Intelligent Smart Tourism Education: AI-based Learning for Cultural Tourism Experiments

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Abstract

Self-learning and active learning are becoming key focal points in the digital era, where the demand for online learning is growing. This is particularly important for the education of smart tourism guides within the context of cultural tourism. In this paper, we present some experiences obtained within the context of the Digital Tourism Course at the University of Rome Tor Vergata over the past two years. The focus is on enhancing self-learning skills through the use of AI generative techniques and its role in digitalizing cultural tourism. We also provide comparisons and discussions on the reported advantages.

Keywords

Smart cultural tourism, inclusive learning, self-learning, AI, generative models

1. Introduction

The integration of artificial intelligence (AI) in education, particularly in the field of digital tourism, is a growing area of interest. Xing (2022) and Cesta (2020) both emphasize the potential of AI in personalizing learning experiences, with Xing focusing on the design of a tourism teaching system and Cesta on the use of intelligent tools for cultural heritage visits. Ferràs (2020) further explores the application of AI in tourism, highlighting its role in creating customized experiences. Morellato (2014) adds a new perspective, proposing an experiential approach to developing digital competence in tourism education, which could be enhanced by AI-driven personalization and active learning. These studies collectively underscore the potential of AI in transforming the learning experience in digital tourism, from personalized teaching systems to the creation of tailored tourist experiences.

In recent years, the integration of artificial intelligence (AI) into education has been rapidly advancing, offering promising opportunities for enhancing learning experiences. One of the notable applications of AI in education is AI-assisted learning, which leverages machine learning algorithms and natural language processing techniques to personalize and optimize the learning process for individual students. This introduction aims to provide an overview of AI-assisted learning, drawing insights from a survey of relevant literature.

AI-assisted learning encompasses a variety of techniques and technologies aimed at tailoring educational content, delivery, and assessment to meet the diverse needs and preferences of learners. As highlighted by [4], AI systems can analyze vast amounts of educational data, including student performance, learning styles, and knowledge gaps, to generate personalized learning pathways and recommendations. These systems can adaptively adjust the difficulty level of learning materials, provide real-time feedback, and offer additional resources or exercises based on individual learning progress and proficiency.

Moreover, AI-powered tutoring systems have shown great potential in providing personalized

support and guidance to students. For instance, intelligent tutoring systems (ITS) can simulate one-on-one interactions with students, offering immediate feedback, explanations, and hints tailored to their specific learning needs [2]. Through the use of natural language understanding and dialogue generation techniques, chatbot-based tutoring systems can engage in conversational interactions with learners, answering questions, clarifying concepts, and fostering a supportive learning environment [5].

Furthermore, AI-assisted learning extends beyond individualized tutoring to collaborative and social learning experiences. Social recommender systems can leverage AI algorithms to analyze learners' social interactions, preferences, and interests, facilitating the discovery of relevant learning resources and fostering peer-to-peer knowledge sharing [6]. Virtual collaborative environments powered by AI can enable students to engage in collaborative problem-solving, project-based learning, and group discussions, with intelligent agents providing guidance, coordination, and feedback throughout the collaborative process [3]. In this paper we outline some experiences obtained in the context of Digital Tourism Course at the University of Rome Tor Vergata in the last 2 years. The focus is on improving self-learning skills with the use of AI generative and its role in the context of cultural tourism digitalization motivated by several reasons as described in [1] in which the importance of academic role has been outlined.

2. Impact of AI in Providing Self-Learning Activities

The impact of AI in providing self-learning activities is profound and multifaceted. Here are several key ways in which AI influences self-learning:

- **Personalized Learning Paths**
  AI can analyze vast amounts of data about a learner's preferences, strengths, weaknesses, and learning styles to tailor educational content and activities to their individual needs. By understanding the learner's pace and level of understanding, AI algorithms can suggest appropriate resources, exercises, and challenges, thereby enabling self-directed learning that is customized to each learner.
- **Adaptive Learning Systems**
  AI-powered adaptive learning systems dynamically adjust the difficulty and pace of learning activities based on the learner's performance and progress. These systems can

provide personalized recommendations for activities that match the learner's current level of knowledge, ensuring that they are appropriately challenged without feeling overwhelmed or bored. By adapting to the learner's evolving abilities, adaptive learning systems promote continuous improvement and engagement in self-learning activities.

