

ALGORITHM FOR OPTIMIZING THE PROCESS OF SELECTING A TOPIC FOR A SCIENTIFIC PUBLICATION WITH THE ASSISTANCE OF CHATGPT

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Abstract. This study presents the development of an algorithm designed to optimize the process of selecting a topic for a scientific publication with the assistance of ChatGPT. The algorithm integrates the analytical capacity of artificial intelligence with the expertise of researchers, providing a structured, adaptive and personalized approach to topic selection. The methodological approach includes key steps such as defining criteria, generating and refining topics, and applying SWOT analysis for comprehensive evaluation. The proposed algorithm is designed to support researchers and scientists through a structured approach to select topics that are aligned with their expertise, reflect current scientific trends and have high innovation potential. The study highlights the applicability of the algorithm in different scientific fields, focusing on its effectiveness, support for collaboration and its strategic relevance. Furthermore, the development highlights the importance of continuously implementing innovative approaches in academia to stimulate the achievement of meaningful scientific results and ensure high quality of future research.

Keywords: algorithm; ChatGPT; scientific publication; topic selection; publication title; AI integration

1. Introduction

In scientific practice, the selection of a research topic is among the most important and often challenging stages in the process of developing scientific publications. Despite the availability of an extensive scientific literature and plenty of studies in various fields, researchers often face difficulties in identifying innovative, relevant and practically significant topics (Jalongo 2023). These difficulties stem from several main factors:

- Limited time for in-depth analysis of existing literature;
- The uneven distribution of knowledge and trends in different scientific fields;
- Subjectivity and lack of structured methodology for topic selection.

There are numerous studies that examine the application of artificial intelligence (AI) to support scientific research (Golan et al 2023; Checco et al 2021; Xu et al 2021; Gohil 2024). For example, in the area of text processing and analysis, technologies such as BERT and SciBERT are used to extract key terms and classify scientific publications (Koroteev 2021; Starukhin & Diukarev 2024). GPT-based technologies find applications in information summarization, automatic text generation, and new idea generation. In addition, citation and keyword analysis algorithms support the identification of new research directions. Despite these successes, few studies focus specifically on an automated process for optimizing topic selection that combines analysis of existing literature and generation of new ideas (Misra 2021; Bowman & Kinnan 2018).

Currently, existing solutions to support topic selection rely mainly on:

- A manual literature review that is time-consuming and subjective;
- Use of platforms such as Scopus and Web of Science, which offer analysis of citations and research trends but do not provide automated topic suggestions;
- Large generative AI models that are used for text summarization and idea extraction but are not yet optimized for specific scientific applications.

There is a lack of a comprehensive, expert-driven algorithm to assist researchers in identifying relevant and timely research topics through automation.

Choosing an appropriate topic is crucial to the success of any research paper. A well-chosen topic not only increases the relevance and quality of the research, but also increases the likelihood of publication in prestigious journals.

ChatGPT represents an innovative generative AI model that has the potential to address these challenges (Stokel-Walker 2023; Stokel-Walker & Noorden 2023). As a tool capable of analyzing large amounts of information, summarizing data, and generating new ideas, ChatGPT can be integrated into an algorithm for automated topic selection assistance. This can be realized through ChatGPT's powerful analytical capacity, its ability to generate innovative and relevant suggestions, and its ability to be combined with expert knowledge.

The goal of this work is to create a ChatGPT-based algorithm to assist in the optimization of topic selection for scientific publication. In this regard, was initially implemented interactively between ChatGPT and an expert author with experience in developing and publishing scientific articles. The main goal of the interaction is to combine the author's expertise with ChatGPT's capabilities to support the selection of a relevant and significant topic for a scientific publication from pre-suggested options. Based on this process, an algorithm has been developed that combines the structured approach of the expert author with the analytical capacity of ChatGPT. Finally, the algorithm is evaluated by considering its advantages, benefits and potential limitations, as well as its potential for practical application in the scientific community.

2. Initiate interaction between ChatGPT and author-expert

The process of interacting with ChatGPT is initiated by an expert author with a proven track record of developing and publishing scientific publications. The primary goal of this dialogue is to integrate expertise with the analytical capabilities of ChatGPT to assist in the selection of a relevant and significant topic for scientific publication based on previously proposed options.

