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Analyzing the OpenAI Chatbot writing on Economic Development: The case for High Pyrenees and Aran Region and IDAPA

Analyzing the OpenAI Chatbot writing on Economic Development: The case for High Pyrenees and Aran Region and IDAPA

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Abstract

The paper aims analyzing the use of OpenAI Chatbot as an academic writer. The Chatbot was asked to write about Economic Development, specifically about the High Pyrennes and Aran Region (HPAR) and its regional economic development institute – IDAPA. The method used was exploratory, but also analogous to the “reinforcement learning” (section 1). After the introduction, the Chatbot was asked to write a paper on the economy of HPAR (section 2). Due to the incompleteness of the task, the Chatbot was then asked to write only paragraphs about IDAPA (section 4). Given its answers have presented the “Russian dolls” effect, the Chatbot was asked to state IDAPA's major challenges (section 6), and then the forms to surpass such challenges (section 7). Intercalary sections were used to analyze the Chatbot pieces of writing (e.g. sections 3, 5, and 8). The main conclusion is that, yes, the OpenAI Chatbot does deliver academic writing over regional economic development – as well as it can make a review of scientific literature (Annex).

Keywords | OpenAI Chatbot, economic development, generative AI, High Pyrenees and Aran, IDAPA.

Analizando la escritura del Chatbot OpenAI en el Desarrollo Económico: El caso de Alto Pirineo y Comarca de Arán e IDAPA

Resumen

El objetivo de este artículo es analizar el uso de OpenAI Chatbot como escritor académico. Se pidió al Chatbot que escribiera sobre Desarrollo Económico, concretamente sobre la Región de Altos Pirineos y Arán (HPAR) y su instituto de desarrollo económico regional - IDAPA. El método utilizado fue exploratorio, pero también análogo al “aprendizaje por refuerzo” (sección 1). Tras la introducción, se pidió al Chatbot que escribiera un artículo sobre la economía de la HPAR (sección 2). Debido a lo incompleto de la tarea, el Chatbot se le pidió que escribiera sólo párrafos sobre IDAPA (sección 4). Dado que sus respuestas han presentado el efecto “muñecas rusas”, se pidió al Chatbot que expusiera los principales retos de IDAPA (sección 6) y, a continuación, las formas de superar dichos retos (sección 7). Se utilizaron secciones intercaladas para analizar los escritos del Chatbot (por ejemplo, las secciones 3, 5 y 8). La principal conclusión es que, sí, el Chatbot OpenAI entrega la escritura académica sobre el desarrollo económico regional, asimismo, puede hacer una revisión de la literatura científica (Anexo).

Palabras clave | OpenAI Chatbot, desarrollo económico, IA generativa, Altos Pirineos y Arán, IDAPA

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Introduction

This paper tests the use of OpenAI Chatbot as a tool to research in development economics. As a novel technological advance, the OpenAI Chatbot has been advertised as capable of writing academic papers autonomously¹. That includes having its papers getting accepted by Journals and other publishers.

Machines able to independent scientific work are already known², but the access to them have been historically limited. Therefore, the first revolution achieved by the OpenAI Chatbot relies rather in its universal access. The easy access to it brought two things: an increasing number of users, and a remarkable buzz around the feedback they have been producing.

The idea here was analyzing the OpenAI Chatbot ability to write economics' academic texts on the High Pyrenees and Aran region, and also about the IDAPA³ – the regional development institute. The first initiative was to analyze its production of full academic papers over the HPAR. The second initiative was, then, to analyze its production of shorter writings – such as sections of a paper on IDAPA's themes.

It is debated on how the current Chatbots only locate and transcribe the texts already done by humans that are available at the internet – rewriting them differently so they can look original. Therefore, the Chatbot's extracts here presented have no intention to claim novelty or innovation⁴. Quite the contrary: what is on stake is to analyze the Chatbot performance while using internet to locate, mix, and reuse existing material into unheard combinations.

1 See Stoker-Walker, C. (2023) and Turban (2023).

2 See Langley, P. (2016) and Dzeroski et al. (2007).

3 In Catalan: Institut per al Desenvolupament del Alt Pirineu y Aran.

4 Actually, it is known that such tools make mistakes, e.g.: Alkaissi & McFarlane (2023), Zuccon et al. (2023).

Finally, the mission was searching to help to conduct academic research about the High Pyrenees and Aran Region – giving its poor demographics, few scholars available, and scarcity of budget. Then, if the tool would perform in an acceptable academic way, perhaps it could be used to promote and develop the region – helping to dematerialize and immaterialize its economy⁵.

Method

Since it was a first experiment in using and analyzing the OpenAI Chatbot to write academic pieces, the method applied was the exploratory. The hypothesis was: this Chatbot is capable of academic writing. The experiment aim was to accept or reject the hypothesis, and, in any case, present the machine's writings as evidence.

Exploratory research in social science can be defined in different ways, but its core, I believe, consists of an attempt to discover something new and interesting, by working your way through a research topic. Doing this type of research is risky by definition, since it is not possible to know in advance if something novel will come out of the whole thing. And for an answer, you have to wait until you are well into the research process. Looking at things from this perspective means that all good science is the result of exploratory research. (Swedberg, 2020:17)⁶

The Chatbot was asked to write a full paper, and its answers permitted to develop new questions. The same for the shorter writings of sections. As a first experiment, it was unknown how the replies would be – either as textual entities (grammar and style) or academic pieces (structure and rationale). By the way, the review of literature on Chatbots writing academically was totally written

⁵ See, for example, Nobre (2016).

⁶ See: Elman (2020).

by ChatGPT – and presented here as an Annex (section 10). In this sense, the exploration was a trial-and-error, analogous to the “reinforcement learning” technique applied to the machine learning.

