

Chapter 3

Introduction of a manuscript with generative AI

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Abstract: This chapter examines the funnel strategy as a structured approach to scientific writing and its integration with AI tools like ChatGPT. The funnel strategy progresses from broad context to specific research questions, guiding the organization of academic texts. By utilizing ChatGPT, writers can enhance their skills through tools such as real-time feedback and template generation. Practical techniques and examples are provided to illustrate how the funnel strategy, combined with AI, improves clarity and efficiency. This chapter is particularly useful for early-career researchers.

A widely accepted convention among researchers is that the first section of any scientific paper or monograph is the *Introduction*. The introduction serves to set the tone and context for the entire work. An effective introduction is particularly significant, as it not only frames the study but also provides a review of relevant literature and educates readers about the research area.

However, crafting a compelling introduction can be a daunting task, especially for students who are new to academic discourse. In this chapter, we will examine some of the common challenges that students encounter while writing an introduction. We will also offer practical guidance on overcoming these obstacles with the support of tools like ChatGPT.

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1 What to consider before writing an introduction

Our experience has led us to believe that an effective introduction contains certain elements, which are discussed next.

1.1 Review of literature

scientific writers acknowledge the contributions of other authors to the research area. By reviewing relevant studies and results, writers address three equally important points. First, they establish the relevance of their research area. Second, they demonstrate their understanding of the current state of knowledge. Third, they present their perspectives and opinions on the work of other researchers.

1.2 Show the gap and fill it

While reviewing the literature, writers refine their reasoning to focus on a single idea that remains unexplored. This idea represents the gap in the existing body of knowledge—the novel finding that the scientist seeks to address. In other words, the introduction section serves as the platform where writers announce their discoveries, describe their contributions, and explain how their findings benefit both their peers and society. In essence, the introduction highlights the gap and articulates how the authors have filled it.

1.3 Be generous in ink

You should allocate a specific space in the text to state clearly your main contribution. This space should be crafted as a detailed and engaging paragraph that communicates your motivation, purpose, goals, research questions, hypothesis, and the methodologies or actions undertaken to support the paper's main findings. Be generous in ink. Aim to be both comprehensive and precise. Make sure the significance of your work is fully understood.

Begin this section with a statement such as “*The main contribution of this paper is...*”. Use this space to explicitly demonstrate how your research addresses the identified gap in the literature and its relevance to the broader academic or practical context.

1.4 Acknowledge the paper's limitations

Every research endeavor has its limitations. Therefore, it is essential to adopt a humble approach and explicitly state the limitations of your paper. Transparency is key—avoid hiding any relevant information.

By acknowledging the constraints of your research, you strengthen your credibility and increase the likelihood of reviewers focusing on the paper's strengths rather than its weaknesses. This approach demonstrates integrity and honesty, qualities highly valued among researchers and reviewers.

These four elements are integral to crafting a compelling introduction. However, writers often face challenges in combining these components effectively. In the following sections, we address some of the common difficulties that writers deal with and provide practical solutions, including specific prompts for ChatGPT, to help overcome these obstacles.

2 Collect your background material

Finding research material to establish the background for your study is often a laborious task. While many books and papers have easy access to content online, not all of them are available for free. For instance, publishers frequently impose paywalls on scientific literature, limiting access to scientific content.

Downloading digital books can present their own challenges. While numerous university libraries provide printed and digital resources, visiting the library can often be unnecessary when the desired title is accessible through free platforms such as the *Internet Archive*. This open-access repository hosts millions of digitized books, offering an invaluable resource for researchers. Its comprehensive collection is available at www.archive.org.

Given that the majority of research findings are now disseminated digitally, researchers can locate them through free online tools such as *Google Scholar* (scholar.google.com), *Semantic Scholar* (semanticscholar.org), and *PubMed* (pubmed.ncbi.nlm.nih.gov), among others [31, 67]. These platforms enable users to perform keyword searches on topics of interest within the academic literature. Almost instantly, they generate a comprehensive list of relevant publications, frequently including direct links to the websites of academic journals. However, access to many of these journals remains restricted by paywall systems, blocking access [96].

A study has reported that scientists unable to access academic papers due to paywall restrictions—particularly those based in low- and middle-income countries such as India, Iran, Indonesia, Vietnam, Egypt, Brazil, and Mexico—often resort to downloading papers through pirate, illegal repositories [20]. Interestingly, even researchers with privileged access to legal resources are increasingly turning to these illegal repositories for obtaining papers [43].