The interaction starts with providing information including the proposed topics as well as the profile of the author team. This information covers the team's research interests, key achievements and areas of expertise. To provide additional context and better tailor the algorithm to specific requirements, links are provided to:

- List of publications of the author team members in the respective scientific field;
- Current topics and trends in the research field.

This information assists ChatGPT in identifying relevant and innovative proposals that fit the profile of the author team's and the relevance of the scientific field:

Author: >> Hi, I am planning to prepare a scientific publication related to the application of artificial intelligence in scientific research. I am considering the following potential topics:

- *Creating a model for analyzing scientific publications using ChatGPT.*
- *Creating a model for generating ideas for scientific publications using generative AI.*
- *A model for automated task allocation in scientific teams using artificial intelligence.*
- *Development of a tool to assess innovation in research using AI.*
- *An algorithm for writing a scientific publication using ChatGPT.*
- *An expert algorithm for optimizing the process of selecting a topic for a scientific publication using ChatGPT.*

Author: >> The author team consists of one scientist for whom I provide information on his publications and research interests: – Aldeniz Rashidov – <https://bit.ly/rashidov>

Author: >> Can you analyze the information provided and recommend me one or two of the topics mentioned that:

- are most relevant in a scientific context.
- best match the expertise and research interests of the author team.
- have the potential for practical application by offering solutions to real problems or improvements to existing processes.
- enable collaboration with other researchers working in the field.
- They take into account the results of previous studies and build on them.

ChatGPT analyzes the information provided, including the author's scientific publications, research interests, and expertise, to suggest the most appropriate topics for scientific publication. This approach provides recommendations that combine scientific relevance, practical application and the potential for strategic development of the proposed topics.

Next, ChatGPT generates proposals:

ChatGPT: >> Thanks for the information and the link to Aldeniz Rashidov's profile. After analyzing the author's scientific publications and research interests, as well as the criteria you have set, I suggest the following two topics as most appropriate:

1. Creating a model for analyzing scientific publications using ChatGPT: This topic is extremely relevant in the scientific context, especially in view of the growing volume of scientific data and the need for automated approaches to their processing. The topic is fully compatible with the author's expertise in intelligent systems and databases. It has significant potential for practical application in academic institutions and research libraries, where publication analysis can improve the efficiency of scientific work. In addition, this topic allows collaboration with researchers working in natural language processing (NLP) and information systems.

2. Development of a tool to assess innovation in research using AI: This topic is also highly relevant, offering a way to systematically assess innovation in scientific publications. It is compatible with the author's experience in designing algorithms and systems for scientific data management. Practical applications of the topic include the creation of a tool that can be used to evaluate scientific contributions and innovation in various fields. Furthermore, the topic opens up opportunities for collaboration with experts in the field of scientific impact measurement and scientific methodology.

ChatGPT: >> These topics have been selected based on their relevance, compatibility with the author's scientific expertise, their potential for practical application, and the possibility of attracting collaboration with other researchers. They also build on existing research by integrating innovative automation and evaluation approaches into the scientific context.

In the next stage of the interaction, the author introduces an additional condition in order to narrow down the choice of proposed topics for the scientific publication. This new requirement focuses on the need for the topic to both be among the most relevant in the scientific context and to address aspects or issues that have been understudied to date. By adding this requirement, the author seeks to focus the dialogue with ChatGPT on topics that are not only consistent with current scientific interests and expertise,

but also address unexplored areas with the potential for significant scientific contributions:

Author: >> Thanks for the recommendations. I have one additional condition I would like you to consider:

The topic should both be among the most relevant in the scientific context and address aspects or issues that have been under-researched.

Author: >> Please analyze your two proposed topics with respect to this condition and recommend me which one best meets it.

Author: >> You can use Google Scholar or other academic databases to assess the range of research done on each topic!

ChatGPT analyzed the two proposed topics using academic databases to assess the scope of existing studies. Based on the relevance and extent of research, it recommends the second topic as the most appropriate, as it offers an innovative approach to an under-researched problem and meets all the criteria set:

ChatGPT: >> Given the additional condition, I will analyze the two proposed topics:

1. Creating a model for analyzing scientific publications using ChatGPT

Relevance: The use of artificial intelligence, and in particular of models such as ChatGPT for text analysis, is a highly topical issue. This includes applications such as article summarization, document classification and information extraction.