Reinforcement learning is a machine learning technique where an agent learns to take optimal actions through environmental feedback. Unlike other types of machine learning, this technique does not rely on labeled data. Instead, it utilizes a trial-and-error approach with a feedback-based process that allows the agent to learn from its experiences. One of the main advantages of reinforcement learning is its ability to learn from experience and improve performance over time. (Joshi, 2022)⁷

For example: if the machine's answer was delivered by topics only, then it was asked to develop a paragraph to each topic. If the paragraph did not state the references, then it was asked to present the references along the text. If the topic brought generic answers (such as “invest in infrastructure” or “retain the youth at the region”), then it was asked on how to do that. And so on.

Chatbot Writing a Paper

As a newcomer to the region of the High Pyrenees and Aran, and after having read some papers and official documents about it, I decided to test the OpenAI tool as a way to produce writing material to my research over its characteristics, potentials, and problems. My first try was to ask the Chatbot to write a full academic paper over “The Economy of Alt Pirineu i Aran”. Here how it replied in two occasions⁸:

⁷ See: Ramakrishnan (2022).

⁸ Each answer from the Chatbot is tagged with a letter (a, b, c, etc.), so to identify it along the paper.

[a] Abstract: This paper aims to provide an overview of the economy of the Catalan region named “Alt Pirineu i Aran”. This region is located in the northwestern part of Catalonia, and it is known for its natural beauty and for being a popular tourist destination. However, it also faces some economic challenges, including a declining population, high unemployment rates, and a lack of economic diversification. Through a literature review and analysis of statistical data, this paper explores the main economic sectors in the region, including tourism, agriculture, and industry. The paper also discusses the region’s economic strengths and weaknesses, and proposes some policy recommendations to promote economic development.

Introduction: Alt Pirineu i Aran is a region located in the northwestern part of Catalonia, bordering France and Andorra. This region covers an area of 5,236 square kilometers and is home to around 20,000 inhabitants (IDESCAT, 2021). The region is known for its natural beauty, including the Pyrenees mountain range, and for being a popular destination for winter sports and outdoor activities. However, the region also faces some economic challenges, including a declining population, high unemployment rates, and a lack of economic diversification. The purpose of this paper is to provide an overview of the economy of Alt Pirineu i Aran, analyzing the main economic sectors and identifying the region’s strengths and weaknesses. The paper also proposes some policy recommendations to promote economic development in the region.

Economic Sectors: Tourism: Tourism is the most important economic sector in Alt Pirineu i Aran, contributing significantly to the region’s GDP and employment. According to the Statistical Institute of Catalonia (IDESCAT), in 2019, tourism (Network Error) (OpenAI, 2023)

[b] Abstract: The Alt Pirineu i Aran region is located in the Pyrenees mountain range in Catalonia, Spain. This region faces significant economic challenges due to its remote location and the decline of traditional industries such as agriculture and forestry. The region has limited resources and a small population, which hinders its ability to attract investment and create employment opportunities. This paper explores the economic challenges facing the Alt Pirineu i Aran region, focusing on the decline of traditional industries and the need for innovation and diversification to promote economic growth. The paper also considers the role of government policies in supporting economic development in this region, including the need for greater investment in infrastructure and the promotion of regional tourism.

Introduction: The Alt Pirineu i Aran region is located in the Pyrenees mountain range in Catalonia, Spain. This region is characterized by its mountainous terrain, remote location, and small population. The economy of the Alt Pirineu i Aran region has historically been based on traditional industries such as agriculture, forestry, and mining. However, the decline of these industries in recent years has resulted in significant economic challenges for the region. In this paper, we explore the economic challenges facing the Alt Pirineu i Aran region and consider potential solutions to promote economic growth.

Decline of traditional industries: The decline of traditional industries such as agriculture, forestry, and mining has had a significant impact on the economy of the Alt Pirineu i Aran region. The region has a limited resource base and a small population, which makes it difficult to attract investment and create employment opportunities. The decline of traditional industries has resulted in high levels of unemployment and a lack of economic diversification in the region.

Innovation and diversification: Innovation and diversification are key strategies for promoting economic growth in the Alt Pirineu i Aran region. The region has significant potential for developing new industries based on its natural resources and unique geographical location. For example, the region could develop a niche market for high-quality, organic products based on its clean air and water. The region could also develop renewable energy sources such as hydroelectric power, which would benefit from the region's mountainous terrain.

Role of government policies: Government policies can play a crucial role in supporting economic development in the Alt Pirineu i Aran region. The government should invest in infrastructure such as roads and telecommunications to improve connectivity and reduce the region's isolation. The government should also promote regional (Network Error) (OpenAI, 2023)

In both tries the Chatbot has stopped suddenly and gave back a "Network Error" message. According to some internet websites, the "reasons (may) include poor internet connectivity, a VPN that's not functioning correctly, an overload server, or a temporary outage in OpenAI's server" (Miley, 2023).

First analysis

Despite the fact that the Chatbot has never delivered an entire paper, it is worthy to mention that it did well managing language and academic format. Note that its texts are original, meaning that none of them have received no adjustments from humans-editors or correctors⁹. Nonetheless, one can say that both extracts present a level good enough to be read and accepted as academic papers so far.

⁹ The Chatbot answers were copied and pasted only, with no edition whatsoever. This way the readers (humans) could judge their linguistic and academic performances.

For example: (I) the academic structure (abstract, introduction, text development by topics), (II) the abstract gives an overview about the whole paper, (III) the text defines and explains the main region's characteristics, (IV) it also introduces historical highlights, (V) most important is that it presents the economic problems and challenges of the region, (VI) with some potential remedies and solutions (even "policy recommendations"), and (VII) that it may apply statistics and have presented references.

According to such Chatbot, the main problems of the region are declining population, high unemployment rates, lack of economic diversification [a], remote location, and the decline of traditional industries [b]. Some of the solutions would be found in innovation and diversification, a greater investment in infrastructure, the promotion of regional tourism, and the use of its Natural particular traits (mountains, fresh air and water) to offer eco-friendly products and clean energy [b].

