VIEWPOINTS

ChatGPT for e-Tourism: a technological perspective

Luisa Mich[1] · Roberto Garigliano[2]

Abstract

The interest around the conversational system ChatGPT has exploded since OpenAI launched the GPT-3 prototype at the end of November 2022. Applications of ChatGPT could be disruptive for the digital transformation processes, challenging societies, companies, and people in a possibly unprecedented way. Alongside remarkable performances, there are risks related to its intrinsic limitations. In this viewpoint paper we introduce ChatGPT, highlighting its main characteristics, with the aim of offering some general and preliminary guidelines for its adoption in the tourism field.

Keywords ChatGPT · Language model · Natural Language Processing · Chatbot · Semantics · Consciousness

1 Introduction

ChatGPT is possibly the buzzword of the day for Artificial Intelligence (AI). Such explosion of interest is evidenced by not only the high number of scientific papers, interviews to AI experts, conferences sections but also public media such as articles in trade magazines, user generated content, podcasts, TV programs, etc. Above all, a significant indicator of the popularity of ChatGPT is the huge number of its users (Buchholz 2023)[1]. On all the communication channels, from the most technical to the

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[1] Due to the quick development of ChatGPT and to the huge interest in it, the related references have to be understood as examples of the large, mainly online, available contents on ChatGPT.

✉ Luisa Mich
luisa.mich@unitn.it

[1] University of Trento, Trento, Italy

[2] Journal of Natural Language Engineering (Founding Editor), Cambridge, UK

popular ones, comments range from enthusiastic feedback and surprise reactions to alert and danger warnings (Chomsky 2023).

Applications of chatbots (and AI in general) have been proposed and adopted in a variety of areas and in many cases have already caused decision makers to evaluate their impacts, but ChatGPT has changed the scenario on a much greater scale. As a conversational system, its features allow it to go far beyond the classical chatbots, and its potentialities are far from being fully understood. ChatGPT can be used for a variety of tasks and applications, for the creations of news, reports, essays, translations, software, and many more (Mearian 2023; Edwards 2023). All of these are discussed as regards their originality, accuracy, need to identify the AI generated content, questioning issues typical for many AI tools, even in an unexpected manner. Among them are explicability, responsibility, trustworthiness, and legality (Weinstein 2023). Obviously, it cannot be a goal of this paper to fully review the variety of application scenarios, reactions, and open questions. Even focusing on the tourism sector, which often pioneers digital solutions, such an objective could be overwhelming.

The role of ChatGPT in the context of the digital transformation is undeniable, but, as researchers, we need to carefully identify and evaluate the claims related to it. In this paper, we will illustrate the main characteristics of ChatGPT as a language model, in order to explain the 'technical' reasons of its success and of its limitations. Focusing on possible applications related to e-tourism,[2] the paper offers some general guidelines on the use of ChatGPT. Being a relatively new system, at least in terms of availability to the public, these suggestions have to be both adapted to the specific project and carefully implemented due to the limitations and the constant changes of the conversational system. The conclusions offer some reflections on the future impacts and on the main open questions.

2 ChatGPT: technological capabilities and applications

ChatGPT - acronym of Generative Pre-trained Transformer - is a language model and a chat tool designed and implemented by OpenAI, who introduces itself as "an AI research and deployment company. Our mission is to ensure that artificial general intelligence benefits all of humanity." (https://openai.com/about). ChatGPT can describe itself in an accurate (and somehow disquieting) way answering a user's question; try for example "I need a description of you for a journal. Can you help me?" (https://chat.openai.com).

As a chatbot, ChatGPT's roots are in the first AI systems mimicking conversations in a specific domain, as the pseudo-psychiatric expert system Elisa (Weizenbaum 1966). In the past few years, chatbots have been adopted to support online customers' services, in users' assistants (e.g., Alexa (Hardesty 2022), or Siri (Siri Team 2017)), in automotive voice assistant (Capgemini 2019) and many more. Chatbots have also

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[2] e-tourism can be defined "as everything that happens electronically related to the travel and tourism industry/experience; more formally it is defined as the design, implementation and application of IT and e-commerce solutions in the travel and tourism industry" (Werthner et al. 2015). See also (Xiang et al. 2020).

been exploited in recommendation systems, to help users to interact more naturally while allowing companies to reduce human intervention (Jannach 2023). Tourism operators have been using chatbot-based recommender systems for customer service, e.g., to give suggestions for travel or hospitality services, but also to support decision about where to go on holiday and what to do during it (Camilleri and Troise 2023).

