Test Application
  - Performance Results
  - Empirical Analysis

- Argue that the empirical analysis tallies with the theoretical analysis carried out earlier.

Performance Evaluations

61

- Some observations to note:
  - Many conferences expect experiments
  - It is easy to do meaningless experiments …..!!!
  - It is easy to design experiments to show your work in best light !!
  - What should the performance experiments measure ? Possibilities:
    - Pure running time
    - Sensitivity to important parameters
    - Scalability in various aspects :data size, complexity….
    - … …
  - IT is very vital that these metrics are defined clearly…..

61

Performance Evaluations...

62

- Some observations to note:….
  - What should the performance experiments show ? Possibilities
    - Absolute performance
    - Relative performance to naïve approaches
    - Relative performance to previous approaches
    - Relative performance amongst different proposed approaches
    - ………

62

Structure

63

- Abstract (4 sentences)
- Introduction (1 page)
- The problem (1 page)
- My idea (2 pages)
- The details (5 pages)
- **Related work** (1-2 pages)
- Conclusions and further work (0.5 pages)

63

Related Work

64

- Should it be covered in the beginning or at the end ?
- Beginning
  - if it could be short yet detailed enough OR
  - if it is absolutely crucial to take a string defensive stance about the previous work right away
  - if written cryptically and precisely could be the last sub-section of the Introduction section
- End
  - if sufficient comparisons require the technical content of the paper
  - could appear just before the Conclusions OR
  - in a separate subsection on "Discussions and Related Work"

64

Related Work : Goals

65

- Several
  - Candidly yet surreptitiously show that you have referred to standard literature to frame the problem – it is not just an eye-wash
  - Acknowledge your debt
  - Explain precisely how your work is different
  - Stroke reader/reviewer egos
  - Outline your perspective on the field

65

Related work

66

Fallacy   To make my work look good, I have to make other people's work look bad

66

The truth: credit is not like money

67

Giving credit to others does not diminish the credit you get from your paper

- *Warmly acknowledge people who have helped you*
- *Be generous to the competition. "In his inspiring paper [Foo98] Foogle shows.... We develop his foundation in the following ways..."*
- *Acknowledge weaknesses in your approach*

67

Credit is not like money

68

Failing to give credit to others can kill your paper

- *If you imply that an idea is yours, and the referee knows it is not, then either*
- *You don't know that it's an old idea (bad)*
- *You do know, but are pretending it's yours (very bad)*

68

Related Work

69

- DO
  - Point out both advantages and disadvantages of related work
  - Discuss all the references that you cite
  - Always navigate the discussion technology/approach-wise and…

- Do NOT
  - Do a laundry list of the papers published in the literature
  - Include irrelevant references
  - Write a paragraph about a very peripheral work

- REMEMBER
  - Your own critique of the current state-of-the-art is expected in this section with appropriate citations.

Structure

70

- Abstract (4 sentences)
- Introduction (1 page)
- The problem (1 page)
- My idea (2 pages)
- The details (5 pages)
- Related work (1-2 pages)
- Conclusions and further work (0.5 pages)

Conclusions and further work

71

- Be brief.

- In no case, should it SIMPLY be the repetition of the contents of the abstract

- It is better if quantitative results are used to justify the claims made earlier.

- Future work is very essential
  - How does the research trigger new research/experimentations
  - If engaged in follow-up work, mention that clearly….claim on further work of yours
  - Be aware that potential researchers always look at the future work to explore new problems……

71

The process of writing

72

The process

73

- Start early. Very early.
  - Hastily-written papers get rejected.
  - Papers are like wine: they need time to mature
- Collaborate
- Use CVS to support collaboration

73

Getting help

74

Get your paper read by as many friendly guinea pigs as possible

- Points to be noted
  - Experts are good
  - Non-experts are also very good
  - Each reader can only read your paper for the first time once! So use them carefully
  - Explain carefully what you want ("I got lost here" is much more important than "Jarva is mis-spelt".)