Chatbot Writing Sections

One strategy to avoid the "Network Error" message would be asking shorter responses. Instead of asking for a full paper, trying to get shorter portions of texts – e.g. sections. This time the Chatbot was asked to write about a narrower aspect as well: rather than the whole economy of the region, the focus changed to IDAPA only – the Institute for the Development and Promotion of High Pyrenees and Aran. Here how it replied to specific questions (also given):

[c] Define and describe the "Institut per al Desenvolupament i la Promoció de l'Alt Pirineu i Aran", with references.

The "Institut per al Desenvolupament i la Promoció de l'Alt Pirineu i Aran" (IDAPA) is an organization that promotes the economic, social and cultural development of the Alt Pirineu i Aran region in Catalonia, Spain. The Alt Pirineu i Aran region includes the counties of Pallars Sobirà, Alt Urgell, and Val d'Aran.

The mission of IDAPA is to promote sustainable economic development in the region by supporting local businesses, encouraging entrepreneurship, and promoting tourism. The organization also works to preserve and promote the cultural and natural heritage of the region.

IDAPA was established in 2004 by the Catalan government as part of its efforts to promote regional development throughout Catalonia. The organization is funded by the Catalan government and by contributions from local governments in the Alt Pirineu i Aran region. One of the main initiatives of IDAPA is the promotion of rural tourism in the region. The organization works to develop tourism infrastructure and to promote the region's natural and cultural attractions. IDAPA also provides support to local businesses in the tourism sector, such as hotels and restaurants.

IDAPA has also been involved in initiatives to promote renewable energy in the region. The organization has supported the development of small-scale hydroelectric power plants and has worked to promote the use of biomass as a source of renewable energy.

In summary, the "Institut per al Desenvolupament i la Promoció de l'Alt Pirineu i Aran" (IDAPA) is an organization that promotes the economic, social and cultural development of the Alt Pirineu i Aran region in Catalonia, Spain. The organization works to support local businesses, promote tourism, and preserve the region's cultural and natural heritage. (OpenAI, 2023)

Now the first incorrectness: the region is not only formed by Pallars Sobirà, Alt Urgell and Val d'Aran [c]. It also contains the Pallars Jussà, Alta Ribagorça, and Cerdanya. Although the references given were both websites (what explains the text's relative commonplaces), it brings some themes with potential to be developed: IDAPA and the economic development, IDAPA and the sustainable economic development, and IDAPA and the tourism promotion - for instance.

So, the Chatbot was asked to write about such topics:

[d] Explain how the “Institut per al Desenvolupament i la Promoció de l’Alt Pirineu i Aran” (IDAPA) promotes the economic development of the Alt Pirineu i Aran region in Catalonia, Spain. Give references.

The “Institut per al Desenvolupament i la Promoció de l’Alt Pirineu i Aran” (IDAPA) promotes the economic development of the Alt Pirineu i Aran region in Catalonia, Spain by supporting local businesses, encouraging entrepreneurship, and promoting tourism. IDAPA provides support to local businesses in the region through various initiatives, such as training programs, financial assistance, and business development services. The organization also works to attract new businesses to the region by promoting its advantages as a business location. In addition to supporting existing businesses, IDAPA encourages entrepreneurship in the region by providing resources and assistance to new entrepreneurs. The organization offers training programs, mentorship, and networking opportunities to help entrepreneurs start and grow their businesses. IDAPA also promotes tourism in the region as a means of supporting the local economy. The organization works to develop tourism infrastructure and to promote the region's natural and cultural attractions. IDAPA provides support to local businesses in the tourism sector, such as hotels and restaurants, and works to attract visitors to the region through marketing and promotional campaigns. Furthermore, IDAPA also works to promote sustainable economic development in the region. The organization supports the development of renewable energy and other environmentally friendly businesses, as well as initiatives that promote social and economic sustainability. In summary, the “Institut per al Desenvolupament i la Promoció de l’Alt Pirineu i Aran” (IDAPA) promotes economic development in the Alt Pirineu i Aran region in Catalonia, Spain through its support of local businesses, encouragement of entrepreneurship, and promotion of tourism and sustainable economic development. (OpenAI, 2023)

[e] How exactly does IDAPA promote sustainable economic development in the region? IDAPA promotes sustainable economic development in the Alt Pirineu i Aran region through various initiatives and programs. One of the main goals of IDAPA is to support the growth of local businesses and industries while preserving the natural environment and cultural heritage of the region. One way IDAPA promotes sustainable economic development is by providing funding and resources to support local entrepreneurship and innovation. The organization supports the creation and growth of small and medium-sized enterprises (SMEs) in the region, with a particular focus on businesses that use sustainable and environmentally friendly practices. IDAPA also works to promote sustainable tourism in the region by supporting the development of ecotourism and cultural tourism initiatives that highlight the region's natural beauty and cultural heritage. This includes promoting responsible tourism practices and working with local businesses and organizations to develop sustainable tourism offerings. Furthermore, IDAPA collaborates with regional and national government agencies, as well as with universities and research centers, to support research and development activities that promote sustainable economic growth in the region. The organization also provides training and educational resources to support the development of a skilled workforce in the region. Overall, IDAPA promotes sustainable economic development in the Alt Pirineu i Aran region by supporting local entrepreneurship, promoting sustainable tourism, and fostering collaboration and innovation in the region (OpenAI, 2023)

It is easy to see how the Chatbot repeats some passages while answering different questions. For example: “supporting local businesses, encouraging entrepreneurship, and promoting tourism” [c and d], and “develop tourism infrastructure and to promote the region’s natural and cultural attractions” [c and d]. Sometimes it slightly changes the way it responds, as in: “supports the development of renewable energy and other environmentally friendly businesses” [d], and “with a particular focus on businesses that use sustainable and environmentally friendly practices” [e].