- **Intelligent Tutoring Systems (ITS)**
  ITS leverage AI techniques to simulate one-on-one tutoring interactions, providing personalized guidance, feedback, and support to learners. Through natural language processing and machine learning algorithms, ITS can understand the learner's questions, misconceptions, and learning goals, offering targeted explanations, hints, and examples to facilitate self-directed learning. By providing immediate and tailored assistance, ITS empower learners to navigate complex concepts and topics independently.
- **Recommendation Systems**
  AI-driven recommendation systems analyze learners' preferences, past interactions, and learning objectives to suggest relevant resources, courses, and activities for self-directed learning. These systems can recommend educational materials, such as articles, videos, tutorials, and online courses, that align with the learner's interests and goals, thereby facilitating serendipitous discovery and exploration of new topics. By curating personalized learning pathways, recommendation systems empower learners to take ownership of their learning journey and pursue areas of interest autonomously.
- **Natural Language Processing (NLP)**
  NLP technologies enable interactive and conversational interfaces for self-learning activities, such as chatbots and virtual assistants. Learners can engage in dialogue with AI-powered agents to ask questions, seek explanations, and receive feedback in natural language. By fostering interactive and responsive learning experiences, NLP-driven systems support self-directed inquiry, reflection, and problem-solving, enhancing learners' autonomy and confidence in their ability to learn independently.

Overall, AI plays a transformative role in enabling and enhancing self-learning activities by providing personalized guidance, adaptive support, curated resources, interactive interfaces, and actionable feedback. By leveraging the capabilities of AI technologies, learners can engage in self-directed learning that is tailored to their individual needs, preferences, and aspirations, thereby empowering them to become lifelong learners mastering new skills, acquiring knowledge, and achieving their educational goals autonomously.

3. Case Description: Self-Learning in Digitalization of Cultural Tourism

Digitalization of cultural routes is a key point used in the education of new generation of tour operators and smart guides. Self-Learning AI powered activities provide in this case a promising means to guarantee a flexible and dynamic learning process suitable in the new tourism era and in particular cultural tourism case. To demonstrate the applicability of AI based education in cultural tourism, we consider three examples used in the Rome Tor Vergata University.

3.1. Self-learning Platform for Cultural Travel Blog Design

A first Example of Digital Tourism learning activity is the digitalization of cultural routes emerging from the need to explore archeo sites and cultural heritage assets in a huge number of ways. As example of self-learning platform, we discuss the case of cultural travel blog designed for walking routes and denoted as cultural travel blog in which information is designed to offer comprehensive resources and interactive activities focused on the digitalization of cultural tourism. Learners have access to a variety of multimedia content, including articles, videos, case studies, and tutorials, covering topics such as digital marketing strategies for cultural attractions, virtual reality experiences in heritage sites, and augmented reality applications for guided tours.

3.1.1. Personalized Learning Paths

Upon accessing the platform, learners are prompted to create a profile where they can specify their interests, goals, and prior knowledge in the field of cultural tourism. AI algorithms analyze this information to generate personalized learning paths tailored to each learner's preferences and learning objectives. For example, learners interested in digital marketing may receive recommendations for articles and tutorials on social media advertising for cultural

destinations, while those interested in immersive experiences may be directed to resources on virtual reality technologies.

3.1.2. Chatbot Assistance

To facilitate seamless navigation and access to resources, the platform features a chatbot interface that serves as a virtual assistant. Learners can interact with the chatbot using natural language queries to request specific information or resources. For instance, a learner interested in learning about the use of augmented reality in cultural tourism may type "AR applications" into the chatbot interface. The chatbot then retrieves relevant PDF documents, articles, and videos from the platform's database and presents them to the learner for exploration.

