

How to Write an Effective Technical Paper

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SAIEEE Power Energy Sector Webinar

IEEE N Karnataka Sub-section, 28 August 2020

Webinar Speaker,

Saifur Rahman, Ph.D.

Professor and Director

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Education

Ph.D., Electrical Engineering, Virginia Polytechnic Institute and State University, 1978.

M.S., Electrical Sciences, State University of New York at Stony Brook, 1975.

B.Sc., Electrical Engineering, Bangladesh University of Engineering and Technology, Dhaka, 1972

Professional Society Activities

- IEEE Member since 1975, Fellow 1998, Life Fellow 2014
- President, IEEE PES, 2018-2019
- Vice president, Publications, IEEE PES, 2001-2003, 2012-2013
- Vice President, Publications, IEEE, 2006
- Editor-in-Chief, IEEE Transactions on Sustainable Energy, 2010-2012
- Editor-in-Chief, IEEE Electrifications Magazine, 2013-2014
- Launched, the IEEE Power & Energy Technology Systems Journal (Open Access), 2014

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Writing Quality Technical Papers (Webinar)

Authoring Webinar

Presenter

Saifur Rahman, Ph.D.
Professor and Director
Virginia Tech Advanced Research Institute



Education

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Saifur Rahman

Candidate for IEEE President-Elect 2021

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AWARDS

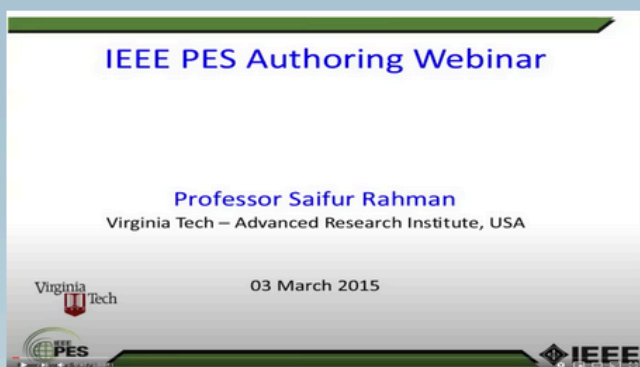
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Audience





Audience

Basic Questions

1.Are you writing this paper for the sake of writing a paper?

2.Or do you want to show how others can benefit from your work?

Audience

Scientific research publishing

- Who writes scientific papers?
 - Engineers, scientists, educators and researchers from:
 - Corporations
 - Academia
 - Government
 - Students typically write and present conference papers before submitting journal articles



Audience

What IEEE editors and reviewers are looking for

- Content that is appropriate, in scope and level
- Clearly written original material that addresses a new and important problem
- Extension of previously published work
- Valid methods and rationale
- Illustrations, tables and graphs that support the text
- References that are current and relevant to the subject

Audience

How does the review process work?

- Editor-in-Chief gets the paper after it goes through content match check (iAuthenticate) and “banned author” check
- If the paper is in scope for the journal, it is assigned to an editor (associate editor)
- Editor assigns the paper to five or more reviewers
- Reviewers send their comments back to the editor
- Editor makes a recommendation to the EIC as follows:
 - Accept
 - Revise & Resubmit
 - Reject
- The EIC makes the final decision and informs the corresponding author

Audience

Why IEEE editors and reviewers reject papers

- The content is not a good fit for the publication
- There are serious scientific flaws:
 - Inconclusive results or incorrect interpretation
 - Fraudulent research
- It is poorly written
- It does not address a big enough problem or advance the scientific field
- Most of the work was previously published
- The quality is not good enough for the journal
- Reviewers have misunderstood the article

Structure

Paper Structure

Elements of a manuscript

Title

Abstract

Keywords

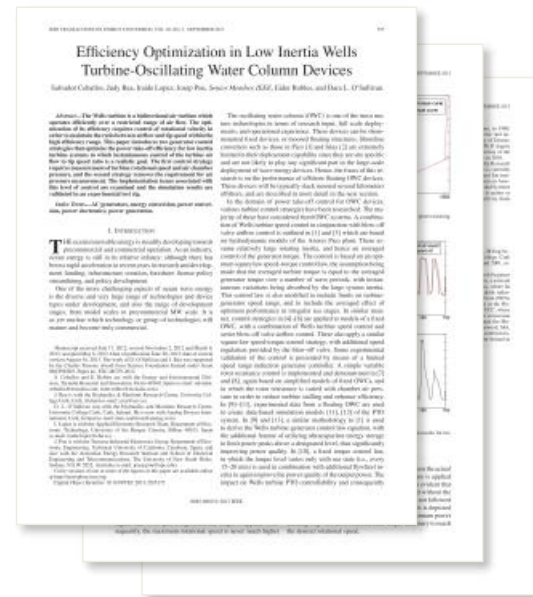
Introduction

Methodology

Results/Discussions/Findings

Conclusion

References



Paper Structure

Title

An effective title should...

- Answer the reader's question:
"Is this article relevant to me?"
- Grab the reader's attention
- Describe the content of a paper using the fewest possible words
 - Is crisp, concise
 - Uses keywords
 - Avoids jargon

Good
Title

VS.

