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Speaker

Ranbir S Sedhey

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Source: Journal Citation Reports (Clarivate Analytics, 2023)

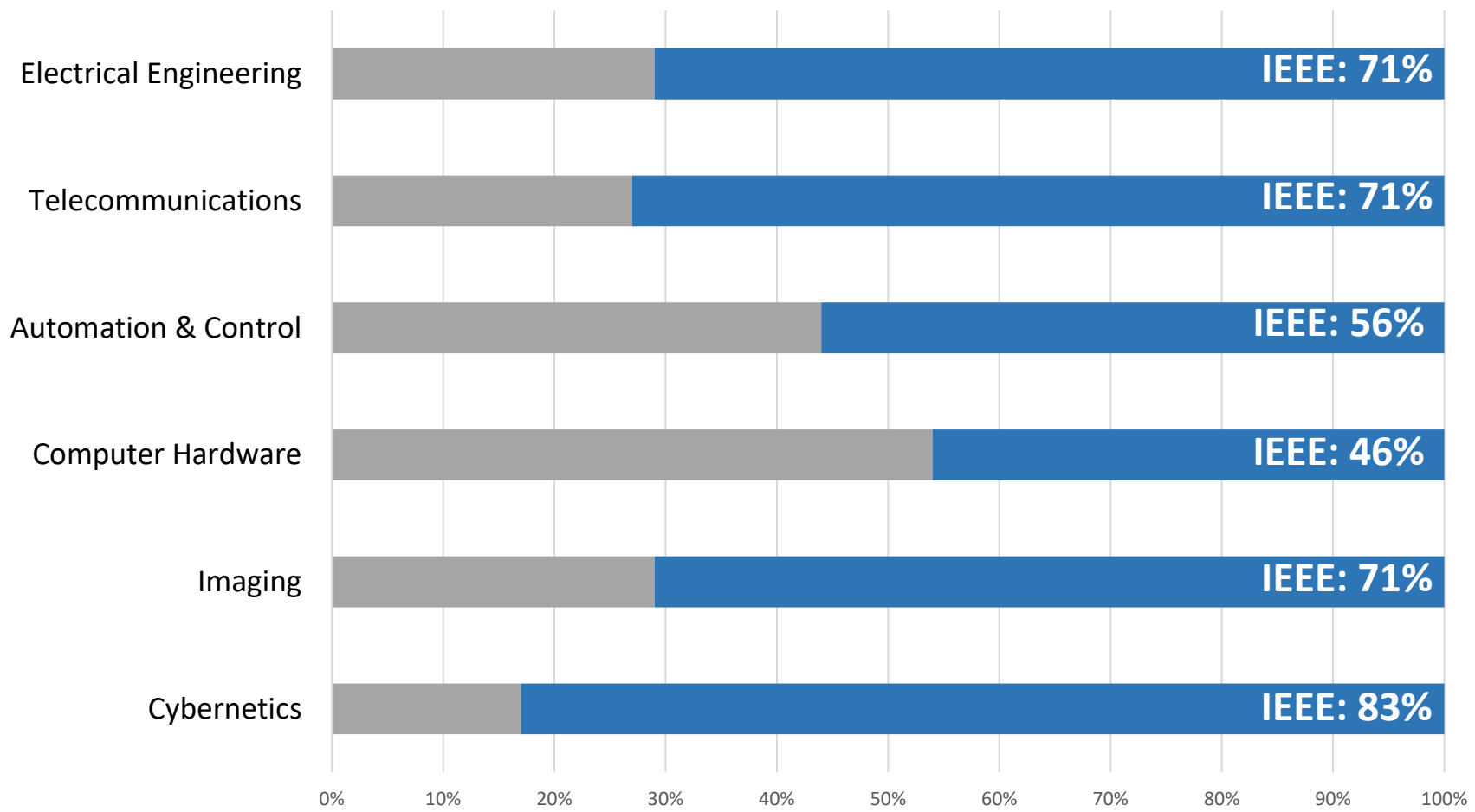
The Journal Citation Report presents quantifiable statistical data that provide a systematic, objective way to evaluate the world's leading journals.