Research indicates that the availability of papers in illegal repositories can significantly boost their citation scores, with one study reporting an increase of approximately 70% [31]. This phenomenon may incentivize authors to upload their own work to such repositories in an effort to enhance their citation indices; however, free and legal repositories, such as arxiv.org and biorxiv.org, also accept preprint drafts of papers and demonstrate a comparable citation-boosting effect [45, 97]. The advantages of these legal repositories are particularly evident in mathematics, where approximately 80% of preprints deposited on arxiv.org are ultimately published in academic journals [173, Sec. 4.1].

Researchers have shown a growing interest in the recent trend of uploading non-peer-reviewed papers to preprint repositories, such as arxiv.org and biorxiv.org; see [81] for an in-depth discussion on the role of free repositories. A clear advantage of these repositories is that they provide free access, thus helping disseminate scientific content. However, when citing a paper from such repositories, we need to check whether the paper has been subsequently published in a reputable journal. Be careful: only cite a paper if it has been validated through publication in a reputable journal.

Citing papers that went through a peer-review process and then became published in reputable journals constitutes the core of the scientific method [156]. For this reason, experienced researchers strongly advise against citing works that have not been subjected to the scrutiny of traditional peer review [81, p. 86].

Editors appreciate citations to papers published in the journals they are serving. When a manuscript references articles from the same journal, it signals to Editors that the research aligns with the journal's scope. Citations increase the journal's citation scores, and Editors appreciate that.

Before presenting your research findings, you must first dive into what other researchers have done. This process involves an in-depth study of their publications, which requires identifying and extracting essential information while disregarding less relevant details. This task demands time and effort. Separate a bunch of time to work on this. Be prepared.

2.1 Stuck with an idea? Ask Bing-ChatGPT to help you

If you find yourself struggling to advance a research idea, Bing-ChatGPT can prove to be an invaluable resource. For instance, it can assist in identifying the most relevant publications related to your topic. However, it is essential to exercise caution, as the responsibility for mastering the research and understanding its implications ultimately relies upon you. Bing-ChatGPT is designed to support and complement your research, not to replace it. Therefore, maintaining a balanced approach and avoiding over-reliance on this tool is crucial.

Caution. *Trusting Bing-ChatGPT to do the whole work for you is a huge mistake.*

For example, suppose we want to find background material for a study on ‘*application of fractals in medicine*.’ Given that Bing-ChatGPT is connected to various databases and sources (e.g., PubMed, BASE, ScienceDirect), one could request the most relevant references available on this specific topic. An illustrative example of such a query is presented in Answer 3.1. Bing-ChatGPT’s response is quite impressive: it provides a list of publications, together with a summary of each, organized around the main research idea.

3 Literature review: how to present it

How to present what others have done is perhaps one of the most important challenges scientific writers face. A writer must give credit to those who have paved the way for that scientific knowledge, and the way we acknowledge what others have done is through citing their works in the *literature review*.

Some students underestimate the significance of the literature review. They may argue that readers are already familiar with the foundational aspects of the research topic, thinking a *review is unnecessary*. Thus, some researchers bypass the basic knowledge and delve directly into the specifics of their research findings. This approach, however, is a mistake.

Presenting foundational knowledge forms the cornerstone of the literature review, which is a mandatory component of scientific writing. The literature review provides the necessary background information, justifies the research topic, and contextualizes the novel findings within the broader scientific landscape. Yet a literature review is more than just a collection of in-text citations describing other people’s discoveries. It embodies critical analysis of previous research, highlighting how the work of others has informed and influenced your own study.

Conducting a review requires significant intellectual effort: you must analyze, evaluate, synthesize, and, when appropriate, critique others’ contributions to your research area. This process involves crafting a coherent narrative by logically linking statements—supported by in-text citations—to develop a clear and structured line of thought. No doubt that achieving this level of clarity and depth is a demanding task.

Cite a source only when essential. Cite exclusively the most impactful sources, only those that have contributed directly to your research.

Our duty as scientific writers is to inform and educate. Through the process of writing a literature review, we provide a clear and comprehensive overview of the current state of knowledge within our research area. To achieve this, we need to

Answer 3.1: Bing-ChatGPT

>> Please act as an experienced scientific researcher. I wish to write a comprehensive literature review of the scholarly papers published on a very specific topic: "application of fractals in medicine". Check all the existing literature on this topic, and search with great care in PubMed, ScienceDirect, BASE, Google Scholar, books, and papers. I wish you to select only the most influential sources on this topic. Show me a summary of their contents.

Answer:.....

Thank you for your request. I have searched the existing literature on the topic of "application of fractals in medicine" and selected some of the most influential sources for your review. Here is a summary of their contents:

Fractal Geometry in Medical Science: Beginning of a New Era?