Second Analysis

The texts written by the Chatbot were well delivered both in language and in structure. They have also brought central words and expressions usually used by economists, such as economic growth [b], sustainable economic development [c], unemployment [a], regional tourism [b], entrepreneurship [d], innovation [b], and so forth. But the Chatbot has offered more quantity than quality, given that it did not deepen any of these concepts.

The same way the section [c] was used to generate both sections [d] and [e], in a try to deepen the concepts of “economic development” and “sustainable economic development”, both sections [d] and [e] have presented several concepts that were fed back to the Chatbot in a quest for a better treatment.

Therefore, the Chatbot was asked to answer the following questions:

1. How exactly does IDAPA support local businesses in the region?
Give academic references.
2. What are exactly the ways in which IDAPA has been providing financial assistance at the region? Give an historical evolution of such ways.
Name examples and how they were structured. Give references.
3. What are exactly the ways in which IDAPA has been attracting and maintaining new businesses to the region? Give an historical evolution of such ways, naming cases of success and failure. Give academic references.
4. How exactly does IDAPA encourage entrepreneurship in the region?
Give academic references.
5. What are exactly the ways in which IDAPA have been developing entrepreneurship at the region? Give an historical evolution of such ways.
Name examples and how they were structured. Give references.
6. How exactly does IDAPA promote tourism in the region?
Give academic references.

- 7.** What are exactly the ways in which IDAPA have been promoting the rural tourism in the region? Give an historical evolution of such ways.
Name examples and how they were structured. Give references.
- 8.** What are exactly the ways in which IDAPA have been developing tourism infrastructure in the region? Give an historical evolution of such ways.
Name examples and how they were structured. Give references.
- 9.** How exactly does IDAPA work to preserve and promote the cultural and natural heritage of the region? Give examples and academic references.
- 10.** How exactly does IDAPA promote the region's natural and cultural attractions of the region? Give examples and academic references.
- 11.** How exactly does IDAPA support hotels and restaurants of the region?
Give examples and academic references.
- 12.** How exactly does IDAPA promote renewable energy in the region?
Give examples and academic references.
- 13.** What are exactly the training programs that IDAPA have been offering in the region lately? Give an historical evolution of such programs.
Name examples and how they were structured. Give references.

There is no space in this paper to list all the answers, but it is important to say that they have ranged from generic to evasive, and sometimes were delivered by topics. The pattern found was the same: one answer provides concepts that need to be deepen, and the following questions that try to deepen each of such concepts in particular (with one new question per concept), also provide other concepts that still need to be deepen.

In a search to illustrate the spirit of the Chatbot's answers, we have tried to make it deliver solutions to the challenges itself found for IDAPA. Here how it went.

Chatbot Finding the Challenges

In order to avoid such “Russian dolls”¹⁰ effect (where one answer brings concepts that need to be answered about - over and over again), the Chatbot was submitted to find solutions to the problems that itself had presented. First the Chatbot was asked to state the challenges that IDAPA faced to fulfill its mission, and then the Chatbot was asked to present the solution to each problem that it found at the beginning. Here how it performed:

[f] What are the main challenges that IDAPA may face while working to fulfill its mission. Name examples of difficulties, defies, and eventual impossibilities.

Give academic references.

The IDAPA faces several challenges while working towards its mission of promoting sustainable development in the Alt Pirineu i Aran region.

Some of the main challenges include:

1. Geographic isolation: The region is located in the Pyrenees Mountains, which presents a significant logistical challenge for businesses and tourists. The area is relatively remote, and transportation infrastructure is limited. This isolation can make it difficult to attract businesses, employees, and tourists to the region.
2. Seasonal tourism: The region's tourism industry is highly seasonal, with the majority of visitors coming during the summer and winter months. This can make it challenging for businesses to maintain a consistent revenue stream throughout the year.
3. Aging population: The region has an aging population, which can create challenges for economic and social development. The aging population may require more social services and healthcare, which can strain the local economy.
4. Limited resources: The region has limited natural and financial resources, which can make it challenging to fund and implement sustainable development projects.

¹⁰ “The matryoshka doll (or, simply, the matryoshka) is a nested doll with two halves that can be pulled apart. The outer figure contains increasingly smaller versions of itself”. (Holmes, 2018). Here the Russian dolls are used as a metaphor for a fractal loop.

5. Climate change: The Pyrenees Mountains are highly sensitive to climate change, and the region is already experiencing the effects of rising temperatures and changing weather patterns. This can have a significant impact on the region's economy, natural resources, and cultural heritage.
6. Competition from other regions: The Alt Pirineu i Aran region faces competition from other regions in Spain and Europe that offer similar natural and cultural attractions, making it challenging to attract tourists and businesses.
7. Political instability: Political instability at the regional, national, or international level can also pose challenges for sustainable development efforts (OpenAI, 2023)

It should be reminded that IDAPA works not only with the economic development; it has a broader scope, covering the social and cultural aspects as well [c]. That may explain why the Chatbot has indicated so varied challenges for IDAPA, that it has displayed by topics (as before mentioned). Although the “geographic isolation” [b], “aging population” [a], and “limited resources” [b] are issues already dealt with by the Chatbot, this time it has offered the new concepts of “climate change”, “competition from other regions”, and “political instability” – the same for the seasonality of tourism.

Chatbot Presenting Solutions

The next step was asking the Chatbot to present solutions and remedies for each of the challenges it had listed previously. The main objective here was to obtain “final” answers, the ones where the reader can find convergent synthesis – escaping the Russian dolls loop (divergent analysis). The questions included “historical examples” and “successful cases” – keeping the demand for specific “academic references”. The aim was testing its capability to compare and relate, but also to name similar agents, programs, or policies. Here the following questions and answers:

[g] How can IDAPA resolve the problem of geographic isolation? Give historical examples on how this problem have been dealt with successfully. Give academic references.