74

Getting help...

75

- Do not artificially formalize the language in the paper….
- e.g. using MS Word Thesaurus
- e.g. which one of the following is better ?????

  Problem X is clearly a critical area that impacts our research agenda and hypothesis . Our ideas about problem X are embryonic and still evolving, and doubtless our ongoing work in this area will quickly yield fruitful results.

  OR

  We recognize that problem X is central to our agenda, but we have only begun to investigate it.

- What you write should not yield a Shakespearean work of literature but should be readable, logically organized prose by construction.

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Getting expert help

76

- A good plan: when you think you are done, send the draft to the competition saying "could you help me ensure that I describe your work fairly?".
- Often they will respond with helpful critique (they are interested in the area)
- They are likely to be your referees anyway, so getting their comments or criticism up front is Jolly Good.

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Listening to your reviewers

77

Treat every review like gold dust
Be (truly) grateful for criticism as well as praise

This is really, really, really hard

But it's
really, really, really, really, really, really, really, really, really, really important

77

Listening to your reviewers

78

- Read every criticism as a positive suggestion for something you could explain more clearly
- DO NOT respond "you stupid person, I meant X". Fix the paper so that X is apparent even to the stupidest reader.
- Thank them warmly. They have given up their time for you.

78

Language and style

Basic stuff

80

- Submit by the deadline
- Keep to the length restrictions
  - Do not narrow the margins
  - Do not **use 6pt font**
  - On occasion, supply supporting evidence (e.g. experimental data, or a written-out proof) in an appendix
- Always use a spell checker

Visual structure

81

- Give strong visual structure to your paper using
  - sections and sub-sections
  - bullets
  - italics
  - laid-out code
- Find out how to draw pictures, and use them
- Figures should
  - always appear after the first reference
  - be referenced in numerical order
  - have the text therein legible
  - always be in grayscale, to the extent possible.
  - Use GNUPlot for graphs….not Excel !!!

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Visual structure

82

remainder of the object is called the *payload*, and may consist of a mixture of pointers and non-pointers. For example, the object $CON(C\ a_1 \ldots a_n)$ would be represented by an object whose info pointer represented the constructor C and whose payload is the arguments $a_1 \ldots a_n$.

The info table contains:

- Executable code for the object. For example, a FUN object has code for the function body.
- An object-type field, which distinguishes the various kinds of objects (FUN, PAP, CON etc) from each other.
- Layout information for garbage collection purposes, which describes the size and layout of the payload. By "layout" we mean which fields contain pointers and which contain non-pointers, information that is essential for accurate garbage collection.
- Type-specific information, which varies depending on the object type. For example, a FUN object contains its arity; a CON object contains its constructor tag, a small integer that distinguishes the different constructors of a data type; and so on.

In the case of a PAP, the size of the object is not fixed by its info table; instead, its size is stored in the object itself. The layout of its fields (e.g. which are pointers) is described by the (initial segment of) an argument-descriptor field in the info table of the FUN object which is always the first field of a PAP. The other kinds of heap object all have a size that is statically fixed by their info table.

A very common operation is to jump to the entry code for the object, so GHC uses a slightly-optimised version of the representation in Figure 3. GHC places the info table at the addresses *immediately*
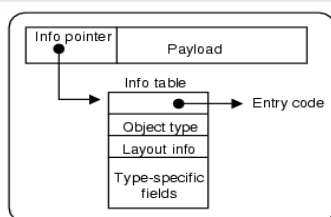
Figure 3. A heap object

The three cases above do not exhaust the possible forms of f. It might also be a $THUNK$, but we have already dealt with that case (rule THUNK). It might be a CON, in which case there cannot be any pending arguments on the stack, and rules UPDATE or RET apply.