As a user, we all experienced a large variability of their performances, ranging from human-like conversations to disappointing situations in which chat-based services are useless for non-standard questions. The reason is in the inherent complexity of natural language and in the limitations of the natural language processing (NLP) systems (Mich 2020). To date, none of them can use natural language as we do. ChatGPT's popularity is due to the fact that it can perform that much better and on a wider scale than all the NLP systems realized so far. This duality is the context for any discussion about ChatGPT.

There are different approaches to analyzing natural language input and to answering questions in an appropriate way by generating narrative texts. Basic approaches for chatbots implement (statistic) algorithms in which a textual input is compared with textual patterns in the stored texts and matched with the most 'adequate' output. More recent approaches use machine learning AI algorithms of different complexity and exploit big data to achieve a higher level of conversational naturalness (IBM n.d.). Tools like ChatGPT have been implemented thanks to progresses in NLP, that in turn have been realized thanks to the huge advances in hardware and software resources.

Put in simplified terms, ChatGPT, which is much more than a chatbot, takes advantage of both classical approaches to NLP: the logic-based and the statistic-based. The first one can be perceived from the rational nature of its answers, the second is related to the nature of AI training algorithms. [3] From a computer science point-of-view, ChatGPT is a huge system, exploiting sophisticated algorithms, integrating a large variety of software modules, trained with an increasing amount of data extracted from many online sources and adding information gathered from the conversations with the users (Hui 2023). The problems to be addressed in such a large-scale, multilanguage, domain-independent system, explain the enthusiasm for its performances and, at the same time, justify its défaillances.

The list of tasks and activities that can take advantage of ChatGPT is very long (Gruetzemacher 2022), and open to new and un-explored applications. It cannot be otherwise, given that natural language is potentially everywhere in the field of information technology.[4] Besides, the conversational interface allows everyone to use ChatGPT, both in terms of usability, but also as a free service according to the OpenAI mission. In addition, ChatGPT can be used as an interface to existing digital tools and technologies. All these characteristics allow everybody to use ChatGPT to

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[3] A detailed explanation of the models, the algorithms, and the software is given on the OpenAI website. See also (Zhou 2023).

[4] ChatGPT has also revived the debate on Artificial General Intelligence (Marcus 2022; Altman 2023). Besides, other large scale language models (LLMs) (Eliaçk 2023) are being made available (FreeAI will be an "open source, free, distributed and decentralized AGI" system on 12 March 2023, http://freeai.io/; on 24 February 2023, MetaAIreleased LLaMA (Large Language Model Meta AI) as an open-source system (not a public Chatbot) that AI developers can request access to (Touvron et al. 2023).

generate content in different forms and according to a specified 'style'.[5] For example, ChatGPT can be used to write and summarize texts, also in different languages, to create images (https://openai.com/dall-e-2/) and videos, to write and test software programs, to improve online search, to use meeting tools more effectively, etc.

Some of these tasks have started many years ago in chatbots and other linguistic tools, but ChatGPT has been a quantum leap. For example, news agencies and journalists have been using AI tools to write articles and press reviews and to update website content. ChatGPT can also be used to emulate a consultant, to ask for advice and ideas, to solve a problem or to design a project. Less obvious are its applications for tasks considered creative in the furrow of the AI art in all its forms such as pictures, music, and lyrics, and to design and solve video games. This has generated a global discussion on the impacts, the performances and the risks related to the use of Chat-GPT in different sectors, from business to education, from politics to labor market, to name just some of the most relevant ones.

Focusing on e-tourism, ChatGPT has been challenging all the big players since its inception – on both the supply and the demand sides – to understand its potentialities. Digital companies offering booking services such as OTAs, web agencies, and other tourism stakeholders are closely following the sign of changes related to first tests and experiences with ChatGPT. The recurrent question is "What can we do with ChatGPT?" There are many examples of informal reports of usage, but there are not as yet many cases of successful applications or of systematic studies.[6]

That is why we propose to frame the problem of ChatGPT in e-tourism according to the information system viewpoint (Piccoli and Pigni 2021). In this way, we can state that ChatGPT can be used to support all the different levels of activities in a company or organization, from operational to tactical and strategic decision making, in any of its functional areas. But more importantly, it can instigate changes involving all their processes.