The collage features several IEEE journal covers: **IEEE Transactions on Industrial Informatics** (September 2023, Volume 19, Number 9), **IEEE Transactions on Cybernetics**, **IEEE Communications Surveys & Tutorials** (First Quarter 2023, Volume 25, Number 1), and **IEEE Geoscience and Remote Sensing Magazine** (June 2023, Volume 11, Number 2). A circular logo for **Journal Citation Reports 2023** by Clarivate is positioned in the lower-left. On the right, a diagram titled **Smart and Secure EO Data Processing** illustrates a **Schematic diagram of Federated Learning**, showing a central server connected to multiple local models (Local Model 1 to Local Model N) and a central data processing hub.



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* Source: 2022 Journal Citation Reports from Clarivate based on quartile ranking for the Journal Impact Factor, released June 2023

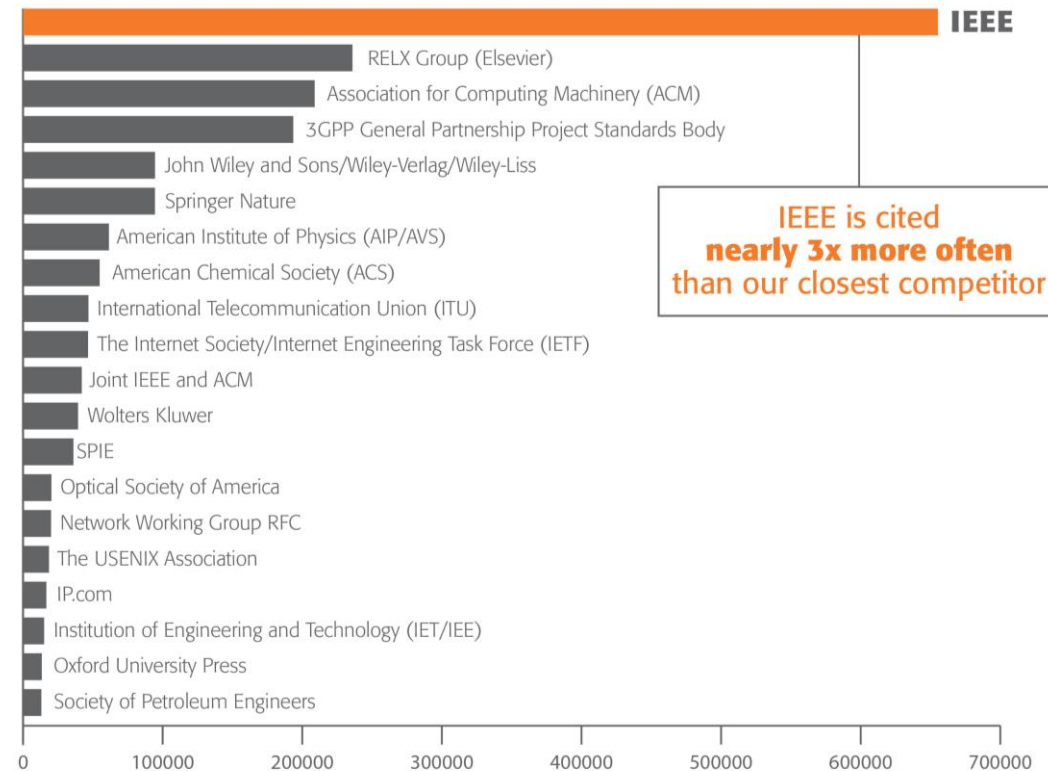


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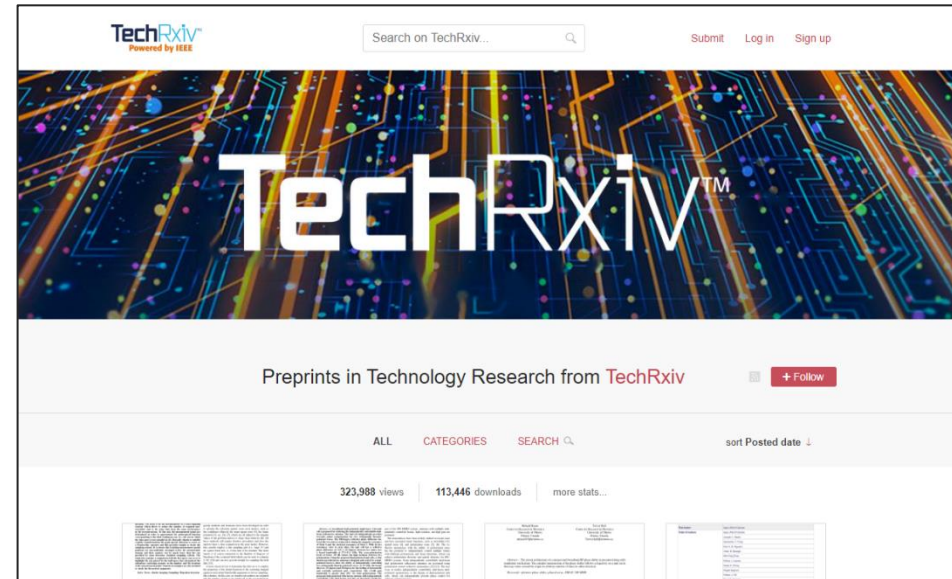
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IMAGE	8
TEXT + IMAGE	2
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IMAGE - 84	TEXT - 48