Extent of research: The specific use of ChatGPT for the analysis of scientific publications is a relatively new and under-researched area. Most existing research has focused on more general NLP tasks rather than its application to the scientific literature.

2. Development of a tool to assess innovation in research using AI

Relevance: the evaluation of innovation using artificial intelligence is an important topic, especially in relation to the measurement of scientific progress and impact.

Extent of research: there are studies and tools that use AI to evaluate innovation by analyzing citations, patents, and scientific trends. While there is room for additional research, the topic is better researched compared to the former.

ChatGPT: >> After reviewing the two suggested topics and using Google Scholar and other academic databases, I can provide the following recommendation: Based on the last condition, I recommend focusing on “*Creating a model for analyzing scientific publications using ChatGPT*”. This topic is both topical and addresses an underexplored aspect – the application of ChatGPT in the analysis of scientific texts. This provides you with an opportunity to contribute original research in a new and promising area.

To make a more accurate and well-founded decision, the author conducts a SWOT analysis of the two proposed topics using ChatGPT. This step is a concrete action where the internal and external factors influencing the potential of each topic are evaluated. By combining expert knowledge with the analytical capabilities of ChatGPT, the author aims to identify the key benefits and challenges associated with each option. This will support the selection of the most appropriate topic for the research publication based on a thorough and structured analysis (Teece 2018; Leigh 2009; Rashidova 2023):

ChatGPT: >> SWOT analysis of the topic “*Creating a model for analyzing scientific publications using ChatGPT*”

Strengths:

- Relevance and innovation. A novel application of ChatGPT in the analysis of scientific texts.
- Responds to the author’s skills in intelligent systems and NLP.
- Facilitates researchers in handling large volumes of literature.
- The model can be applied in different scientific fields.

Weaknesses:

- Complexity in handling specialized terminology.
- Need for qualitative data for an effective model.
- Possibility of generating inaccuracies without proper controls.
- Need to continuously update the model with new data to maintain performance.

Opportunities:

- Opportunity for partnerships with publishers and libraries.
- Adding features such as generating scientific trends or identifying deficiencies.
- Adding additional analytics and tools.
- Applications in education and other fields.

Threats:

- Other researchers can work on similar projects.
- Ethical issues related to copyright and use of published material.
- Risk of rapid technology obsolescence.

ChatGPT: >> SWOT analysis of the topic “*Development of a tool to assess innovation in research using AI*”:

Strengths:

- Significance in assessing scientific contribution and innovation.
- Useful for funders and research institutions.
- Provides objective criteria for evaluating innovation in research publications.

- Creates a unified approach to innovation assessment.

Weaknesses:

- Subjectivity and assessment complexity.
- It is difficult to develop universal criteria for innovativeness.
- May require additional expertise.
- Researchers and authors can try to optimize their designs against the algorithm rather than the actual innovation.

Opportunities:

- Influencing science policy.
- Potential for commercialization.
- Applications outside academia, e.g. in industry.
- Can improve the transparency and efficiency of the scientific funding process.

Threats:

- Not accepting automated assessments.
- Ethical and legal challenges related to the use of data and algorithms.
- Possible barriers from policies and standards.
- AI may not be able to capture the nuances of human creativity and innovation.

ChatGPT concludes on the SWOT analysis conducted and further explores the selected topic in depth:

ChatGPT: >> The first topic “*Creating a model for analyzing scientific publications using ChatGPT*” is more suitable as it is more innovative, more closely related to the expertise of the author and offers significant opportunities for original scientific contributions.

Opportunities are being explored to enhance the quality of the publication by integrating AI models such as ChatGPT, GPT-4, BERT and SciBERT, adapted to the specific requirements of the chosen topic:

Author: >> Can you analyze the possibilities to improve the quality of the publication on the proposed topic by using AI models like ChatGPT, GPT-4, BERT and SciBERT?

ChatGPT: >> The integration of AI models such as ChatGPT, GPT-4, BERT and SciBERT provides significant opportunities to automate key aspects of the scientific publication development process. AI models can optimize efficiency by automating analyses, generating summaries, and structuring texts, which speeds development and improves accuracy. All of these can significantly improve the quality and efficiency of a publication when implemented with the right strategy and scientific oversight.