This paper explores the potential of fractal geometry for describing and understanding biological organisms, their development and growth as well as their structural design and functional properties. It also discusses the possible applications of fractals in medicine, such as:

Predicting impending arrhythmia by analyzing the heart rate variability of healthy individuals and comparing it to those with heart diseases.

Measuring the infiltrative margin of malignant tumors, assessing tumor angiogenesis, and measuring irregular distribution of collagen in tissue.

Finding a scale invariance and self-similarity of digital images and signals in medical physics.

Providing new promising diagnostic approaches that include noninvasive methods and visual imaging methods avoiding any potentially damaging procedures.

The paper concludes that fractal geometry offers a new perspective and a powerful tool for biomedical research and practice.

Source: Fractal Geometry in Medical Science: Beginning of a New Era?(1)

Fractals in Biology and Medicine

This book is a collection of papers presented at a symposium on fractals in biology and medicine held in 1993. It covers various aspects.....

Remaining of this answer is omitted

carefully select the most relevant papers and books. The next step involves citing them appropriately. Always keep in mind that our goal is to craft a concise yet informative review.

The following section outlines a method to develop an engaging and insightful review.

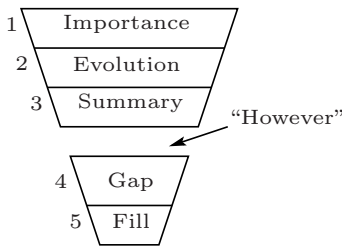


Fig. 5 Funnel strategy. It indicates how to write the introduction section of a scientific paper through five parts. Each part contains a piece of text that functions as described in Section 4. The arrow indicates the point at which the “However” transition must be included (Section 4).

Answer 3.2: Bing-ChatGPT

>> In English. Give me only essential information. Do not show me greetings. Do not show external links. Explain in plain English and condense your answer into 150 words or less. What is the funnel strategy in scientific writing? Write your explanation in bullet points.

Answer:.....

- The funnel strategy is a way of writing an introduction for a scientific paper or report.
- It starts with a broad and general overview of the topic and gradually narrows down to the specific research question or hypothesis.
- The purpose of the funnel strategy is to provide context, background, and motivation for the study and to show how it fits into the existing literature and knowledge.
- The funnel strategy can be divided into four steps:
 - * Establish a broad territory: introduce the general field or discipline of the study and explain why it is important or relevant.
 - * Establish a sub-territory: identify and review the main themes, theories, or gaps in the literature related to the topic and show how your study contributes to them.
 - * Build a niche: state the problem, question, or gap that your study addresses and explain why it is significant or original.
 - * Occupy the niche: present your main argument, claim, or hypothesis and outline the structure and scope of your paper or report.

4 Literature review: the funnel strategy

To help us write a meaningful review of the literature, experienced researchers recommend using the funnel strategy [77, Sec. 11.2], [28, Ch. 8, p. 44]. According to them, the funnel strategy creates a coherent flow of thought. To deepen our understanding of this approach, let us explore the insights provided by Bing-ChatGPT; see Answer 3.2. As it shows, Bing-ChatGPT is consistent with our view of what constitutes the funnel strategy, as detailed next.

The funnel strategy contains five moves, as depicted in the scheme of Fig. 5. According to our experience, the scheme of Fig. 5 provides guidance to writers, as detailed next.

Step 1: Importance

(Fig. 5–Part (1)). We must write the first sentence of the first paragraph to create a positive impression. The aim is not only to capture the reader’s attention but also to sustain their engagement throughout the entirety of the paper. To accomplish this, we resort to two specific strategies, as described next.

First strategy: The opening sentence of the paper can be used to provide a concise historical overview of the research topic. While incorporating a historical perspective is not mandatory, it can effectively underscore the significance of the research topic. Consider the following example.

- ✓ In 1975, a mathematician named Benoit Mandelbrot wrote a book that laid the foundation of what we name today as *fractal*.

This example highlights that Benoit Mandelbrot discovered fractals: such a historical perspective can help establish the importance of fractal research. Nevertheless, reviewing the history is not the only way to write an engaging first sentence.

Second strategy: Another option for capturing the reader’s attention in the opening sentence is to present an *interesting fact*. By interesting fact, we refer to a statement that conveys information widely recognized and accepted within the research community. Consider the following example.

- ✓ Machine learning represents a set of algorithms that can be applied to find patterns in data, make decisions, and guess human behavior (Smith et al., 2019).

This example illustrates the opening sentence of a paper discussing the applications of machine learning. Notably, the verbs in this example are in the *present tense*, indicating to readers that the information about machine learning remains valid. In addition, in academic writing, authors can employ another verb tense to denote true facts: the *present perfect tense*. This tense is particularly effective in conveying that an event or development has occurred over a period of time leading up to the present (e.g., [17, Sec. 6.3, p. 460]). Consider the next example.