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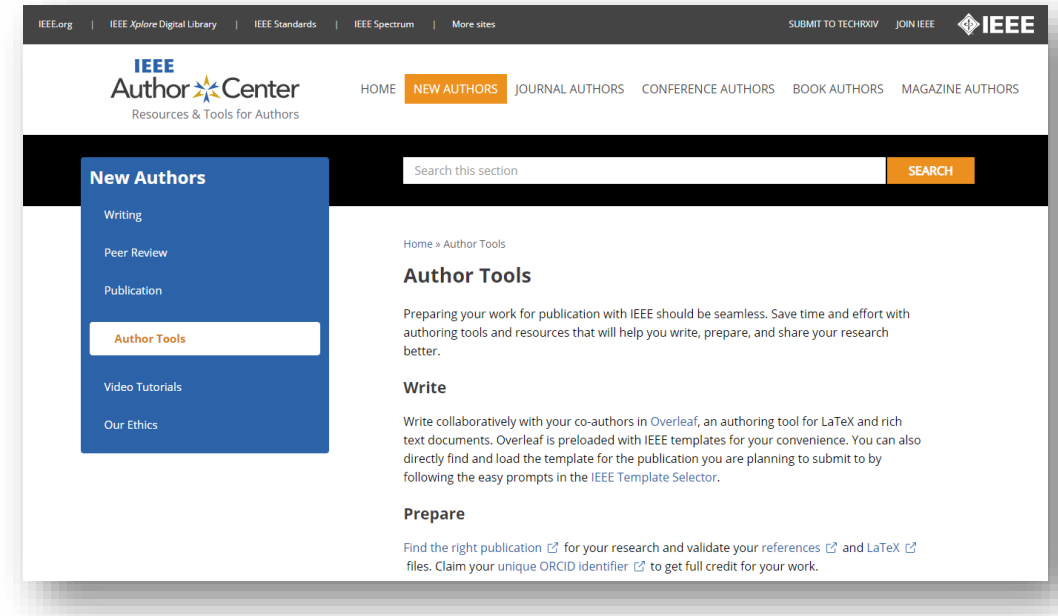
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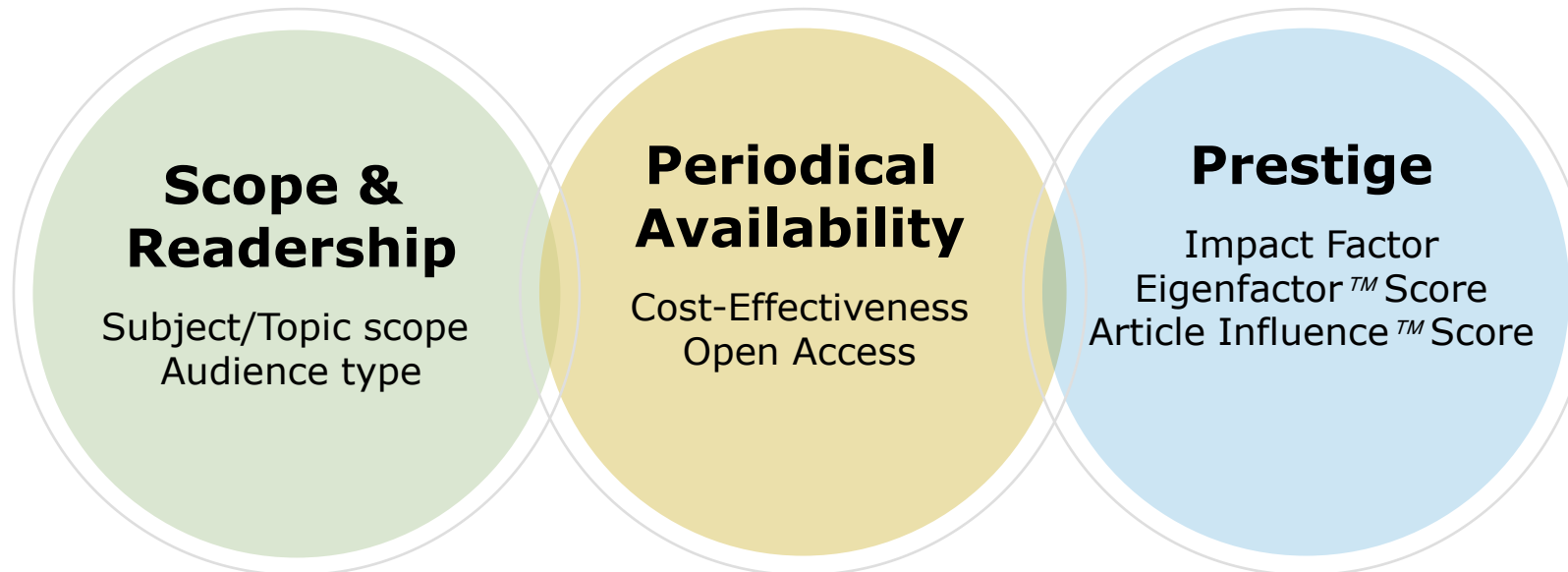
Final Steps