4.3 The eval/apply model

The last block of Figure 2 shows how the eval/apply model deals with function application. The first three rules all deal with the case of a FUN applied to some arguments:

- If there are exactly the right number of arguments, we behave exactly like rule KNOWNCALL, by tail-calling the function. Rule EXACT is still necessary — and indeed has a direct counterpart in the implementation — because the function might not be statically known.
- If there are too many arguments, rule CALLK pushes a *call*

82

Use the active voice

83

The passive voice is "respectable" but it DEADENS your paper. Avoid it at all costs.

NO	YES
It can be seen that...	We can see that...
34 tests were run	We ran 34 tests
These properties were thought desirable	We wanted to retain these properties
It might be thought that this would be a type error	You might think this would be a type error

"We" = you and the reader

"We" = the authors

"You" = the reader

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Use simple, direct language

84

NO	YES
The object under study was displaced horizontally	The ball moved sideways
On an annual basis	Yearly
Endeavour to ascertain	Find out
It could be considered that the speed of storage reclamation left something to be desired	The garbage collector was really slow

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Further Style Guidelines

85

NO	Yes
ATP formation, reaction product	Formation of ATP, product of the reaction
This is a fast program. This leads us to conclude	This program is fast. This observation leads us to conclude
It was observed that the system crashed on this input	We observed that the system crashed when the input was …….
The yield was higher using bromine.	The yield was higher using bromine than chlorine

85

Further Style Guidelines…

86

- Just like a program, all terminologies and notations must be defined (*only once !!*) before used

- Global definitions should be grouped into Preliminaries section.
  - Other definitions must be given before their first usage

- Do not use "etc." unless the remaining items are completely obvious
  - e.g. We shall number the iterations as 1,2,3, etc. √
  - e.g. We use the evaluation parameters such as time, RAM used etc.   ✖

- Never use "For various reasons….."
  - Be specific about the terms used.

86

Further Style Guidelines…

87

- Avoid non referential use of "this, "that", these" and so on..
  - Explicitly identify what "this" refers to…..
  - e.g.
  - *"We use different environments and test beds to test our algorithm. Our algorithm performs well in some and does not perform well in others. This is important because…………*
  - *"By increasing the impedance, the radiation level is increased and the electric field becomes stronger. This means that….." The issue is what specifically "this" refers to ? Moreover, who did the increasing …? Use instead, the following*
  - *""By increasing the impedance, the radiation level is increased and the electric field becomes stronger. This observation implies that …………*

Further Style Guidelines…Expletives

88

- Avoid Expletives
  - Expletives are words that serve a grammatical function in a sentence but have no meaning.
  - The most common expletives are it is, there is, there are, and related phrases.

- Instead of ……*There is no alternative for us except to withdraw the product.*

- Use……*We have no alternative except to withdraw the product.*

Further Style Guidelines...Expletives...

89

- Avoid Expletives
  - Expletives are words that serve a grammatical function in a sentence but have no meaning.
  - The most common expletives are it is, there is, there are, and related phrases.

- Instead of ...... *It is hoped that testing the evaluation copies will help us make a decision.*

- Use.....*We hope that testing the evaluation copies will help us make a decision.*

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Further Style Guidelines...Nominalized words

90

- Avoid Nominalized Verbs
  - Nominalized verbs are verbs that have been changed into nouns then coupled with weaker verbs.

- Instead of ...... *Each preparation of the solution is done twice.*

- Use.......*Each solution is prepared twice.*

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90

Further Style Guidelines...Nominalized words...

91

- Avoid Nominalized Verbs
  - Nominalized verbs are verbs that have been changed into nouns then coupled with weaker verbs.