- ✓ Researchers have shown the potential of machine learning for industrial applications, like in entertainment (e.g., Netflix), web search (e.g., Google), and chatbot processing (e.g., Bing-ChatGPT).

We can ask Bing-ChatGPT for more examples of first sentences, as illustrated in Answer 3.3.

Answer 3.3: Bing-ChatGPT

>> In English. Give me only essential information. Do not show me greetings. Do not show external links. Give me 2 examples of engaging sentences used as the first sentence of the first paragraph of scientific papers, in the introduction section, stated in active voice. I wish to use these sentences as a template for my scientific paper. Select sentences that emphasize the relevance of the research topic. Write in the form of template, like [topic], and give explanation.

Answer:.....

I understand that you want to write an engaging introduction for your scientific paper. Here are two examples of sentences that you can use as templates for your first sentence, based on the web search results I found:

- [Topic] is a crucial issue that affects [stakeholders] in various ways. However, despite its importance, there is a lack of [knowledge gap] on this topic. This sentence emphasizes the relevance of the topic by highlighting its impact and identifying a specific knowledge gap that your paper aims to fill.
- Recent advances in [field] have opened up new possibilities for [topic]. However, there is still a need for [knowledge gap] to fully understand and exploit these possibilities. This sentence emphasizes the relevance of the topic by showing how it relates to the current state of the field and pointing out a specific knowledge gap that your paper aims to address.

Step 2: Evolution

(Fig. 5–Part (2)). Once you have established the importance of your research topic, the next step is to describe how it has evolved over time. This is arguably one of the most challenging aspects of academic writing. You will demonstrate your understanding of what other researchers have discovered and reflect on what you have learned from their work.

In addition, you will detail how their findings have shaped the current knowledge for the specific research area you are exploring. Avoid citing an excessive number of references; A reference should be included only if it contributes meaningfully to the analysis presented in your article (Section 2).

How to create ‘Evolution.’ Let us consider the next phrases; they can function as templates.

- ✓ One study [shows / has shown] that ... (Smith et al., 2019).
- ✓ A recent study has [detailed / examined / investigated / reported / introduced] ...; see (Johnson, 2023).
- ✓ Another study have [confirmed / proved] that ... (McDonnell, 2012)).
- ✓ Two studies that have [investigated / considered] the [topic / area] are McDonnell (2012) and Cohen (2018).
- ✓ The authors of (Smith et al., 2019) have [shown / demonstrated] that

Research area

Intense activity on social media elicits some negative reactions. For instance, people using various social media platforms have substantially higher levels of both depression and anxiety when compared to those who use two or less social media platforms (Primack et al., 2017), impacting strongly teenagers (Woods and Scott, 2016). One study shows that 20% of college students in a population were addicted to social media (Allahverdi, 2021). Other studies confirm that being intensively exposed to news and social media negatively affects the mental health of an individual (Brunborg and Burdzovic Andreas, 2019; Brailovskaia et al., 2021; Geirdal et al., 2021). Also, diversity of thought can disappear and studies report that social media users engage in similarly thinking groups, framing, and reinforcing a shared narrative, a psychological phenomenon called *echo chambers* (Cinelli et al., 2021; Lavorgna and Myles, 2021; Mosleh et al., 2021). Despite the psychological risks (Primack et al., 2017; Allahverdi, 2021), people have become used not only to spending long hours on social media but also to expressing sentiment and opinions therein (De Choudhury et al., 2016; Guntuku et al., 2017).

Fig. 6 A paragraph that illustrates **Evolution** (Section 4). The authors of this paragraph [167] start by stating the research area. Next, they review the literature over the years. They create reasoning, bring references, and present ideas and facts that support the research area. Common words that facilitate citations are underlined, and each citation is appropriately formatted.

- ✓ In a study by Smith et al. (2019), they [found / showed / proposed] . . .
- ✓ Cohen (2018) [has observed / points out] that Since the method of Cohen has led researchers to Moreover, an experiment done by Johnson (2022) confirmed that

As you can see, there are different ways to integrate citations into your writing. Citations can have different formats (e.g., (Cohen 2018) or [14]). You must follow the journal's editorial preference. Look at the journal's website for more information; all journals provide text templates in Latex and MS-Word. These templates will specify which type of citation should be in place.

Read the journal's submission instructions carefully. It will help you with the citation style and rules.

Fig. 6 showcases a piece of text illustrating the concept of "Evolution." Observe how the sentences are constructed with in-text citations and arranged meaningfully to follow a coherent line of thought. These sentences incorporate transition words, which are underlined for emphasis.