Main Steps to Consider When Writing a Technical Paper

Publishing Choices

Choices

Publish your research where it will have the most impact



Publish

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A **journal article** is a fully developed presentation of your work and its final findings

- Original research results presented
- Clear conclusions are made and supported by the data

A **conference article** can be written while research is ongoing

- Can present preliminary results or highlight recent work
- Gain informal feedback to use in your research
- Typically shorter than journal articles, with less detail and fewer references

Publish

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PRO

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CON

A high percentage of articles submitted to any professional publication are rejected

IEEE Conferences

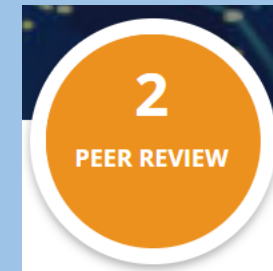
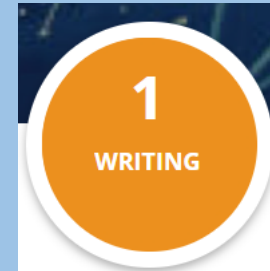
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The screenshot shows the IEEE Publication Recommender website. At the top, there is a navigation bar with links to IEEE.org, IEEE Xplore Digital Library, IEEE Author Center, IEEE-SA, IEEE Spectrum, and More Sites. The main heading is "IEEE Publication Recommender™" with the tagline "Find the best match for your scholarly article". Below this, there are two columns of bullet points: "Search 190+ periodicals and 1800+ conferences" and "Compare critical points such as Impact Factor and Submission-To-Publication Time" on the left; "Get all the key data about IEEE publications at a glance" and "Download the results of your search" on the right. The main content area is titled "Choose a search type and let Publication Recommender do the work!". It features three radio buttons for search types: "Both Periodicals and Conferences" (selected), "Periodicals only", and "Conferences only". There is a text input field for "Enter keywords, key phrases, or article title" and a dashed box for "Extract keywords from your article" with instructions to "Enter your abstract or drag your article file here (PDF, DOC, DOCX, TEX)" and an "ADD YOUR FILE" button. Below these is a "Narrow by date:" section with the text "I would like to publish before:" followed by a date picker and a "Get Recommendation" button. At the bottom of the main area, there is a section titled "Or, find details for a specific Periodical or Conference:" with a text input field "Enter the name of a periodical or conference". The footer contains links to IEEE.org, Contact & Support, Accessibility, Nondiscrimination Policy, Privacy & Opting Out of Cookies, and Feedback. It also includes the IEEE logo and the tagline "Advancing Technology for Humanity".