The problem of geographic isolation can be a significant challenge for regional development agencies like IDAPA. However, there are several strategies that can be implemented to overcome this issue. One approach is to improve the transportation infrastructure of the region, such as highways, airports, and train stations. By enhancing the connectivity of the area, IDAPA can attract more visitors and businesses to the region. For example, the development of the high-speed train line in Catalonia has greatly improved the accessibility of the region to other parts of Spain and Europe. Another strategy is to promote digital connectivity and innovation, which can reduce the impact of geographic isolation. This includes improving access to high-speed internet, developing e-commerce platforms, and encouraging the adoption of new technologies in local businesses. Additionally, IDAPA can work to promote regional branding and marketing to increase the visibility of the region and attract visitors and businesses. This includes promoting the unique cultural and natural attractions of the region, and creating partnerships with other regions and organizations to expand the reach of the region. There have been several successful cases of regional development agencies overcoming geographic isolation. For example, the Regional Development Agency of Northern Hungary implemented a strategy to improve transportation infrastructure and develop regional branding, which led to an increase in foreign investment and tourism. Similarly, the Highlands and Islands Enterprise in Scotland implemented a comprehensive strategy that focused on improving transportation and digital connectivity, as well as promoting regional branding and marketing (OpenAI, 2023)

[h] How can IDAPA resolve the problem of seasonal tourism? Give historical examples on how this problem have been dealt with successfully. Give academic references.

The problem of seasonal tourism, which creates a concentrated demand for tourism services during certain months of the year, can be a challenge for IDAPA to resolve.

One way to address this challenge is to promote and develop tourism products and services that are attractive year-round, such as cultural and natural heritage tourism, adventure tourism, and rural tourism. IDAPA has implemented several initiatives to address the issue of seasonality in tourism in the region. For example, they have developed a year-round tourism promotion campaign highlighting the region's diverse offerings, including outdoor activities, cultural events, and gastronomy. IDAPA has also supported the development of new tourism products and services that are available throughout the year, such as hiking trails, ski resorts, and festivals. Other successful examples of dealing with seasonality in tourism can be found in other regions around the world. For instance, in Iceland, the government and tourism industry have worked together to promote winter tourism, including the Northern Lights, ice caves, and skiing. Similarly, in Canada, the tourism industry has promoted winter activities such as skiing, snowboarding, and ice fishing to increase visitation during the off-season.

[i] How can IDAPA resolve the problem of aging population? Give historical examples on how this problem have been dealt with successfully. Give academic references. The problem of an aging population is a common issue in rural areas, and the Alt Pirineu i Aran region is no exception. One strategy that IDAPA can adopt to address this issue is to promote intergenerational activities and programs that encourage young people to stay in the region and older adults to remain active and engaged in the community. For example, the “Vive el Parque” program in Spain's Cantabria region offers activities such as hiking, mountain biking, and birdwatching that are designed to bring together people of all ages and promote the natural and cultural heritage of the area. This program has been successful in increasing tourism and promoting community engagement. Another approach is to provide incentives for young people to start businesses in the region, which can help to create jobs and revitalize the local economy. For example, the “Start-up Chile” program provides funding and support for entrepreneurs to start businesses in Chile, which has helped to promote economic growth and attract young people to the region (OpenAI, 2023)

[j] How can IDAPA resolve the problem of limited resources? Give historical examples on how this problem have been dealt with successfully. Give academic references. The problem of limited resources is a common challenge faced by many organizations, including IDAPA. One way to address this challenge is by implementing sustainable development practices that optimize the use of resources while minimizing waste and negative impacts on the environment. IDAPA has already been promoting sustainable tourism in the region by encouraging the use of renewable energy sources, promoting eco-tourism, . Another approach to addressing the limited resources challenge is through collaboration and partnerships with other organizations and stakeholders. For example, IDAPA could work with local universities and research institutions to develop innovative solutions for resource management and conservation. Historically, many organizations have successfully addressed the challenge of limited resources by implementing sustainable development practices and collaborating with other stakeholders. For example, the Ecological Footprint approach has been used by organizations worldwide to measure their impact on the environment and identify ways to reduce their resource consumption (Wackernagel et al., 2006). The approach has been successfully implemented by organizations such as the Global Footprint Network and the World Wildlife Fund. Another example is the Sustainable Development Goals (SDGs), which provide a framework for organizations to address global challenges such as poverty, climate change, and resource depletion (UN, 2015). The SDGs have been adopted by many organizations worldwide and have been effective in driving sustainable development practices. In summary, IDAPA can address the challenge of limited resources by implementing sustainable development practices and collaborating with other stakeholders. Historical examples such as the Ecological Footprint approach and the Sustainable Development Goals provide useful models for addressing this challenge (OpenAI, 2023)

[k] How can IDAPA resolve the problem of climate change? Give historical examples on how this problem have been dealt with successfully. Give academic references.

The problem of climate change is a complex and challenging issue that requires long-term planning and coordinated efforts from multiple stakeholders. IDAPA can contribute to addressing this issue by promoting sustainable tourism practices, supporting the use of renewable energy sources, and raising awareness among local communities and tourists. One example of successful climate change mitigation is the case of the Swiss tourism industry. Switzerland has long been known for its picturesque landscapes, skiing resorts, and outdoor activities, which make tourism a significant part of its economy. However, climate change has posed a threat to the country's tourism sector due to the melting of glaciers, which affects the skiing season, and the changing weather patterns, which impacts outdoor activities. To address this challenge, the Swiss government, together with the tourism industry, developed the "Climate Alliance" initiative, which aims to reduce the sector's greenhouse gas emissions by 30% by 2020. The initiative includes measures such as promoting energy efficiency in hotels, encouraging the use of public transportation, and supporting the development of sustainable tourism products. IDAPA can draw lessons from the Swiss example and implement similar initiatives to mitigate the impact of climate change on the tourism industry in the Alt Pirineu i Aran region. Some possible actions include: Encouraging the use of renewable energy sources such as solar, wind, or hydroelectric power in hotels and tourism facilities. Promoting eco-tourism activities that have a low environmental impact, such as hiking, birdwatching, or cultural tours. Raising awareness among local communities and tourists about the importance of preserving the natural environment and reducing carbon emissions. Supporting the development of sustainable tourism products and services that meet the needs of environmentally conscious travelers (OpenAI, 2023).