In summary, organizing research knowledge through sentences and citations is like solving a jigsaw puzzle: (1) we piece together fragments of published research; (2) we add citations and rearrange the fragments; (3) we fit them to create a narrative that captivates readers with a coherent flow. Note that achieving (1)–(3) requires careful preparation (Section 2).

Answer 3.4: GPT-3.5

>> In English. Give me only essential information. Do not show me greetings. Do not show external links. Give me 6 examples of sentences used in the introduction section of scientific papers, each one of these sentences contains in-text citations, and these citations are taken from papers published in impact-factor journals listed in PubMed. The in-text citations follow pattern like "Smith et al." or "[N]" where "N" represents any number. Show only sentences that are commonly used to establish the territory, that is, sentences that establish the research background or the research evolution. Consider at least one sentence that follows the pattern "... study has shown ..." Write these sentences in the form of template, like [topic], [discipline], [sub-area], because I wish to use these sentences as a template for my scientific paper.

Answer:.....

1. The [topic] field in [discipline] has undergone significant advancements in recent years, as demonstrated by the studies conducted by Smith et al. [1] and Johnson et al. [2].

2. In the domain of [sub-area] research, several investigations have shed light on the intricate mechanisms involved, such as the work by Brown and colleagues [3].

3. Previous studies have elucidated the impact of [topic] on [discipline], highlighting its relevance in various contexts [4,5].

4. The evolution of research in [sub-area] has been driven by seminal contributions, including the seminal work of Thompson and Smith [6] that laid the foundation for subsequent investigations.

5. A number of recent studies have provided insights into the intricate relationships between [topic] and [discipline], as indicated by the findings of Lee et al. [7] and Wang [8].

6. The study conducted by Johnson et al. [9] has shown the potential implications of [topic] in [discipline], opening up new avenues for further exploration.

Step 3: Summary

(Fig. 5–Part (3)). By the time you reach Step 3, you have successfully established the significance of your research topic, conducted a thorough literature review, and cited the most relevant publications. Through this process, you have crafted sentences intertwined with in-text citations, and through them, you have created a line of thought. This line of thought navigates seamlessly through the findings of other researchers, providing a solid foundation for your work.

Your next task is to present a concise summary of previously published findings. This summary serves to prepare the reader’s mindset for the forthcoming argument—namely, the statement of your discovery. Transitioning from the findings of others to your own contribution should be handled thoughtfully and strategically. This transition follows the "Summary" section (Fig. 5).

In our perspective, the "Summary" is a brief piece of text positioned at the end of a paragraph. To illustrate this concept, let us examine the following phrase.

Answer 3.5: GPT-3.5

>> In English. Give me only essential information. Do not show me greetings. Do not show external links. Select sentences used in the introduction section of scientific papers published in impact-factor journals. From your selection, show me only the most frequent 5 sentences, used at the end of paragraphs, to summarize the information presented elsewhere in the same paragraph. A phrase like "these studies taken together" is usual in summary sentences. Present sentences in the form of template, like [topic], because I wish to use these sentences as templates in my own scientific paper.

Answer:.....

1. This study provides new insights into [topic], highlighting the importance of [specific finding] in understanding [broader concept].
2. The findings of this research shed light on [topic], emphasizing the significant role of [specific factor] in influencing [broader phenomenon].
3. These results contribute to our understanding of [topic], demonstrating the impact of [specific variable] on [broader process].
4. This study expands our knowledge of [topic], emphasizing the relationship between [specific factor] and [broader concept].
5. The findings presented here enhance our understanding of [topic], emphasizing the significance of [specific finding] in advancing our knowledge of [broader field].

✓ [sentences]. To sum up, **these investigations** confirm that [summary].

This example presents a template where the phrase *these investigations* encapsulates all the previously cited papers. The sentence concludes with a concise summary of the knowledge coming from these works, effectively synthesizing their contributions.

We can also create a summary using the word *thus*, as illustrated in the following example.

✓ [sentences], **thus** [indicating / demonstrating / suggesting / supporting / revealing / providing strong evidence for / opening new avenues] ... [summary].

In addition to *thus*, other words can be used to signal that a summary will appear soon, like ‘*in sum*’ and ‘*to conclude*’ (e.g., [17, Sec. 10.4.1.2, p. 876]). Many other phrases do exist to signal a summary, like the ones suggested by GPT-3.5 in Answer 3.5.