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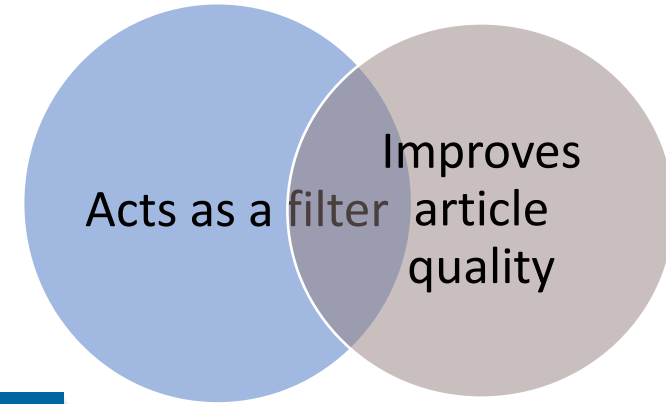
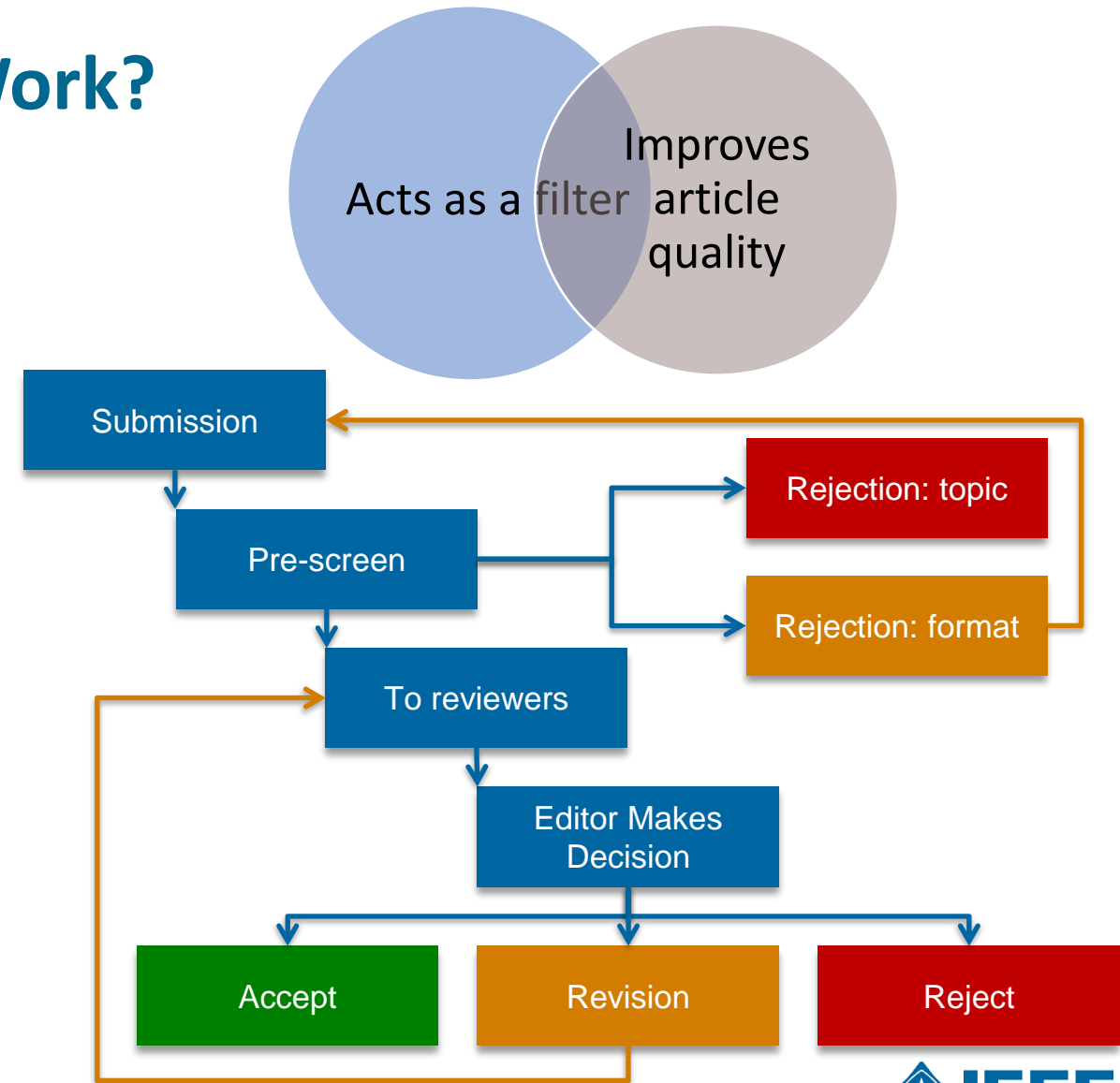
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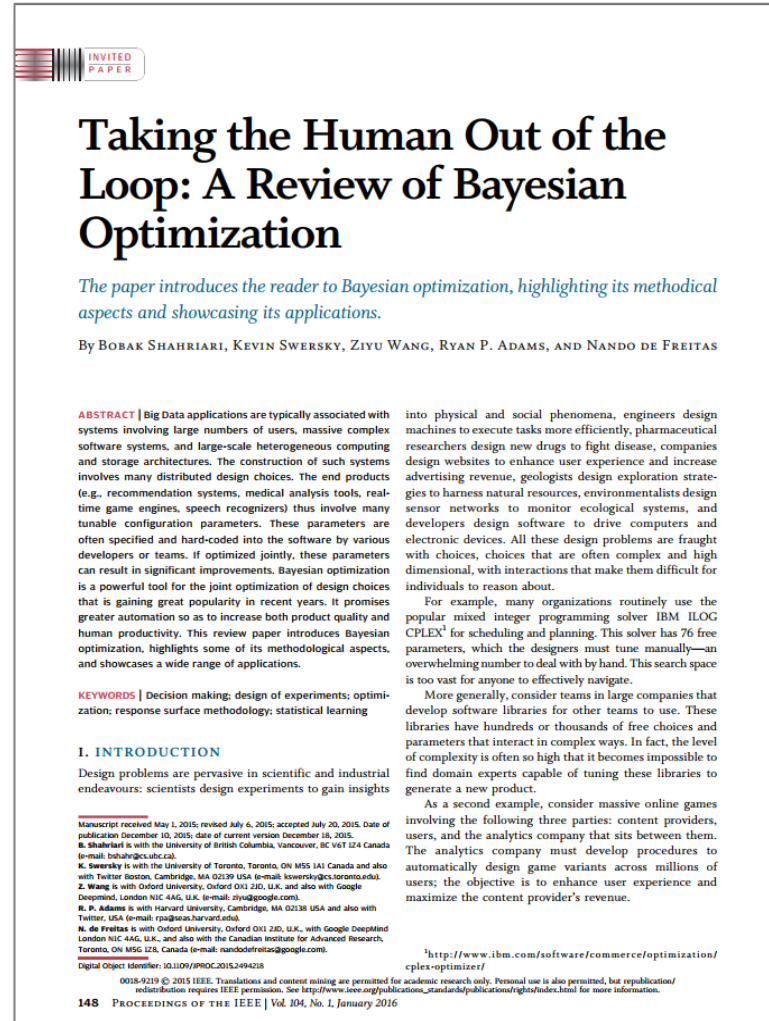