Bad
Title

Title Dos and Don'ts

- ✓ *A Human Expert-based Approach to Electrical Peak Demand Management*
- VS
- ✗ *A **better** approach of managing **environmental and energy sustainability** via a study of different methods of electric load forecasting*

Paper Structure

Abstract

A “stand alone” condensed version of the article

- No more than 250 words; can use past or present tense
- Uses keywords and index terms

Why they're useful & important
& move the field forward

Why you did it

What you did

How the results
were useful,
important & move
the field forward

Paper Structure

Abstract Dos and Don'ts



The objective of this paper was to propose a human expert-based approach to electrical peak demand management. The proposed approach helped to allocate demand curtailments (MW) among distribution substations (DS) or feeders in an electric utility service area based on requirements of the central load dispatch center. Demand curtailment allocation was quantified taking into account demand response (DR) potential and load curtailment priority of each DS, which can be determined using DS loading level, capacity of each DS, customer types (residential/commercial) and load categories (deployable, interruptible or critical). Analytic Hierarchy Process (AHP) was used to model a complex decision-making process according to both expert inputs and objective parameters. Simulation case studies were conducted to demonstrate how the proposed approach can be implemented to perform DR using real-world data from an electric utility. Simulation results demonstrated that the proposed approach is capable of achieving realistic demand curtailment allocations among different DSs to meet the peak load reduction requirements at the utility level.

Vs



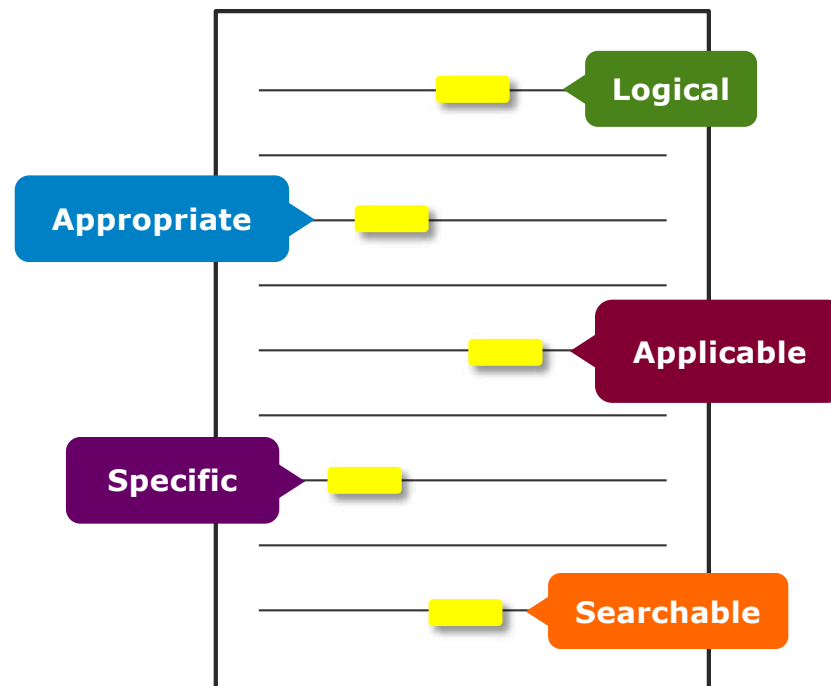
This paper presents and assesses a framework for an engineering capstone design program. **We explain** how student preparation, project selection, and instructor mentorship are the three key elements that must be addressed before the capstone experience is ready for the students. **Next, we describe** a way to administer and execute the capstone design experience including design workshops and lead engineers. **We describe the importance** in assessing the capstone design experience and report recent assessment results of our framework. **We comment** specifically on what students thought were the most important aspects of their experience in engineering capstone design and provide quantitative insight into what parts of the framework are most important.

First person, present tense

No actual results, only describes the organization of the paper

Paper Structure Keywords

Use in the Title and
Abstract for enhanced
Search Engine Optimization



Paper Structure

Introduction

- A description of the problem you researched
- It should move step by step through:

Generally
known
information
about the topic

Prior studies'
historical
context to
your research

Your hypothesis
and an
overview
of the results

How the
article is
organized

- The introduction should be:
 - Specific, not too broad or vague
 - About 1-2 pages
 - Written in the present tense

Paper Structure

Methodology

- Problem formulation and the processes used to solve the problem, prove or disprove the hypothesis
- Use **illustrations** to clarify ideas and support conclusions:

Tables

Present representative data or when exact values are important to show



Graphs

Show relationships between data points or trends in data



Figures

Quickly show ideas/conclusions that would require detailed explanations



Results/discussion

Demonstrate that you
solved the problem or
made significant advances

Results: Summarizes the Data

- Should be clear and concise
- Use figures or tables with narrative to illustrate findings

Discussion: Interprets the Results

- Why your research offers a new solution
- How can it benefit other researchers professionals