“However” transition

The word *however* deserves special attention in the introduction section. Specifically, after completing the tasks outlined in Steps 1–3, you should write a passage that begins with *however*. This word functions as a conceptual line break, dividing

Regarding natural language processing (NLP), a tool that has been widely used is the so-called *BERT* (Devlin et al., 2018). The creators of BERT, members of a research team working for Google, mention that BERT incorporates a training database of writings with more than a billion words (see Devlin et al., 2018), a feature that has helped BERT reach success in more than 90% of the classification tasks (e.g., Alaparthi and Mishra, 2021). Note, however, that even well-trained judges do not agree with each other in rating sentiment from personal stories (Tausczik and Pennebaker, 2010, p. 26). Judges tend to perform better than an algorithm when the task is detecting depression (Ziemer and Korkmaz, 2017). Although these investigations taken together indicate that researchers have gone through highly technical, complicated methods, sentiment from words and phrases, understanding the context of those algorithms and their score numbers is widespread use.

summary

Fig. 7 A paragraph that illustrates **Summary** (Section 4). The authors of this paragraph use a key phrase to indicate a move: “these investigations taken together.” This phrase signals that the subsequent content summarizes knowledge previously written.

the knowledge into two distinct parts: (i) the existing knowledge established by other researchers, and (ii) the novel contributions resulting from your own discoveries.

When examining the funnel strategy depicted in Fig. 5, we can see that the word *however* splits two contrasting elements: the old and the new, the known and the unknown, the expected and the unexpected. This duality ignites curiosity and captivates the reader’s attention. The word *however* signals to the reader that what follows is of significant value and merit, encouraging them to continue reading.

Consider the following example.

✓ [sentences]. **However**, understanding how these elements ... remains a major challenge in [specific-sub-area].

This example indicates that old knowledge is placed in [sentences] and new knowledge is placed in [specific-sub-area]. As can be seen, *however* marks a transition between the old and the new, that is, what others have done and what you have done.

Note that the word *however* is by far the most used adverb of contrast found in academic writing [17, Tab. 10.17, p. 887].

There exist words and grammar constructions with effects similar to ‘however,’ like ‘nevertheless,’ ‘despite this,’ ‘in contrast,’ among others; see [171, Sec. 4.9], [17, Sec. 10.4.1.5, p. 878].

According to the funnel strategy depicted in Fig. 5, the word *however* marks the transition to the tighter part of the funnel. This narrower part is dedicated to presenting information about the gap that exists within the current body of knowledge. Once the gap has been clearly identified, the next step is to convey to readers that you have made a discovery that addresses and fills this gap. By doing so, you em-

Answer 3.6: Bing-ChatGPT

>> In English. Please give me only essential information. Do not show me greetings. Do not show external links. Show me only the most frequent 5 sentences used in the introduction section of impact-factor journals that starts with "however". Present sentences in the form of template, like [topic], because I wish to use these sentences as templates in my own scientific paper.

Answer:.....

Based on my web search, I found the following five sentences that are commonly used in the introduction section of impact-factor journals that start with "however":

- However, [previous studies] have [limitations] that [motivate] the current research.
- However, [the topic] is still [understudied / controversial / challenging] and [requires / deserves / demands] further investigation.
- However, [the existing literature] does not [address / explain / account for] [a specific gap / question / problem] that is relevant for [the field / the practice / the society].
- However, [the current knowledge] is based on [a narrow / biased / outdated] [sample / method / perspective] and may not be [generalizable / applicable / valid] for [a broader / different / new] [context / population / situation].
- However, [a recent development / finding / event] has [challenged / changed / influenced] the way we [understand / approach / evaluate] [the topic] and raised new [issues / questions / opportunities] for research.

phasize the significance of your contribution—a novel finding that holds value and deserves to be shared with readers.

Step 4: Gap

(Fig. 5–Part (4)). The term ‘gap’ represents a piece of text that encapsulates the main research question. Answering this question serves as the driving motivation behind the entire scientific paper. In the space allocated to the ‘gap,’ you elaborate on how your research addresses the question and contributes to the advancement of scientific knowledge.

Let us examine the following sentences.

- ✓ Most studies have focused mainly on [summary]. **However**, little is known about [gap].

This example demonstrates three key moves: (i) a summary of previous research (i.e., [summary]); (ii) the use of *however* to mark a transition from established knowledge to new one; and (iii) the use of the phrase ‘*little is known*’ to signal the forthcoming presentation of the main research question (i.e., [gap]).

Another practical template is as follows.

- ✓ Despite significant advancements in [summary], gaps in our understanding of the [topic] still exist, particularly regarding [gap].

This example dispenses the use of *however* to produce the effect of contrast. Rewriting it with *however* yields

- ✓ ...significant advancements in [summary] have been made. **However**, gaps in our understanding of the [topic] still exist, particularly regarding [gap].