Paper Structure

Paper Structure

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- ▶ Abstract
- ▶ Introduction
- ▶ Approach
- ▶ Results
- ▶ Discussion
- ▶ Conclusions
- ▶ Acknowledgements
- ▶ References



INVITED PAPER

Taking the Human Out of the Loop: A Review of Bayesian Optimization

The paper introduces the reader to Bayesian optimization, highlighting its methodical aspects and showcasing its applications.

By BOBAK SHAHRIARI, KEVIN SWERSKY, ZIYU WANG, RYAN P. ADAMS, AND NANDO DE FREITAS

ABSTRACT | Big Data applications are typically associated with systems involving large numbers of users, massive complex software systems, and large-scale heterogeneous computing and storage architectures. The construction of such systems involves many distributed design choices. The end products (e.g., recommendation systems, medical analysis tools, real-time game engines, speech recognizers) thus involve many tunable configuration parameters. These parameters are often specified and hard-coded into the software by various developers or teams. If optimized jointly, these parameters can result in significant improvements. Bayesian optimization is a powerful tool for the joint optimization of design choices that is gaining great popularity in recent years. It promises greater automation so as to increase both product quality and human productivity. This review paper introduces Bayesian optimization, highlights some of its methodological aspects, and showcases a wide range of applications.

KEYWORDS | Decision making; design of experiments; optimization; response surface methodology; statistical learning

1. INTRODUCTION

Design problems are pervasive in scientific and industrial endeavours: scientists design experiments to gain insights into physical and social phenomena, engineers design machines to execute tasks more efficiently, pharmaceutical researchers design new drugs to fight disease, companies design websites to enhance user experience and increase advertising revenue, geologists design exploration strategies to harness natural resources, environmentalists design sensor networks to monitor ecological systems, and developers design software to drive computers and electronic devices. All these design problems are fraught with choices, choices that are often complex and high dimensional, with interactions that make them difficult for individuals to reason about.