3. Algorithm for optimizing the process of selecting a topic for a scientific publication with the assistance of ChatGPT

The goal of this algorithm is to assist authors in choosing a current and relevant topic for a scientific publication, using the analytical and generative capabilities of ChatGPT. The development of the algorithm is the result of an interactive dialogue between an author-expert and ChatGPT, in which author-proposed options for scientific topics are evaluated and analyzed. The initial version of the algorithm was generated by ChatGPT based on a question posed by the author-expert specifying the key requirements, *“Create an algorithm for selecting a topic for a scientific publication based on our previous dialogue. Let the algorithm be useful for scientists, authors and researchers as a tool to optimize the topic selection process for their scientific publications.”*.

After the initial generation, the algorithm was further developed and optimized through the active participation of the expert author. The additional steps added to the process increase its efficiency by focusing on factors such as relevance, consistency with the author’s expertise, and potential for innovative scientific contributions. The algorithm follows a strictly defined structure consisting of sequential steps, each aimed at extracting relevant information and supporting informed decision making. A block-diagram of the algorithm is presented in Fig. 1, illustrating the main steps and their relationship. This development offers a standardized and adaptable approach that greatly facilitates the process of selecting a topic for a scientific publication. The algorithm is versatile and can be customized to the needs of different scientific fields and research objectives.

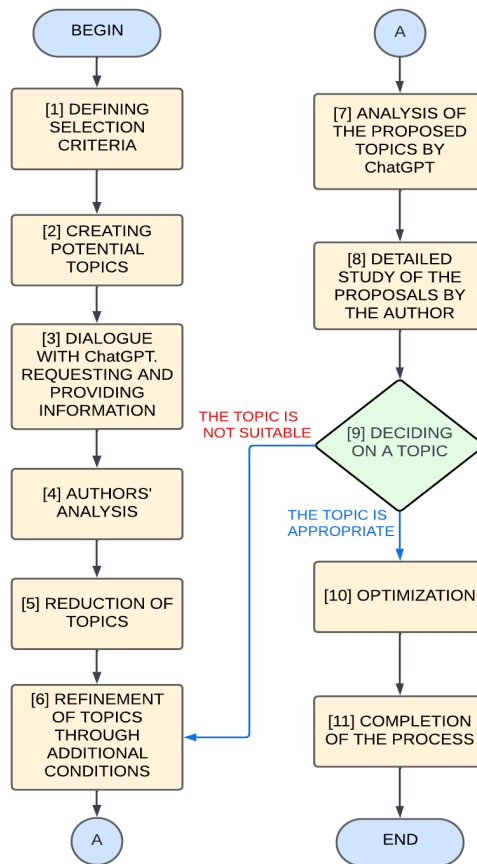


Figure 1. Block diagram of an algorithm for selecting a topic for a scientific publication

A. Main stages of the algorithm

1) Defining the selection criteria (by the author):

The author defines the main criteria that the topic should fulfil:

- Scientific relevance and significance;
- Relevance to the expertise and research interests of the author(s);
- Potential for scientific contribution and practical application;
- Under-researched aspects and opportunities for innovation.

2) *Creating potential topics (by the author):*

The author compiled an initial list of potential topics based on:

- Previous research and publications;
- Analysis of current trends in the scientific literature;
- Personal research goals and interests.

3) *Interaction with ChatGPT. Request and provide information:*

The author provides ChatGPT with a list of potential topics, their author profile(s), and relevant information about research interests and expertise.

- Formulating a clear request to ChatGPT, in line with the criteria set, e.g. “Please evaluate the proposed topics against the criteria of topicality, relevance and potential for scientific contribution.”.

4) *Analysis of the authors, information and evaluation of topics:*

- ChatGPT analyses the information provided and each proposed topic against the set criteria;
- Assess the compatibility of the topics with the author’s profile, the set criteria, their timeliness and relevance to existing research. ChatGPT excludes those that do not meet the requirements.

5) *Reducing topics:*

- ChatGPT reduces the list of topics by excluding those that do not meet the specified criteria;
- The remaining themes are ranked according to their relevance to the criteria and opportunities for input.

6) *Improvement through additional conditions:*

- The author adds new criteria to get a result that best matches his preferences;
- ChatGPT shall present reasoned proposals, subject to additional conditions. ChatGPT updates the assessment based on these new conditions.