We can ask Bing-ChatGPT for more examples, as illustrated in Answer 3.6

Step 5: Fill the gap

(Fig. 5–Part (5)). This step is the final one, though it is far from the least significant. Here, ‘fill the gap’ denotes the place where our discovery will be placed. Yet filling the gap is not easy. Conveying our findings in a clear and impactful manner is a challenge. Over years of editorial experience with impact-factor journals, we have noted a distinct tendency among early-career researchers, especially students: they often undervalue the importance of their own findings.

Researchers at the beginning of a career often do a good job of conducting thorough literature reviews. However, they frequently struggle with presenting their own findings. Too often, key results become obscured within less pertinent details. It is not uncommon to see their discoveries overshadowed by weaker sentences, diminishing the impact of their contributions.

Templates offer a practical solution for improving clarity and focus in academic writing. For instance, the following example sentences could serve as a standalone paragraph in the introduction section:

- ✓ Despite extensive research on [topic], a critical gap remains in understanding [specific issue]. This study aims to address this gap by [briefly state novelty or contribution].

Templates like this can guide researchers in emphasizing their findings without losing them in less relevant details. Now consider another example.

- ✓ To the best of the authors’ knowledge, this study is the first to provide evidence that [novelty]. Indeed, this study presents the [sub-area]. In addition, this study expands the usefulness of the results in (Smith, (2022)) because we show here that [benefit]. These findings set the main contribution of this paper.

This set of sentences is highly effective. It highlights the originality of the study by emphasizing that it is the first of its kind. Additionally, it strengthens the authors’ credibility by demonstrating how the new research builds upon previous work.

At an appropriate point in the introduction section, you can begin a paragraph with the phrase ‘*The main purpose of this paper is to ...*’ to clearly articulate the

focus of the study. If your findings support those of others, you might consider including a phrase like:

- ✓ These findings align with those of [author(s)], providing further validation of [specific aspect of prior research or the field].

Such phrases not only underscore the significance of your research but also position it within the broader context of existing scientific contributions. Consider also a template like:

- ✓ This [finding / result / analysis / evidence / data] confirms (or suggests) that ..., as [shown / described / supported] by Smith (2022).

Clearly articulate the main contributions and implications of your findings. Use concise and confident language to emphasize the significance and originality of your work. Reviewers and editors will appreciate such clarity and precision.

We have to highlight our own findings. Do not expect that the reader will grasp and interpret how great our findings are if we do not say so.

In summary, the literature review adopts a funnel strategy structured around five steps. Before drafting the literature review, you should identify and select the most influential papers and books in the research area (Section 2). Subsequently, compose the text following these five steps: (1) begin with one or two sentences to highlight the importance of the research topic; (2) carefully select the publications to be cited and weave them into a narrative that integrates arguments, facts, and ideas, emphasizing the existing body of knowledge and the findings of other researchers; (3) summarize the key points from Step 2; (4) identify the gap in the literature and demonstrate its connection to the existing knowledge; and (5) address the gap by highlighting your main finding and explaining its contribution to peers and society.

4.1 Use the funnel strategy with ChatGPT

At this point, you are ready to draft the introduction section of your paper. Remember, the introduction serves as the starting point for readers to understand your research findings. Therefore, it is essential to craft an engaging and compelling text.

The introduction section acts as a guide, providing your readers with a clear path to follow. By logically linking sentences, you connect ideas that lead to your research question. Along the way, include citations from relevant publications to support your claims and reasoning. A well-written introduction with in-text citations demonstrates your deep understanding of the research area. It fosters a dialogue with your readers, showing them how existing knowledge connects to your novel findings. To create this section effectively, consider employing the funnel strategy, which can be further supported with tools like ChatGPT

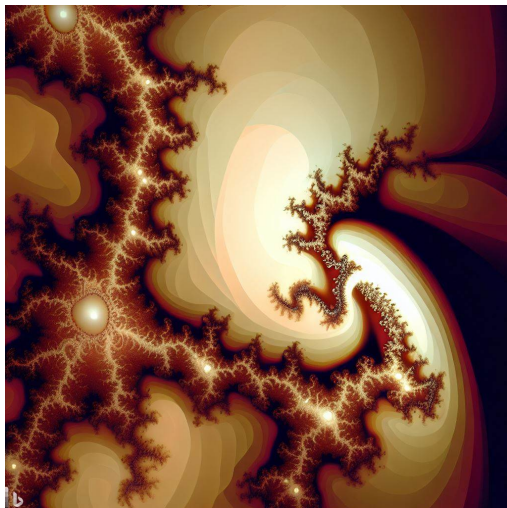


Fig. 8 Fractal image. It was drawn by Bing-ChatGPT through the command “draw me a very unusual, unique fractal based on the Mandelbrot set.”

In addition to mastering the funnel strategy, you are familiar with various templates (Section 4), which ChatGPT can generate in abundance to suit your needs.