Discussion

Results

JIMENEZ-MUNOZ *et al.*: LST RETRIEVAL METHODS FROM LANDSAT-8 THERMAL INFRARED SENSOR DATA

1949

REFERENCES

- [illegible]

Paper Structure

Conclusion

- Explain what the research has achieved
 - As it relates to the problem stated in the Introduction
 - Revisit the key points in each section
 - Include a summary of the main findings and implications for the field
- Provide benefits and shortcomings of:
 - The solution presented
 - Your research and methodology
- Suggest future areas for research



Paper Structure References

- Support and validate the hypothesis your research proves, disproves or resolves
- There is no limit to the number of references
 - But use only those that directly support your work (about 30)
- Ensure proper author attribution
 - Author name, *article title*, publication name, publisher, year published, volume and page number, Digital Object Identifier (DOI)

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IEEE TRANSACTIONS ON SMART GRID, VOL. 5, NO. 4, JULY 2014

We then have

$$(P_t^{k,+} + P_t^{k,-})^2 - (P_t^{k,+} - P_t^{k,-})^2 = 4P_t^{k,+}P_t^{k,-} < (P_t^{k,+} - \hat{P}_t^{k,-})^2 + 4\hat{P}_t^{k,+}\hat{P}_t^{k,-} - (P_t^{k,+} + \hat{P}_t^{k,-})^2.$$

Since $P_t^{k,+} - P_t^{k,-} = \hat{P}_t^{k,+} - \hat{P}_t^{k,-}$, we then have $P_t^{k,+} < \hat{P}_t^{k,+}$, and $P_t^{k,-} < \hat{P}_t^{k,-}$. Because the operational cost is an increasing function of $(P_t^{k,+}, P_t^{k,-})$, we obtain that

$$c_{k|n}(P_t^{k,+}, P_t^{k,-}) < c_{k|n}(\hat{P}_t^{k,+}, \hat{P}_t^{k,-}).$$

Therefore the optimal pair $(P_t^{k,+}, P_t^{k,-})$ must satisfy that $P_t^{k,+}P_t^{k,-} = 0$, i.e., only one of $P_t^{k,+}, P_t^{k,-}$ can be non-zero. ■

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Feng Yang (S'11) received the B.Sc. degree in electrical engineering from University of Science and Technology, Anhui, China in 2006, and the M.Sc. and Ph.D. degrees in electrical engineering from Washington University in St. Louis, St. Louis, MO, USA, in 2011 and 2014, respectively. His Ph.D. advisor is Dr. Arya Nehorai.



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Who should be on the Authors' list

A Report

A report documents in detail the work done including results for a project and has a lead author and other multiple authors

A Technical Paper

- It highlights one or more aspects of a report
- Multiple papers can come out of one report
- Include any and all who have contributed to the writing of the paper
- Others can be acknowledged

Ethics

Ethics

Types of misconduct

Conflict of Interest

- A financial or other relationship with the publication at odds with the unbiased presentation of data or analysis.

Plagiarism

- Copying another person's work word for word or paraphrasing without proper citation.

Missing Author Attribution

- Must be given if you use another author's ideas in your article, even if you do not directly quote a source.

Ethics

Ethical publishing

Plagiarism

- Avoid plagiarism
 - Cite and separate any verbatim copied material – **but how much?**
 - Paraphrase other's text properly, and include citation
 - Credit any ideas from other sources
 - Familiarize yourself with IEEE Policies



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Ethics

Ethical publishing

Duplication, Redundancies & Multiple Submissions

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 - Is not under review for another refereed publication
 - Cites previous work
 - Indicates how it differs from the previously published work
 - Authors MUST also **inform the editor** when submitting any previously published work



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Systematic and objective

Impact Factor is not necessarily enough of a metric

Other attributes:

- Journal's reputation in the community is important
- For new and lesser known journals – look at the editorial board, their reputation

Other ways of judging a journal's value to the engineering community

- 1. Number of Downloads** (IEEE uses this information for revenue distribution)
- 2. Patent Citations** (Available from IEEE)

Follow-up Steps

Process of Writing the Paper

Discuss the content among team members
Literature search – Reference List
Description of the Experiment/Model
Results/Discussion
Write the Conclusion
Collect the components – Prepare the draft
All members comment on the draft
Produce the final copy

I would like to see a broader IEEE

We need to ensure that we are “READY FOR RECOVERY”, when we get back to the “NEW NORMAL” after COVID-19. Let us enhance cooperation, collaboration and community spirit.

For this we need to make IEEE broader so that IEEE is more relevant to the work our members do regardless where they work.

We need more participation from volunteers globally in IEEE governance. A broader based IEEE will make the Institute more relevant to technologists and academics from all parts of the world.

I would like to see more **IEEE Senior Members** and **IEEE Fellows** from Regions **8, 9 & 10**

Prof. Saifur Rahman (s.rahman@ieee.org)



Past-President of IEEE Power & Energy Society
Past-Chair, IEEE Publication Services & Products Board

PES accomplishments:

- PES University
- PES Corporate Engagement Program
- PES Chapters' Councils in China, India, Africa and Latin America

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