A variety of capabilities, for which ChatGPT may be used in e-tourism, which we know can only be partial, include:

- identification of new target markets, e.g., for a mature destination or for a new tourist product;
- development of new products, e.g., to deal with climate change challenging ski resorts;
- design and implementation of marketing strategies and campaigns, e.g., to promote new tourism destinations;
- support to operational and management activities, e.g., supporting hotels to deal with human resources shortage;
- improved customer services, e.g., offering more customized travel advice;
- personalize customer experience, e.g., identifying original events during the holiday based on the expectations of the tourist;

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[5] The authors have not used ChatGPT to write this paper. One of the problems for scientific papers will be how to check the contribution of that tool vs. the human contribution (Clark 2023).

[6] Problems related with the ChatGPT's impact on research are illustrated in (van Dis Eva et al. 2023).

- innovate business process, e.g., OTAs have to change their services integrating or revising holiday plans created by conversations with ChatGPT;
- ….

None of the items in the list is new, as for all of them digital technologies already offer a wide range of solutions. For example, AI tools are already used in recommendation systems and in trip planning systems. What is new is the ways in which each of them might be improved or innovated using ChatGPT. Therefore, the most important question is not "What can we do with ChatGPT?", but "How can we use it for …?" regarding each of the above, which, in turn, raises an array of more focused questions, as for example: "How will ChatGPT change the way tourists plan their holiday?", "How will ChatGPT change the offer?", "How can we support sustainability projects", etc. Discussions on those issues have started on many blogs and social networks, such as, for example, on LinkedIn (https://www.linkedin.com), or Phocuswire (https://www.phocuswire.com). A comprehensive discussion about ChatGPT in e-tourism could benefit from the conceptual framework of five layers proposed in (Werthner et al. 2015) to identify and organize research topics in e-tourism: (1) individual, (2) group/social, (3) corporate/enterprise, (4) network/industry, and (5) government/policy. Along those lines, we propose a forum dedicated to the definition of a manifesto for the future application and research issues in ChatGPT and tourism.[7]

Another relevant aspect is the fact that ChatGPT, thanks to the accessibility of its services to the final users[8] (everyone has access to it), might change the information equilibrium, in the way the Internet did, disrupting tourist companies' business models with changes that are hard to predict.

3 ChatGPT's limitations and risks

ChatGPT has been trained using different kinds of AI algorithms, supervised machine learning and reinforcement machine learning.[9] OpenAI has developed different versions of large natural language models: with each new version, the quality is getting significantly better. The prototype launched in November 2022 was GPT-3. A new version, GPT-4 has been announced for spring 2023.

The success of ChatGPT can be attributed to the following aspects:

- Its outputs sound very natural, possibly better than many human generated texts.
- The online prototype can be used by everyone. One can try it on the official website, but there are also other possibilities, for example as a Chrome extension.
- A number of related software resources are available to developers for free.

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[7] Given the disruptive potential of LLMs, the research community needs to organize an urgent and wide-ranging debate. We thus believe that every research group should have a meeting to discuss ChatGPT and try ChatGPT for themselves (if they haven't done so already).

[8] 'User' here is intended as 'user of the conversational system', not only the customer or the tourist.

[9] A detailed explanation of the generative pre-training (GPT) method is given in (Zhou et al. 2023). A description of the Reinforcement Learning from Human Feedback (RLHF) is described at https://openai.com/blog/chatgpt.

- It supports, albeit at a different level, many languages.
- It has been trained on very large datasets, covering many topics.

There are a number of limitations and risks that have to be considered when using ChatGPT:

- None of the existing language models 'understand' what is said. In technical terms, none of them deals with the semantic content of the input. The result is that ChatGPT has no idea of what it is talking about, nor of the implications of what it says, i.e., it has no consciousness.[10]
- It has been trained with multiple datasets and corpora, using input from the Internet and from the interactions with its users. As a consequence, information can be inaccurate or wrong, according to the GIGO (Garbage-In, Garbage-Out) concept. Errors in the output can derive from errors in the data, but also from the extraction algorithms and finally from the output generation algorithms.
- In general terms, ChatGPT is a multisource system, whose output has to be considered as secondary sources; however, the problem is that it is not always possible to find the input used by the system, which would be critical for fact-checking activities.
- Due to the machine learning algorithms used to train the system. ChatGPT is not able to (fully and rationally) explain its output, raising issues of transparency and responsibility (ACM 2022).
- It has been trained with datasets updated to 2021, so any application needing more recent data has to integrate such data directly in the system.
- ChatGPT has no moral views and cannot reason on what is right or wrong. Prejudices are in the data: they cannot be fully eliminated with the existing language model. This problem is shared by other AI systems, like Tay (Lee 2016) and Galactica (Douglas Heaven 2022), but ChatGPT seems able to deal better than them with 'toxic' content.[11]
- Inaccurate information can be spread out very quickly and used to create fake content and fake websites to impact Search Engine Optimization (SEO) results.