For example, many organizations routinely use the popular mixed integer programming solver IBM ILOG CPLEX¹ for scheduling and planning. This solver has 76 free parameters, which the designers must tune manually—an overwhelming number to deal with by hand. This search space is too vast for anyone to effectively navigate.

More generally, consider teams in large companies that develop software libraries for other teams to use. These libraries have hundreds or thousands of free choices and parameters that interact in complex ways. In fact, the level of complexity is often so high that it becomes impossible to find domain experts capable of tuning these libraries to generate a new product.

As a second example, consider massive online games involving the following three parties: content providers, users, and the analytics company that sits between them. The analytics company must develop procedures to automatically design game variants across millions of users; the objective is to enhance user experience and maximize the content provider's revenue.

¹<http://www.ibm.com/software/commerce/optimization/cplex-optimizer/>

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Paper Structure

Title

An effective title should...

- Be specific, concise, and descriptive
- Answer the reader's question: *Is this article relevant to me?*
- Think about what you would search for if you were looking for articles related to your research. Be sure to incorporate those keywords into your title.
- Grab the reader's attention
- Describe the content of a paper using the fewest possible words
 - Use important keywords—put as much time into your keywords as your paper, as that is how it will usually be found
 - Avoid jargon

Good
Title

vs.

Bad
Title

Paper Structure

Title – Best Practices

✓ *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

- Concise summary of research conducted: results obtained and conclusions reached
- A “stand-alone” condensed version of the article
- 250 words or less
- Written in the past tense although general factual statements can be written in present tense
- Uses keywords and index terms

ABSTRACT | Big Data applications are typically systems involving large numbers of users, massive software systems, and large-scale heterogeneous computing and storage architectures. The construction of such systems involves many distributed design choices. The end products (recommendation systems, medical analysis tools, real-time engines, speech recognizers) thus involve many configuration parameters. These parameters are often specified and hard-coded into the software by various developers or teams. If optimized jointly, these parameters can result in significant improvements. Bayesian optimization is a powerful tool for the joint optimization of such parameters that is gaining great popularity in recent years. This review paper, which highlights some of its many applications, and showcases a wide range of applications.

What you did

Why you did it

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

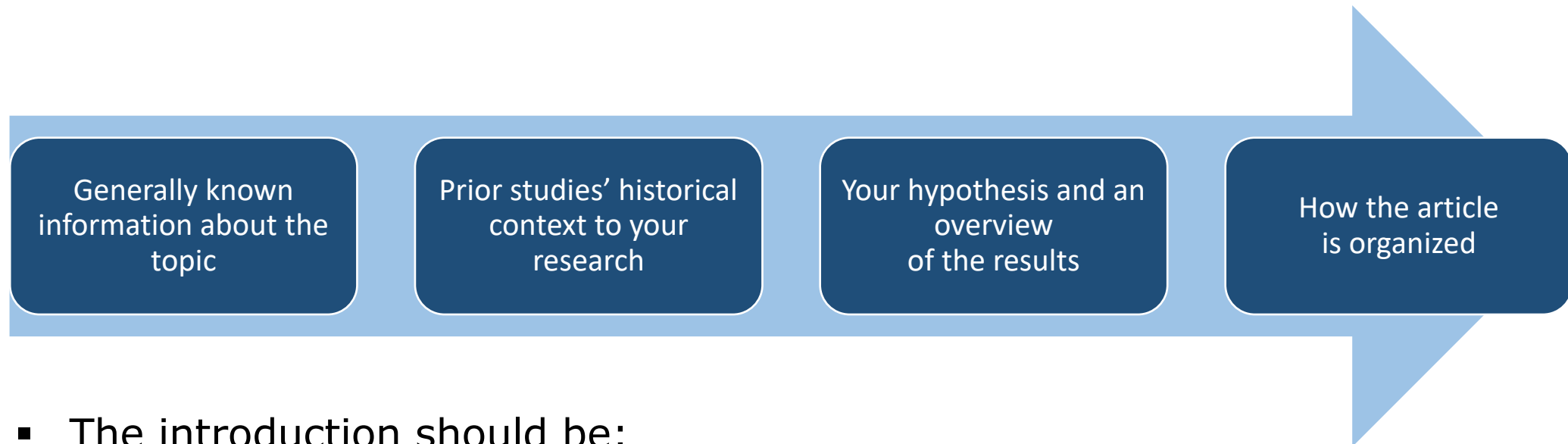
Why they're useful and important and move the field forward