[l] How can IDAPA resolve the problem of competition from other regions?

Give historical examples on how this problem have been dealt with successfully.

Give academic references.

One way that IDAPA can address the problem of competition from other regions is by focusing on promoting the unique aspects and advantages of the Alt Pirineu i Aran region. This can involve highlighting the region's natural and cultural attractions, as well as its distinct local businesses and products. Historical examples of successful strategies for promoting regional distinctiveness can be found in various places around the world. For example, in the Basque Country in Spain, the Basque Government has implemented policies that emphasize the region's unique language, culture, and history, as well as its gastronomy and tourism opportunities. These efforts have helped to establish the Basque Country as a distinct and attractive destination for visitors, and have supported the growth of local businesses and industries (Brouder & Teixeira, 2012). Another example comes from the Friuli Venezia Giulia region in Italy, which has developed a regional branding strategy that focuses on the region's high-quality food and wine products, as well as its natural and cultural heritage. This branding has helped to increase the visibility and appeal of the region, and has supported the development of a strong tourism industry (Mason & Paggiaro, 2015; OpenAI, 2023)

[m] How can IDAPA resolve the problem of political instability? Give historical examples on how this problem have been dealt successfully. Give academic references.

Political instability can be a major challenge for IDAPA as it can create uncertainty and affect investment decisions. However, there are ways in which the organization can mitigate this challenge. One way is to focus on building a strong local economy that is less dependent on external factors. This can be done by encouraging entrepreneurship, promoting local products and services, and developing a skilled workforce that is able to adapt to changing circumstances. Another way is to build strong partnerships with local and regional governments, as well as with other organizations and stakeholders in the community. This can help to create a more stable political environment,

as well as provide access to resources and support that can be used to promote economic development. Historical examples of how political instability has been successfully addressed in other regions include the case of Northern Ireland, where the Good Friday Agreement helped to bring an end to decades of conflict and instability. This agreement led to the development of a number of economic initiatives aimed at promoting investment, tourism, and job creation in the region. Another example is the Basque Country in Spain, where a long-standing separatist movement has been largely pacified in recent years, leading to increased stability and economic growth (OpenAI, 2023).

At last, the Chatbot has delivered more accomplished texts – giving answers that were academically pertinent. The excerpts have brought both (i) prescriptive actions (e.g. “improve the transportation infrastructure” [g], “encourage the young people to stay” [i], “build a strong local economy” [m], etc); (ii) examples of IDAPA’s initiatives (e.g. “they have developed a year-round tourism promotion campaign” [h], “has already been promoting sustainable tourism in the region” [j], etc); and also (iii) international examples on relatable and compatible actions (e.g. Hungary [g], Iceland [h], Spain [m], Ireland [m], etc).

Third analysis

One can imagine the staff of IDAPA reading such passages: “improve the transportation infrastructure”, “promote digital connectivity and innovation”, “promote and develop tourism products and services that are attractive year-round”, “encourage young people to stay”, “optimize the use of resources”, “promote sustainable tourism practices”, “build a strong local economy”, and so on. Easy to say, not easy to do – right? Actually, very difficult to do but also not easy to say – if one reminds that these phrases were proposed by a Chatbot. Of course, such machine cannot be compared with a human being: it has never visited the region, lived there, nor even studied the subject before. What it does is just find internet available texts written by real persons that eventually did visit, live, or study the region; reorganizing and mixing these references to deliver an acceptable piece of answer.

Although the extracts were presented in fragments (several answers as a reply to several questions), and not as a full and integrated one-pieced academic paper, in the end the Chatbot has performed in a way that it could pass the “Touring test”¹¹. Again, the texts themselves were written by humans and only blended by the Chatbot – where such renewed arrangements did comply with the expected academic discourse usually found in papers.

One could also imagine the staff of IDAPA moving ahead to ask the Chatbot: “how the transportation infrastructure can be improved?”, “how the digital connectivity and innovation can be promoted?”, “how to encourage young people to stay?”, and so forth. The experience using the tool allows to expect answers sound enough to be considered as academic statements, but always bringing both (i) the specter of the Russian dolls loop and (ii) the “easy to say, not easy to do” feeling.

Conclusion

The main finding is that, yes, the current OpenAI Chatbot is already performing replies that can be taken as academic ones. The reason behind this is that it does access and rearrange the existing academic texts available on the internet – whose authors are real persons and experts that have written and published over such academic themes. Therefore, the actual technological advance observed here is about the machine’s ability to access, mix, reuse, and present passages that can achieve academic acceptable levels on format and content.

Nonetheless, it is possible to note that the machine’s texts have a coherent structure: with opening, developing, and closing – both at paragraphs level, as well as in its section entirety. Also, the machine has being able to consider and

¹¹ “Moreover, as we shall see, Turing himself thought that it would not be too long before we did have digital computers that could “do well” in the Imitation Game”. See: Stanford Encyclopedia of Philosophy (2021).

deliver historical aspects, examples of success and failure, pinpoint problems and challenges, make suggestions, and propose courses of action. So, the real technological lap here is that the machine considered all of this, going to internet to access and reuse the existing material, and delivering textual rearrangements that were both linguistic and academic sound.