With the above characteristics in mind, it is not surprising to see the large number of off- and on-line comments on ChatGPT reporting a variety of negative issues and examples of poor or wrong output: "It creates content out of what is already out there, with no authority, no understanding, no ability to correct itself, no way to identify genuinely new or interesting ideas." (Lowrey 2023).

It is more important to consider that all of the above risks are amplified by scale factors typical of the network effects, both in size and time. ChatGPT creates new content quickly, with almost no human effort, in large quantity, with a quality that could be adequate for many tasks. But all these features come with the same scale for

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[10] The role of consciousness in AI has been discussed since its inception (McDermott 2007).

[11] ChatGPT limits bias and harmful content applying 'guardrails', tools able to detect harmful content in training data. To date, such content has to be manually classified and filtered, with negative impact on the people who have to do this work (Perrigo 2023). This is not a new problem, see e.g. (Criddle 2021).

negative impacts, which can be huge and too fast to be controlled. As is the case with all technologies, the same features of ChatGPT can be used in a positive or negative way. Here are some examples:

- facilitating e-mail marketing campaigns, but also helping hackers to improve their phishing emails;
- supporting non-English-speaking authors to write scientific papers focusing on method and results, but also increasing 'cheating' (Baquero 2022);
- improving security procedures, analyzing malware or other algorithms, but also writing new ones;
- making propaganda campaigns more persuasive but increasing the risks of misuses (Manson 2023).

4 Guidelines to ChatGPT adoption

The multi-stakeholder and information-based nature of the tourism sector is pushing firms and stakeholders towards the adoption of ChatGPT. ChatGPT can be used to create new digital solutions and to innovate the existing ones. Here are some general and preliminary guidelines.

Integration with existing databases. ChatGPT can be used to exploit companies' big data on reservations, reviews, preferences, etc., integrating such proprietary information with the huge amount of data ChatGPT already uses. For example, an OTA might adopt ChatGPT, combined with its own data, to implement a chatbot for trip planning that answers users' questions in almost real time and in a personalized way.[12]

Specialization for given domains. For applications requiring information that ChatGPT cannot offer in its core version, it is possible to add specialized information sources – databases, knowledgebases, but also real time input from sensors systems, or in general from cyber-physical systems. Such input could be pre-processed to guarantee the quality needed for a specific application, e.g., in terms of accuracy for travel or accommodation services.

Exploitation of OpenAI resources. OpenAI has developed, and made available, online software resources that can be used by developers to design new digital solutions that so far required considerable investments of money.[13] This opens new opportunities for small companies. For example, training a robot to allow a user to interact with it in a human-like conversation. Translation features could be added to

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[12] See for example the Microsoft announcement, https://www.cnbc.com/2023/02/07/microsoft-will-offer-chatgpt-tech-for-companies-to-customize-source.html.

[13] For example, OpenAI has made available models on their API, to give "developers access to cutting-edge language (not just chat!) and speech-to-text capabilities".

tourist apps in order to enhance their interactions during a trip. In a near future, OpenAI ChatGPT technology could be trained by companies for their individual needs, and to develop their own chatbots.

Integration with other AI tools. There are a variety of AI tools (see for example https://www.futuretools.io) that could be integrated to generate and improve the quality of multimedia content, e.g., for a tourism destination website, polishing texts, and images, creating video for events, including personalized descriptions on the flight, adding personalized geo-tagged information, etc.

Integration with existing digital technology. For example, ChatGPT can be connect to Google Maps to better support trip planning (https://journeai.com), or to control robots and to interact with them, e.g., for concierge robots.