B A A R C

Paper Structure

Introduction

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



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

S - N - S

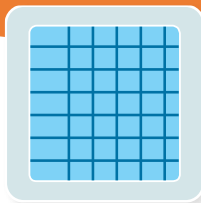
Paper Structure

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 used when exact values are important to show



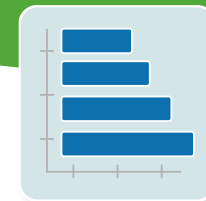
Figures

Quickly show ideas/conclusions that would require detailed explanations



Graphs

Show relationships between data points or trends in data



Paper Structure

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 and professionals

the SC algorithm over the whole range of w values increase to 3–4 K, except for the TIGR₁₊₂ database, with an RMSE of 2 K. This last result is explained by the w distribution, which is biased toward low values of w in this database. When only atmospheric profiles with w values lower than $3 \text{ g} \cdot \text{cm}^{-2}$ are selected, the SC algorithm provides RMSEs around 1.5 K, with almost equal values of bias and standard deviation, around 1 K in both cases (with a negative bias, that is, the SC underestimates the LST). In contrast, when only w values higher than $3 \text{ g} \cdot \text{cm}^{-2}$ are considered, the SC algorithm provides RMSEs higher than 5 K. In these cases, it is preferable to calculate the atmospheric functions of the SC algorithm directly from (3) rather than approximating them by a polynomial fit approach as given by (4).

V. DISCUSSION AND CONCLUSION

The two Landsat-8 TIR bands allow the intercomparison of two LST retrieval methods based on different physical assumptions, such as the SC (only one TIR band required) and SW algorithms (two TIR bands required). Direct inversion of the radiative transfer equation, which can be considered as a “ground-truth” algorithm, is assumed to be accurate enough. The SC algorithm is assumed to be accurate enough. The SC algorithm is a continuation of the previous SC algorithm developed for Landsat-4 and Landsat-5 TM sensors. The TM/ETM+ sensor on board the Landsat-7 platform (W), and it could be used to generate consistent LST products from the historical Landsat data using a single algorithm. An advantage of the SC algorithm is that, apart from surface emissivity, only water vapor content is required as input. However, it is expected that errors on LST become unacceptable for high water vapor contents (e.g., $> 3 \text{ g} \cdot \text{cm}^{-2}$). This problem can be partly solved by computing the atmospheric functions directly from τ , L_w , and L_s values (see [5]), or also by including air temperature as input [15]. A main advantage of the SW algorithm is that it performs well over global conditions and, thus, a wide range of water vapor values; and that it only requires water vapor as input (apart from surface emissivity at the two TIR bands). However, the SW algorithm can be only applied to the new Landsat-8 TIRS data, since previous TM/ETM sensors only had one TIR band.

The LST algorithms presented in this letter were tested with simulated data sets obtained for a variety of global atmospheric conditions and surface emissivities. The results showed RMSE values of typically less than 1.5 K, although for the SC algorithm, this accuracy is only achieved for w values below $3 \text{ g} \cdot \text{cm}^{-2}$. Algorithm testing also showed that the SW errors are lower than the SC errors for increasing water vapor, and vice versa, as demonstrated in the simulation study presented in Sobrino and Jiménezo-Muñoz [18]. Although an extensive validation exercise from *in situ* measurements is required to assess the performance of the two LST algorithms, the results obtained for the simulated data, the sensitivity analysis, as well as the previous findings for algorithms with the same mathematical structure give confidence in the algorithm accuracies estimated here.

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Results

Discussion

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, page number, and Digital Object Identifier (DOI)

Properly cited material

We then have

$$\begin{aligned} (P_t^{k+} + P_t^{k-})^2 &= (P_t^{k+} - P_t^{k-})^2 + 4P_t^{k+}P_t^{k-} \\ &< (P_t^{k+} - P_t^{k-})^2 + 4\hat{P}_t^{k+}\hat{P}_t^{k-} \\ &= (P_t^{k+} + \hat{P}_t^{k-})^2 \end{aligned} \quad (32)$$

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

$$c_{0/10}(P_t^{k+}, P_t^{k-}) < c_{0/10}(\hat{P}_t^{k+}, \hat{P}_t^{k-}). \quad (33)$$

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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