7) *Analysis of the proposals from ChatGPT:*

- ChatGPT provides a reasoned analysis of the advantages and disadvantages of each topic against the set criteria. The analysis focuses on the topicality, scientific potential and relevance of the topics.

8) *A detailed study of the proposals by the author:*

The author conducts thorough research of his own on the reduced list of topics, including:

- Previous research and publications;
- Analysis of current trends in the scientific literature;
- Personal research goals and interests.

9) *Deciding on a topic:*

- The author selects the most appropriate topic based on the analysis and research. The decision is supported by data and reasoning from the previous stages. If the chosen topic is not fully satisfactory, the process can be repeated from stage six.

10) Optimization and additional consultations:

- At this stage, actions aimed at improving the quality and originality of the chosen topic are carried out;
- A major focus is the exploration of opportunities for the integration of AI models such as ChatGPT, GPT-4, BERT and SciBERT to be adapted to the specific requirements of the chosen topic;
- In addition, the author performs a refinement of key aspects of the publication, focusing on the clarity, relevance and feasibility of future application of the development.

11) Completion of the process:

- The process ends with the validation of the topic.

B. Advantages of the algorithm

The developed algorithm offers the following advantages:

- *Efficiency and time saving:* the algorithm significantly increases the efficiency of the process by automating the analysis of the scientific literature and suggesting relevant topics in a short time. This allows the author to focus on key aspects of the research, such as methodology and publication structure;
- *Objectivity and reasoned choice:* the algorithm provides reasoned decisions by using clearly defined criteria to evaluate the proposed topics. This eliminates subjectivity and ensures that the selected topic is scientifically significant and relevant;
- *Personalization and compatibility with the author's expertise:* by analyzing the author's profile, interests and publications, the algorithm suggests topics that are compatible with the author's expertise. This ensures a high degree of personalization and facilitates the development of the publication;
- *Integration of innovative AI technologies:* using advanced AI models provides in-depth analysis of current scientific trends. These technologies identify under-researched aspects and stimulate innovation in scientific activity;
- *A structured and standardized approach:* the algorithm follows clearly structured steps, making it easy to systematically go through the process of topic selection. This approach ensures consistency and reliability while allowing adaptation to different scientific fields;
- *SWOT analysis of the proposals:* the algorithm includes a strategic analysis of the strengths and weaknesses of each proposed topic, as well as the opportunities and risks associated with them. This enables the author to assess the potential of each topic and select the most appropriate one;
- *Intelligent approach:* the algorithm uses an intelligent approach through the integration of advanced analytical tools and technologies. This ensures objectivity, speed and innovation in the decision-making process that are tailored to the specifics of the study;

– *Potential for future research and collaboration*: the selected themes are aimed at long-term development and offer opportunities for collaboration with other researchers. The algorithm helps to identify under-researched aspects that could lead to significant discoveries;

– *Improving publication quality*: the algorithm offers opportunities for optimization of the selected topic through the integration of AI models to improve originality and structural clarity. This ensures that the development is not only scientifically relevant but also practically applicable;

– *Flexibility and adaptability*: the algorithm allows for the dynamic addition of new criteria or changes in conditions, making it suitable for a variety of scientific fields. This provides a high degree of flexibility and adaptation to the individual needs of the authors.

It can be concluded that the advantages presented establish the algorithm as an effective tool that combines automation, objectivity and personalization. Through the integration of advanced AI technologies and structured methods, it successfully supports the selection of relevant and important topics, fostering innovation and collaboration. Its versatility and adaptability make it applicable across scientific domains, ensuring high quality and strategic contributions to scientific developments.

4. SWOT analysis of the proposed algorithm

Figure 2 shows the basic structure of the SWOT analysis for the proposed algorithm for selecting a topic for a scientific publication.

Positive	Negative sides
Strengths	Weaknesses
Opportunities	Threats

Figure 2. Basic matrix for SWOT analysis of the algorithm

Based on this structure, a detailed matrix was created to organize the features of the algorithm into four key categories (Teece 2018; Leigh 2009). Strengths and opportunities are considered as positive impact factors that support the effectiveness and feasibility of the algorithm. At the same time, weaknesses and threats are identified as aspects that require attention and optimization to minimize their negative impact on the performance of the algorithm. Tables 1 shows a SWOT matrix of the algorithm.