- Instead of ……*Consideration should be given to an acquisition of the properties.*

- Use………*We should consider acquiring the properties.*

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91

Further Style Guidelines...Avoid Fillers

92

- Avoid Fillers
  - In our writing, we sometimes use fillers, many of which are more suited to speech.
  - Most of these fillers are meaningless in writing.
  - Some examples of fillers are *basically, kind of, certain, rather, essentially, sort of. These words simply "bloat" your paper.*

- Instead of …….. *I think that, basically, the board felt sort of betrayed, in a sense, by the kind of behavior the president displayed.*

- Use…..*The board felt betrayed by the president's behavior.*

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92

Further Style Guidelines...Avoid Fillers...

93

- Avoid Fillers
  - In our writing, we sometimes use fillers, many of which are more suited to speech.
  - Most of these fillers are meaningless in writing.
  - Some examples of fillers are *basically, kind of, certain, rather, essentially, sort of. These words simply "bloat" your paper.*

- Other fillers include redundant expressions, such as .....
  - *collaborate together, past history, end result, any and all, still remain, completely eliminate, very unique*

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93

Further Style Guidelines...Avoid Fillers...

94

- Avoid Fillers
  - In our writing, we sometimes use fillers, many of which are more suited to speech.
  - Most of these fillers are meaningless in writing.
  - Some examples of fillers are *basically, kind of, certain, rather, essentially, sort of. These words simply "bloat" your paper.*

- Instead of ....*This project would not have succeeded if not for the hard work and considerable effort of each and every one of the auditors.*

- It is better to use......*This project would not have succeeded if not for the hard work of every one of the auditors.*

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94

Further Style Guidelines...Avoid Wordy Phrases

95

- Avoid Wordy Phrases
  - Wordy phrases also make writing long and boring.
    - For example, many people write *on a daily basis instead of daily.*
  - *The longer sentence may sound more important,* but *daily says the same thing more concisely.*

- Instead of ....*I am of the opinion that, in regard to profit achievement, the statistics pertaining to this month will appear to indicate an upward tendency.*

- Use more concise.........*I think that this month's statistics will show an increase in profits.*

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Further Style Guidelines...Avoid Wordy Phrases ...

Wordy Phrase	Concise Phrase	Wordy Phrase	Concise Phrase
a majority of	most	in the event of	if
a number of	some, many	in view of the fact that	because
at an early date	soon	it is often the case that	often
at the conclusion of	after, following	it is our opinion that	we think that
at the present time	now	it is our recommendation that	we recommend that
at this point in time	now	it is our understanding that	we understand that
based on the fact that	because	make reference to	refer to
check out	check	of the opinion that	think that
despite the fact that	although	on a daily basis	daily
due to the fact that	because	on the grounds that	because
during the course of	during	prior to	before
during the time that	during, while	relative to	regarding, about
have the capability to	can	so as to	to
in connection with	about	subsequent to	after
in order to	to	take into consideration	consider
in regard to	regarding, about	until such time as	until

96

Further Style Guidelines...Avoid prepositional phrases

97

- Avoid Unnecessary Prepositional Phrases
  - A prepositional phrase consists of a preposition followed by a noun or a noun equivalent, such as in the summary, on the engine, under the heading.
  - Unnecessary prepositional phrases, often used with abstract nouns and nominalizations, can make your writing long and boring.

- Instead of long........*The increase in the number of students enrolled in the Mechanical Engg. program at SVNIT, Surat is suggestive of the regard in which that program is held by the university's new students.*

- Use more shorter...........*The growth of SVNIT Surat's Mechanical Engineering program suggests that the university's new students consider it a good program.*

97

Further Style Guidelines...

98

- Be careful in using "while"....
  - do not use "while" when you wish to mean "and" OR "but", "although"
  - "while" should be used only in the strictest sense of "during the time...."
  - e.g.

  "The WSNs consist of resource starved sensor nodes. Therefore, devising the security algorithms to work on sensor nodes is non-trivial. While ciphers for the RFID devices may work feasibly in the sensor nodes, it is important to examine the feasibility of AES cipher."

- A single numbered sub-section
  - it is strange to have a single sub-section (e.g. 5.2.1 in section 5.2).
  - Why should you number a sub-section, if it is single ?