3.1.3. Accessing PDF Resources

One of the key functionalities of the chatbot is its ability to provide access to PDF resources on demand. Learners can request PDF documents on specific topics by simply typing keywords or phrases related to their interests. For example, a learner curious about the impact of digitalization on cultural heritage preservation may type "heritage preservation" into the chatbot interface. The chatbot then searches the platform's repository for PDF documents, reports, or research papers related to the topic and presents them as downloadable resources.

3.1.4. Interactive Learning Activities

In addition to accessing static resources, learners can engage in interactive learning activities to deepen their understanding of digitalization in cultural tourism. These activities may include quizzes, simulations, virtual tours, and collaborative projects, allowing learners to apply theoretical concepts in real-world scenarios and gain hands-on experience in digital cultural heritage management.

3.1.5. Progress Tracking and Feedback

Throughout their learning journey, learners can track their progress and performance using built-in analytics and assessment tools. AI algorithms analyze learner interactions, quiz scores, and completion rates to provide personalized feedback and recommendations for further learning. Learners receive insights into their strengths and areas for improvement, empowering them to adapt their learning strategies and goals accordingly.

The self-learning platform for digitalization of cultural tourism offers a flexible and engaging educational experience, enabling individuals to acquire knowledge and skills at their own pace and convenience. By harnessing the capabilities of AI technologies and interactive resources, the platform empowers learners to explore the intersection of culture, technology, and tourism and become informed advocates for sustainable and inclusive digital practices in cultural heritage preservation and promotion.

3.2. Self-learning activities for local Smart Cultural Operators

As another example of the application of a self-learning platform, we highlight the case of Archeo Tutorial, implemented within the context of the ERASMUS+ project ADHOC. The platform's role is to enhance accessibility for users with disabilities. In this context, the platform has been equipped with a dynamic generative script for the text-to-speech function, allowing it to be seamlessly integrated into the original archaeological guide. Obviously, this generation can be put in the form of NLP by taking advantage from a chatbot interacting with PDF resources. This approach showcases how AI generative interaction with PDF resources can serve as a viable solution for self-learning activities aimed at educating cultural guides. This is particularly valuable in contexts where there is a need to extend cultural tourism learning to students with disabilities, as part of an inclusive learning program. For instance, in the case of translating cultural content into LIS (Italian Sign Language), the learning program is tailored for students who are already proficient in using LIS.

Figure 1 illustrates the impact of AI-powered learning methodologies on the education of local cultural guides. The diagram depicts the gains and benefits that could be achieved through the Master's program (see also 8]).
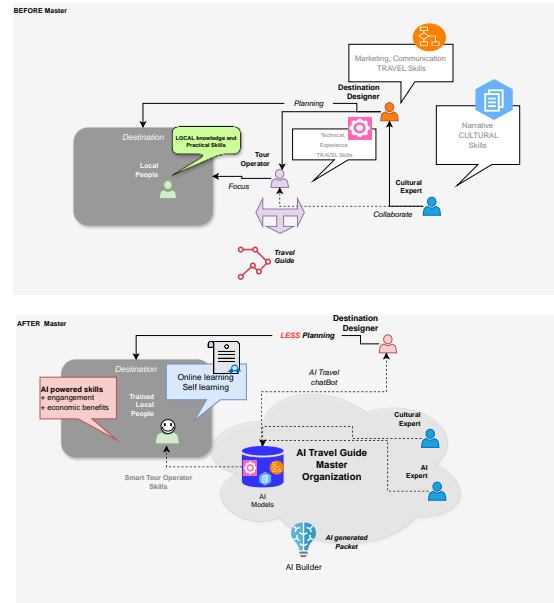

Figure 1: AI-Power Master of Local Cultural Guides Overview

3.3. Accessing a PDF Book on Cultural Routes in Rome

In this latter example, we aim to highlight an instance of an AI-powered application utilizing advanced AI-assisted self-cultural guidance. The learner communicates their interest in cultural routes in a densely populated cultural destination such as Rome through a natural language query to the chatbot. The chatbot recognizes the learner's request and responds by asking a PDF book.