Table 1. SWOT matrix of the proposed algorithm.

Strengths	Weaknesses
<i>Technological capability</i> – The algorithm uses advanced AI technologies to analyse the proposed topics in depth. Its potential flexibility allows for the integration of other AI models as needed, expanding its analytical capacity.	<i>Dependency</i> – The quality of the results is directly dependent on the accuracy and completeness of the information provided by the author.
<i>Objectivity</i> - Ensures objectivity by using clearly articulated evaluation criteria, minimizing the subjectivity of the process.	<i>Relevance</i> – The models used by the algorithm may have limited knowledge of the latest research if they are not updated with recent scientific publications.
<i>Efficiency</i> - Increases efficiency and saves significant time by automating the analytical process and reducing the list of topics.	<i>Textual guidance</i> - The algorithm relies on textual information, which may limit its effectiveness for complex or interdisciplinary topics.
<i>Personalization</i> – Allows for a customized assessment that considers the author’s specific expertise, interests, and goal.	
<i>Structuredness</i> – Presents a structured approach that facilitates the systematic selection of a topic for publication.	
Opportunities	Threats
<i>Extending</i> – Extending the algorithm by integrating additional AI models specialized in scientific text processing, such as BERT or SciBERT, which can enrich the analysis of topics and the identification of understudied aspects.	<i>Irrelevance</i> – Potential limitations in the relevance of the AI models used if they are not updated regularly.
<i>Identification</i> – Developing functions to analyze scientific trends in depth and identify new directions in the chosen field.	<i>Dependency</i> – Technological dependency can lead to over-reliance on the algorithm, limiting the author’s critical thinking.
<i>Platforms</i> – Ability to incorporate the algorithm into specialized scientific platforms to support individual authors.	<i>Competition</i> – Competition from other AI tools that offer similar topic selection functionality.
<i>Contextual validity</i> – Improving analysis capabilities by integrating additional criteria, such as the geographical and social context of the chosen topic.	<i>Ethics</i> – Ethical challenges related to the use of personal data and analysis of protected information, which may limit access to relevant sources.

The SWOT analysis performed on the algorithm highlights its significant advantages, including efficiency, objectivity, and the ability to personalize through the integration of advanced AI technologies. At the same time, the analysis points to areas that require attention, such as the dependence on the quality of the input information and the need to update the models used. Development opportunities, such as extension with additional AI technologies and adaptation to new criteria, provide perspectives for improving the algorithm. Threats related to competition, technological dependence and potential ethical risks highlight the importance of strategic management, adaptation and compliance with ethical standards (Henz 2021). This analysis not only outlines the current state of the algorithm but also provides guidance for its improvement and successful application in scientific practice.

5. Conclusion

The research conducted highlights the importance and effectiveness of the ChatGPT-assisted topic selection algorithm for scientific publication. The algorithm combines the analytical capabilities of Artificial Intelligence and expert knowledge, providing a structured and personalized approach to identify timely and relevant topics for scientific publications. The integration of SWOT analysis further supports the assessment of strengths and weaknesses as well as the identification of opportunities and risks associated with topic selection.

The algorithm demonstrates the potential to optimize the scientific process through rationalization, objectivity, and adaptability. It not only facilitates the selection of topics, but also encourages a deeper engagement with innovation and supports collaboration across scientific fields. Opportunities for further development and integration, including adaptation to new AI models and expansion of analysis criteria, underline its sustainability and broad application.

A major drawback of the algorithm is the dependence on the quality of the input data provided by the author, which can affect the accuracy of the analysis and suggestions. Furthermore, the AI models used may not reflect the latest scientific trends if they are not regularly updated.

The results of the study demonstrate the need for continued refinement of the algorithm to ensure its relevance and effectiveness in a rapidly evolving scientific environment. Such algorithms represent a strategic tool for accelerating scientific discovery, improving the quality of publications and fostering innovation in academia.

Future developments foresee extending the algorithm by integrating new AI technologies, such as BERT and SciBERT, to improve analysis and identify underexplored aspects. These additional developments will ensure the sustainability and efficiency of the algorithm, making it an even more useful tool for the scientific community and stimulating innovation in the research process.

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