98

Further Style Guidelines…

99

- Referring Tables, Figures, Sections in your text
  - always capitalize these names when you refer them in the text in the paper
  - e.g.

  - *"As we discuss further in Section 1.2, …………..*
  - *"We use CPU-cycles and RAM/ROM requirements as the metrics of evaluation of our approach and show the results of our evaluation in Figure 4.2."*
  - *In Table 4.3, we show the comparative evaluation of ………………"*

- Use a uniform and consistent citation style as well as reference style

99

Further Style Guidelines…

100

- Referring numbers in your text……….
  - Rule of thumb: spell out one to ten and use numbers (figures) for numbers 11 and up….
  - However, it is better to be consistent rather than trying to follow this rule….e.g. compare the following two sentences….

  - *"If the size of one page frame is four KB and there are ten such pages allocated, the total memory used is forty KB. "*
    OR
  - *"If the size of 1 page frame is 4 KB and there are 10 such page frames allocated, the total memory used is 40 KB."*

- Which one do you think intuitively aids the understanding ?

100

Further Style Guidelines...

101

- Do not anthropomorphize the computers e.g. never use.....
  "The program thinks that sorting is required to be done before .... "

- Do not use words like "obviously" or "clearly" unless it is absolutely necessary ....
  - *"Obviously, if sum=1+2+3+.....n, then sum evaluates to n(n+1)/2 "*

- Get rid of as many abstract words as possible
  - *Instead of "We determined the conditions for performance improvement." use "We measured the noise variance necessary to increase the bit error probability by 5 percent."*

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101

Further Style Guidelines...

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- Prefer singular to plural number e.g.
  - *In "sequences induce graphs....", it is not clear whether the two collections are in one-to-one correspondence OR not. Instead, "each sequence induces a graph.." is precise.*
  - *Likewise, "graphs might contain paths...", it is not clear whether a given graph might contain multiple paths or might contain atmost one path. "*

- Check for consistent use of verb tense.
  - do not change tense inbetween during the presentation
  - stick to the present tense always during the entire paper...

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Further Style Guidelines…

103

- Use verbs more than nouns….do not sideline the main action of your sentences in nouns or adjectives.
  - *Original: "The annual report produced a* disappointed *reaction from the sponsor."*
  - *Revised: " The annual report* disappointed *the sponsor."*

  - *Original: "It is our* expectation *that we will see* radiation *pattern improvement when the antenna is elevated."*
  - *Revised: "We* expect *to* improve *the radiation pattern by elevating the antenna."*

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Further Style Guidelines…

104

- Italics are for definitions or quotes not for emphasis (pet peeve)
  - Text alone should provide sufficient emphasis.

- Be clear about using "which" versus "that".
  - "that" is defining, whereas "which" is nondefining.

  The algorithms that are easy to implement all run in linear time.   Correct usage
  The algorithms, which are easy to implement, all run in linear time.   Correct usage

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Mechanics

105

- Always run a spelling checker on the final document

- For drafts and technical reports,
  - use 11 point font, generous spacing, 1" margins and a single column format.

- In the final camera ready, fonts in figures should be no smaller than the font size in the body of the paper.

- Tables, Figures, graphs and algorithms should always
  - be placed on top of a page or a column, not in the body – unless it is very small and fits into the flow of the paper.

- Every table, figure, graph or algorithm must appear
  - on the same page as the first reference OR on the following page…

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Mechanics…

106

- Try to reduce the fog index. The Fog Index F is defined as

$$F = 0.4\ (L + P),$$
$$L - average\ number\ of\ words\ per\ sentence,$$
P is the average number of polysyllables per 100 words of text,
a polysyllable is a word with three or more syllables.