Development of new use cases. This last guideline is the most important one. It suggests to 'invent' new uses of ChatGPT, looking forward to the uses no one has even thought of yet, starting from objectives and needs. Any tourism stakeholder's needs, from satisfying those already known in a new way, to discovering unexpected and henceforth useful features in order to increase competitive advantage. Such needs could be identified looking for solutions to big problems challenging tourism, as climate change and sustainability.

Other recommendations for the application of ChatGPT related to its limitations are as follows:

- Performances required for a given task have to be defined in terms of recall, precision, and accuracy. Due to inaccurate data, for each ChatGPT application, we should evaluate the time to check the reported fact (for which sources could not be found in some cases) with human expertise. For many tasks, 'almost correct data' are not acceptable, e.g., timetables or prices. That is why some of the tourism stakeholders which are already providing services with their AI-based information systems do not necessarily need to use ChatGPT.
- If ChatGPT will be adopted as an interface in many tools in order to establish a kind of standard for online dialogues, it could help to increase users' trust with more human-like interactions (Sorrells 2023), thanks to dialogues instead of filling in forms or personalizing filters etc., and to truly customized suggestions. To this end usability issues have to be carefully addressed.
- Fact-checking requires experts, and this is a challenge to the educational institutions. Some of them have banned the use of ChatGPT, while others are evaluating policies with which to help students in order to prepare for a future in which AI plays a relevant role (Villasenor 2023).

5 Conclusions

In this paper we have tried to answer, in a preliminary fashion, the main questions raised by the adoption of ChatGPT; we have also tried to underline the potential risks associated with ChatGPT. Among the many questions we have to face, one certain thing is that it will be more and more difficult to distinguish human-generated contents from AI-generated ones: any new communication may have been written with the help of a system like ChatGPT, raising a number of concerns. Besides, ChatGPT is a large and complex system.

Focusing on an issue that is very relevant for a journal like the one you are reading, ChatGPT has already been used to write scientific papers, sometimes added as co-author. How to deal with the problem of authorship is a question that must be answered quickly: OpenAI guidelines say that author should identify the use of content generated by ChatGPT and that the responsibility of such content is with the author (Baquero2022)[14].

Effective applications, future impacts, and the long-term implications of a technology like this are difficult to identify and to estimates. "It is very easy to underestimate the power of increasingly large AI models. Things that seemed like science fiction only a few months ago are rapidly becoming reality" (Welsh 2023). However, we are still far from having a system that is able to 'understand' what it says and to justify its 'suggestions': in a word, a system with some 'consciousness', or, at least, with some self-awareness. On the one hand, researchers in AI are aware that ChatGPT is far from being intelligent (Garner and Marcus 2023); on the other hand, there is a race to build the winning applications, involving many big players.[15]

Among the most debated issues relevant to the tourism sector and beyond are the following:

- the job loss (Lowrey 2023), which is already changing web agencies and, in general, content creators;
- the impact on search engines due to the integration of AI generative systems (Marcus 2023);
- the need of new business models to manage changes due to costs of ChatGPT (some have estimated that ChatGPT queries cost a few cents each vs. less than a cent for more traditional queries, https://twitter.com/debarghya_das/status/160575 5768099045377?s=20&t=FyesjSBId6GIMfnYO3mHGg).

The enthusiasm around ChatGPT would possibly give way to more useful and focused reflections. The scope, and the scale, of actual and potential ChatGPT applications urge all of us to study very closely all the related aspects. It is not an easy objective,

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[14] Springer has introduced the following rules for its journals: "Large Language Models (LLMs), such as ChatGPT, do not currently satisfy our authorship criteria. Notably an attribution of authorship carries with it accountability for the work, which cannot be effectively applied to LLMs. Use of an LLM should be properly documented in the Methods section (and if a Methods section is not available, in a suitable alternative part) of the manuscript." (https://www.springer.com/journal/40558/submission-guidelines#Instructions%20for%20Authors_Text)

[15] Besides, ChatGPT may be challenging their business models, e.g., Google's search engine (Gow 2023).

also due to conceptual limitations. According to Bertalanffy (1969), systems show emergent behaviors, and we are not able to fully understand how large AI models work (Brown et al. 2020).

Initiatives, like those promoted by the digital humanism community, have started to interrogate themselves about such technology and its impacts in a multidisciplinary and comprehensive way (Werthner 2022). The staggering differences in quality and complexity of tools as ChatGPT confirm that this is the only way to address present and future problems.

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