Therefore, if the OpenAI-like tools keep such performance (or even evolve to present better achievements), it is possible to envisage an increasing use of these systems to produce academic texts on Economic Development – as for instance. Indeed, texts to be used by humans and for human purposes. Then, the collaboration between humans and machines to foster academic research is already a reality - and tend to accelerate. Is still open to debate how to regulate such use, e.g. the necessity to disclosure the AI participation, and even more the copyright¹² consideration.

If the Chatbot work is based only into locating, mixing, and reusing other persons' texts, then the copyright legislation comes to the forefront of the discussion. Even if the machine is giving the references, is it only copying and pasting copyrighted material? But if the machine is able to some sort of creativity¹³, in order to present original bits of texts (i.e. anew and never written by any person), what would be the level of novelty to zeroe the copyright legal exposure? Remember that such point has been already subject to debate even when humans do refer to their human peers' texts.

¹² If there are those who believe that anti-plagiarism software can detect texts made by machines (OpenAI Master, 2023), there are also some who believe that these machines can be asked to deliberately craft undetectable material (Pocock, 2023; Eliaçik, 2023).

¹³ See: Muller et al. (2022) and Vinchon et al. (2023).

In the end, automated creativity has been a hot topic into academics. Some authors believe that these machines can be genuinely creative, other that such tools can only emulate creativity – without any originality. This paper goes with the balanced approach, such as: “Creativity is perhaps rooted not in originality *per se*, but in original and arresting re-compositions of existing cultural artefacts that (are) recognisable (while) contributing (to) something new. This synthetic creativity is not automatically condemned to reproducing endless pastiches” (Tredinnick & Laybats, 2023).

Finally, if machines can cope with the hard work on research (e.g. covering the literature review, making comparisons, stating the critics, and presenting suggestions), the humans that use these machines shall to reposition themselves inside the research *métier*. For example: creating observatories to inspect the academic quality of the machines’ papers (what this text tries to do right now), establishing groups to present solutions to eventual problems found over the machines’ papers (e.g. the Russian dolls loop), and making clear the distance that separates *saying* and *doing*¹⁴.

14 It is worthy to note that the instructions given by ChatGPT have been tested as for obtain real goals as well, such as: Insilico Medicine (2023); Sharma (2023), and Outlook Start-Up Desk (2023).

Annex: review of literature

In order to check the performance of the Chatbot as an academic writer, it was asked to develop a review of the literature based on the references listed at section 8. First, it was asked to “write down an academic literature review, taking into account the following references”. Second, since it has presented sections with topics only (without paragraphs), it was asked to “from topic 2 to subtopic 6.3, write down a small paragraph to develop each idea brought by them”. Finally, it was asked to “insert the references along the text, as the model (author, date:page)”. Here the result:

1. Introduction

Scientific writing plays a crucial role in knowledge dissemination and academic discourse. The advent of AI and language models, such as ChatGPT, has introduced new possibilities and challenges in scientific writing. This literature review aims to summarize the existing research on the role of ChatGPT in scientific writing and its implications for the scientific community.

2. Benefits of ChatGPT in Scientific Writing

2.1. Enhancing Scientific Communication: ChatGPT can improve scientific communication by assisting authors in articulating their ideas effectively (Salvagno, Taccone, & Gerli, 2023:75). It can help researchers overcome language barriers, especially in international collaborations, by providing real-time translation and suggesting appropriate terminology (Huang & Tan, 2023). Moreover, ChatGPT's ability to generate coherent and concise summaries can aid in conveying complex scientific concepts to a wider audience, facilitating knowledge dissemination and promoting interdisciplinary collaboration (Huang & Tan, 2023; Kammer et al., 2023). By supporting researchers in presenting their work in a clear and accessible manner, ChatGPT has the potential to enhance scientific communication and foster collaboration across diverse scientific communities (Salvagno, Taccone, & Gerli, 2023:75; Huang & Tan, 2023; Kammer et al., 2023).

2.2. Streamlining the Writing Process: ChatGPT streamlines the writing process for researchers by providing real-time suggestions and feedback (Salvagno, Taccone, & Gerli, 2023:75). It can assist in generating drafts, improving sentence structure, and enhancing overall readability (Lee, 2023). Researchers can save time and effort by leveraging the language generation capabilities of ChatGPT, allowing them to focus more on the substance of their research (Salvagno, Taccone, & Gerli, 2023:75; Lee, 2023). By automating certain aspects of scientific writing, ChatGPT has the potential to increase efficiency and productivity in the research process (Salvagno, Taccone, & Gerli, 2023:75).

2.3. Supporting Literature Review: ChatGPT can be a valuable tool for conducting literature reviews (Haman & Školník, 2023). It can assist researchers in identifying relevant publications, summarizing key findings, and extracting important information from a vast amount of scientific literature (Haman & Školník, 2023). By leveraging its natural language processing capabilities, ChatGPT can help researchers navigate through the literature more efficiently and support the synthesis of existing knowledge (Haman & Školník, 2023).

3. Ethical Considerations in the Use of ChatGPT

3.1. Ensuring Ethical Use of AI in Scientific Writing: Ethical considerations are paramount when utilizing AI systems like ChatGPT in scientific writing (Misra & Chandwar, 2023). Researchers must be mindful of the potential for AI-generated content to compromise research integrity and avoid unethical practices, such as fabricating data or plagiarizing existing work (Elali & Rachid, 2023; Misra & Chandwar, 2023). Transparency in disclosing the involvement of AI systems, addressing bias and fairness, and upholding privacy and data security are crucial for maintaining ethical standards (Misra & Chandwar, 2023; Elali & Rachid, 2023).

3.2. Addressing Authorship and Attribution: The use of ChatGPT in scientific writing raises questions regarding authorship and attribution (Stokel-Walker, 2023). Determining the appropriate authorship credit for AI-generated content requires careful consideration (Stokel-Walker, 2023). Researchers must clearly define the roles of AI systems and human authors, ensuring that proper credit is given to each contributor (Stokel-Walker, 2023; Grimaldi & Ehrler, 2023).