Exploring historical cities like Rome can now benefit from a variety of digital tools (applications, augmented reality, chatbots, and interactive maps) that facilitate immediate access to the dense and hyper-dimensional fabric of data, stories, and paths related to the cultural components of the urban landscape. Particularly, the integration of intelligent chatbots and interactive maps, programmed with extensive databases of information, represents an innovative breakthrough in the cultural tourism sector capable of offering users immediate answers to specific questions, recommendations tailored to their interests and needs, as well as real-time updates on events in the explored context, significantly enriching the personal experience and making it unique and rich. In this regard, a case study aimed at optimizing the touristic exploration of Rome is proposed, based on the innovative integration of an advanced chatbot, built on generative artificial intelligence technologies, and Leaflet, an open-source platform for creating

interactive maps. This synergy specifically aims to offer a highly personalized tourist experience, within the scope of themes chosen by the user, encompassing a wide spectrum of cultural components of the urban landscape, from artistic and historical to enogastronomic elements. This system, named GuidaTuristicaAI (or AI-CH-Tour-Map), includes in its descriptions information drawn from a vast corpus of documents, ranging from books by illustrious visitors, literary works, and musical compositions, to enogastronomic guides about Rome over the centuries. Upon interacting with GuidaTuristicaAI, the user is invited to select one or more themes of interest to further personalize their exploration of the city. If the choice falls, for example, on literary works about Rome as a thematic filter, the chatbot searches its PDF document database to select those including literary references to Rome, extracted from works by famous authors who have described the city in their visits or narrative and poetic works. In the case study, it is imagined that an art history student plans a visit to Rome following the footsteps of Giuseppe Vasi. The chatbot suggests a series of publications. For example, they can download the PDF of one of the volumes from the open archive.org site or another source:(https://ia801006.us.archive.org/7/items/tesorosacroevene02vasi/tesorosacroevene02vasi.pdf) . Using the web application, the user receives a personalized itinerary with the sites described by Vasi. The generated interactive map allows him to easily navigate from one place to another, while the chatbot provides cultural and historical insights. The Leaflet mapping platform plays a crucial role in the implementation of this thematic customization. The dynamism of the real-time interaction between the user and GuidaTuristicaAI can indeed be enriched with specific points of interest identified on the map related to other themes selected by the user, allowing them to discover the city through different interpretative and perceptual lenses. For example, in accord to the literary theme, markers can be added to places mentioned in novels or poems, with short excerpts or quotes visible by clicking on the respective markers, emotionally connecting them to the places through the words of authors who have immortalized them in their works. Moreover, information can be provided on dining venues and typical Roman dishes and wines that can be paired with them.

4. Conclusions

From the outset and in the coming years, AI promises to play a decisive innovative role in the field of educational pathways, transforming and enhancing learning experiences through its technological features (intelligent tutoring systems and chatbots) that cater to the needs for personalization and adaptability. This work particularly investigates the importance and impact of AI, with a special reference to AI-assisted learning in the field of cultural tourism. There are several ways in which AI can be enabled for better personalization and improvement of the educational experience, namely customizing learning paths, advanced tutoring systems, recommendation mechanisms, and the use of natural language processing to enhance interaction and support for students. The research has specifically focused on the use of self-learning platforms in the production of blogs dedicated to cultural travel, emphasizing the importance of digitalizing cultural routes. Particular attention was given to specific use cases implemented at the University of Rome "Tor Vergata", highlighting how AI solutions can enable self-learning and accessibility for users with disabilities, aiming to ensure a better experience in their training for future professionals. AI can help and enhance a series of activities conducted in self-learning through personal guidance, adaptive support, and interactive interfaces to resources. It allows students to follow a self-regulated learning path that, according to their needs, preferences, and personal goals, enables approaches to lifelong learning, which can empower them to acquire new skills and knowledge entirely autonomously. Such flexible and interactive self-learning modalities can be effectively extended into digital tourism, facilitating experiences by any user in consuming cultural landscapes in a more accessible and engaging way.

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