- Ideally, strive for a fog index lesser than 15.
- Use Grammar and Style check, if using MS-Word. Strive for Flesch-Kincaid Grade level of ……

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Peep into the Review process

107

- **Reviewer's Evaluation of the "Technical Content"**
  - the extent to which the work is relevant to thi workshop/conference/journal
  - the extent to which the work answers a valid research question
  - the research methodology
  - the quality of results and argumentation (any suspected flaws)
  - the evaluation
  - awareness of related work (including the correct number of appropriate references)
  - the degree of significance of the results
  - do the conclusions follow from the work described?

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Peep into the Review process

108

- **Reviewers evaluation of writing and presentation**
  - Can the reviewer understand the development of the argument?
  - Does the abstract describe what reviewer reads (and did you know what he/she were going to read about when he/she had read the abstract)
  - Do the intro and conclusions tell a story on their own?
  - Have the authors kept to the format and length requirements of the publishers?
  - Are the diagrams and figures readable?
  - Are the references and citations formatted properly?
  - Are the references "fully formed"?
    - Are all the authors listed?
    - Is all the information about the venue that would be needed to retrieve the paper listed?
      - The list should not include references to commercial web-sites.
      - Academic Web references should preferably include author, title and date published, and/or date last accessed

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Peep into the Review process

- Typos
  - Reviewer may produce a table of any grammatical errors, typos and other minor textual problems that have been spotted.
  - Presumably if the problem is that English is not the authors' native language; they need to be advised to get help before submitting the final version.

- Note that
  - A reviewer is always right ……
  - Never question a reviewer…..fruitless
  - If you feel some point is not interpreted correctly, it is you mistake in articulation – not the reviewe's mistake.
  - Most reviews are done on travel !!!!!

Choosing a venue : conference or journal ?

- Why to prefer a conference ?
  - Have higher status
  - Provide higher visibility, greater impact
  - Opportunity to defend, discuss your work with established researchers
  - Have higher quality
  - Are more timely
  - Have higher standards of novelty
    - journals only require 20-30% of the material to be new compared to an earlier conference version of the same.

Choosing a venue : conference or journal

111

- Why to prefer a journal ?
  - Have higher page limits
  - Reviews tend to be more detailed – reviewer spends days on paper
  - Have the opportunity to revise your work and re-submit it for review
  - Have higher acceptance rates
  - Have perceived higher status
    - In most of the scientific fields, journals have higher status than conferences, computer science according to a few (e.g. Michael Ernst) is an exception.
    - The best papers at conferences are often solicited for journal publication
  - The paper would be cited more than the conference version
  - Journal version adds real value – because corrections are compelled

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111

Summary - Academic Research

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- If you remember nothing else:
  - Identify your key idea
  - Make your contributions explicit
  - Use examples

- Lot of academic research is incremental
  - Incremental research has its purpose
  - Keeps research skills sharp

- Hard for most to go straight to the big problems and great solutions;
  - path to greatness lies through incremental research
  - Risk: Remain forever in this mode!

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Key Points

113

- Research is different from engineering –is about creating new knowledge
- Research must show what new ideas it has and must show how it improves the existing state
- Publishing is an integral part of research, papers must follow proper style and copyright/IPR rules

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Acknowledgement

114

- The contents now onwards have been inspired from the talks viz.
  - Research and Publishing in Software Engineering Prof Pankaj Jalote, Director, IIIT, Delhi
  - How to write a great research paper by Simon Peyton Jones Microsoft Research, Cambridge
  - Whitesides' Group: Writing a Paper by George M Whitesides, Harvard University, USA
  - Writing Research Papers by Aaron Hertzmann
  - Tips for Writing Technical Papers by Jennifer Widom
  - Advice on Research and Writing" - http://www-2.cs.cmu.edu/afs/cs.cmu.edu/user/mleone/web/how-to.html
  - Amanda Barney from Jon Marc Smith's handout at Student Learning Assistance Center (SLAC), Texas State University-San Marcos

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Thank you

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