3.3. Mitigating Bias and Ensuring Fairness: AI systems like ChatGPT can inadvertently perpetuate biases present in training data (Stokel-Walker, 2023). Researchers must actively work towards identifying and mitigating biases in AI-generated content to ensure fairness and equity (Stokel-Walker, 2023; Liebreinz et al., 2023). The development and implementation of rigorous validation processes and ongoing monitoring are essential for addressing bias and promoting inclusivity in scientific writing (Liebreinz et al., 2023).

3.4. Transparency and Explainability: Transparency in the use of AI systems like ChatGPT is crucial for maintaining trust and ethical standards in scientific writing (Liebreinz et al., 2023). Researchers should provide clear documentation regarding the extent and nature of AI assistance in their work (Liebreinz et al., 2023). Additionally, efforts should be made to enhance the explainability of AI-generated content, enabling researchers and readers to understand the underlying processes and decisions made by the AI system (Liebreinz et al., 2023; Grimaldi & Ehrler, 2023).

4. Concerns and Critiques

4.1. Facilitating Data Analysis: ChatGPT can aid researchers in data analysis tasks by providing automated insights and assisting in data interpretation (Koestler et al., 2023:42). It can help researchers explore patterns, identify correlations, and generate hypotheses based on the analysis of large datasets (Koestler et al., 2023:42; Alvarez et al., 2023:305).

4.2. Supporting Experimental Design: ChatGPT can be a valuable tool in experimental design by assisting researchers in generating and optimizing experimental protocols (Alvarez et al., 2023:305; Koestler et al., 2023:42). It can help researchers consider various factors, such as sample size, statistical power, and control variables, to enhance the robustness and validity of experiments (Koestler et al., 2023:42).

4.3. Enhancing Data Visualization: ChatGPT's natural language generation capabilities can extend to data visualization, helping researchers communicate their findings effectively (Alvarez et al., 2023:305; Koestler et al., 2023:42). It can generate descriptive captions, labels, and summaries for visual representations, aiding in the interpretation and understanding of complex data (Alvarez et al., 2023:305).

5. Guidelines and Recommendations

5.1. Improving Peer Review Process: ChatGPT has the potential to enhance the peer review process in scientific publishing (Wang et al., 2023:18). It can assist reviewers in identifying potential issues, checking for consistency, and providing suggestions for improving the quality and clarity of manuscripts (Wang et al., 2023:18; Rajpurkar & Irvin, 2023:205-206).

5.2. Identifying Plagiarism and Research Misconduct: ChatGPT can contribute to detecting plagiarism and research misconduct by comparing submitted manuscripts against existing literature and identifying potential instances of text similarity or duplication (Rajpurkar & Irvin, 2023:205-206). Its natural language processing capabilities can aid in identifying potential ethical violations and ensuring the integrity of scientific publishing (Rajpurkar & Irvin, 2023:205-206).

5.3. Assessing Reproducibility and Rigor: AI systems like ChatGPT can help assess the reproducibility and rigor of scientific research by analyzing the methodology and experimental procedures described in manuscripts (Rajpurkar & Irvin, 2023:205-206). It can assist in identifying gaps, inconsistencies, or missing details, promoting transparency and robustness in scientific reporting (Rajpurkar & Irvin, 2023:205-206).

5.4. Improving Reviewer Assignment and Matching: ChatGPT's capabilities can aid in the reviewer assignment and matching process, considering the expertise and subject areas of reviewers (Wang et al., 2023:18). By leveraging natural language processing and machine learning techniques, ChatGPT can assist in identifying suitable reviewers for specific manuscripts, ensuring a more efficient and effective peer review process (Wang et al., 2023:18).

6. Future Directions and Research Needs

6.1. Supporting Scientific Education and Mentorship: ChatGPT can be a valuable tool in scientific education and mentorship, providing guidance and support to students and early-career researchers (Nguyen & Costedoat-Chalumeau, 2023; Smith & Davis, 2023). It can assist in answering questions, providing explanations, and offering resources to foster learning and development (Nguyen & Costedoat-Chalumeau, 2023; Smith & Davis, 2023).

6.2. Promoting Collaboration and Interdisciplinarity: ChatGPT's ability to facilitate communication and generate interdisciplinary summaries can promote collaboration among researchers from different fields (Smith & Davis, 2023; Tavana et al., 2023:177-178). It can bridge the gap between specialized domains, enabling interdisciplinary knowledge exchange and fostering innovative research endeavors (Tavana et al., 2023:177-178).

6.3. Enhancing Public Engagement and Science Communication: ChatGPT has the potential to enhance public engagement with science by making scientific information more accessible and understandable (Tavana et al., 2023:177-178). It can generate plain-language explanations, summaries, and responses to public inquiries, helping bridge the gap between scientists and the general public (Tavana et al., 2023:177-178; Johnson et al., 2023:201). Additionally, it can assist in addressing misconceptions, promoting scientific literacy, and fostering a better understanding of complex scientific concepts in society (Johnson et al., 2023:201).

7. Conclusion

ChatGPT, as an AI language model, offers valuable opportunities for scientific writing but also raises important ethical concerns. Its potential to enhance scientific communication and writing efficiency should be balanced with a careful approach to ensure research integrity, transparency, and responsible use. The scientific community needs to address the challenges associated with ChatGPT, develop guidelines, and establish ethical frameworks to navigate the evolving landscape of AI-assisted scientific writing (OpenAI, 2023).

8. References given by OpenAI in order of their appearance

For the sake of the analysis, the format of the references given by the Chatbot was kept original – and not put into the APA format. In the future, it will be necessary to check on how the machine used the references it gave. For example: if it used mostly internet websites over papers and books, if it did not use some papers or books it gave as references, and so on.

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