A potential writing strategy involves filling in templates with your research ideas. Since no single template perfectly fits all scenarios, you should experiment and determine what works best for your research paper. During the writing process, you can engage with ChatGPT for feedback and examples. For instance, you can share a section of your text with ChatGPT, which can effectively evaluate its quality and provide corrections (Chapter 2).

Caution. *Never, ever copy-and-past contents of Bing-ChatGPT into your scientific writing. Copy-and-paste means plagiarism. Be careful.*

ChatGPT can function as an *expert* on your research topic by reflecting ideas from its extensive database. Additionally, it can synthesize concepts and introduce intriguing, previously unknown insights. For example, let us consider drafting the introduction section of a paper on *fractals*, a significant topic in mathematics. For this purpose, you could employ Answer 3.5.

As demonstrated in Answer 3.5, Bing-ChatGPT produced a text on fractals that offers an overview, includes relevant citations, and highlights fascinating facts. However, it is important to recognize that Bing-ChatGPT does not replace you as the author. The ultimate responsibility for writing the introduction section rests solely on your shoulders.

Answer 3.7: Bing-ChatGPT

>> In English. Give me only essential information. Do not show me greetings. Suppose you are an experienced scientific writer and you have mastered all the knowledge about [fractals], an important branch of [Mathematics]. Write me an introduction for a scientific paper about [fractals]. Write in a confident voice. In your writing, balance long and short sentences. Avoid jargon. Do not write basic information about [fractals] because you will write this introduction section for a scholarly research article, and all of your readers know much about [fractals]. Write your introduction following the "funnel strategy". This strategy obeys the next steps. Step 1: Importance; Step 2: Evolution and background; write 6 paragraphs to emphasize the evolution and background on [fractals], and add in-text citations to support your ideas; Step 3: Write only one sentence containing the summary of Step 1 and Step 2 together; Step 4: Write the word "however" and next present a gap in knowledge about [fractals]. Suppose that you have a great discovery on [fractals] and you will present this discovery here. The word "however" delimits what other researchers have found and what you have found. Be specific. Focus on only one gap the knowledge. Explain this gap; Step 5: Fill the gap. Explain what are the findings that you have found; Last step: Present information about what will come next in your paper. To make these steps engaging for readers, critically review the literature. Add in-text citations to the whole text using references from PubMed and Scientific Direct. For these in-text citations, follow the form of [Smith et al.] or [N], where "N" is a reference number. Remember that this text is for the introduction section of a scholarly paper on [fractals] and must contain in-text citations.

Answer:.....

Thank you for your message. I am glad you are interested in fractals, which are fascinating mathematical objects that have many applications and implications in science, art, and nature. Fractals are geometric shapes that have self-similarity, meaning that they look the same at different scales. For example, if you zoom in on a snowflake, you will see smaller snowflakes that resemble the whole. Fractals also have fractional dimensions, meaning that they are more complex than regular shapes like lines, circles, or cubes.

You asked me to write an introduction for a scientific paper about fractals. This is a challenging task, but I will try to do my best. Here is a possible introduction:

Continue on next page.

Continued 1: (from Answer 3.7)**Fractals: A New Perspective on Geometry and Nature**

Geometry is the branch of mathematics that studies shapes and their properties. For centuries, geometry has been based on the assumption that shapes can be described by simple formulas and measured by integers. However, this assumption fails to capture the complexity and diversity of many natural phenomena, such as clouds, mountains, coastlines, and plants. These phenomena exhibit irregularity, roughness, and self-similarity at different scales, which defy the conventional rules of geometry.

In the 20th century, a new branch of geometry emerged to address this challenge: fractal geometry. Fractals are shapes that have fractional dimensions, meaning that they occupy a space between dimensions. For example, a line has dimension one, a square has dimension two, and a cube has dimension three. A fractal curve, such as the Koch snowflake (1), has dimension between one and two, because it is more complex than a line but less than a square. Fractals also have self-similarity, meaning that they are composed of smaller copies of themselves at different scales. For example, if we zoom in on the Koch snowflake (1), we will see smaller snowflakes that look like the original.

Fractal geometry was pioneered by Benoit Mandelbrot (2), who coined the term fractal from the Latin word *fractus*, meaning broken or fragmented. Mandelbrot was inspired by the work of earlier mathematicians, such as Felix Hausdorff (3), Gaston Julia (4), and Helge von Koch (5), who explored the properties of continuous but non-differentiable functions and sets. Mandelbrot also used computer graphics to visualize and generate fractals, such as the famous Mandelbrot set (6), which is a set of complex numbers that produces an intricate and beautiful pattern when iterated by a simple formula.

Remaining of this answer is omitted

