Employing Artificial Intelligence to Enhance the Sustainability of Ecotourism (A case study of Lattakia Governorate)

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Abstract:

Eco-tourism constitutes one of the sustainable domains which a lot of the world countries seek to reach in today's world which witness an environmental awareness that goes in steady steps towards sustainability in all domains. This awareness goes side by side with rapid technological developments which greatly affects in achieving those sustainable steps through the intellectual and practical development in the technological and communication domain and the sub-techniques of the artificial intelligence which have been produced as a result of this development. The objective of this research is to know the role of the artificial intelligence in enhancing the sustainability of the eco-tourism projects in Lattakia governorate. To achieve the goal of the research it has been depended on the analytical descriptive method to describe and analyze the benefits of the investing the artificial intelligence on the sustainable of the eco-tourism projects depending on the techniques of the artificial intelligence represented by mechanical learning, deep learning, neural nets, expert systems, intelligent agents and the genetic algorisms. This study has reached several results the most important of which is that employing the artificial intelligence achieves benefits to the eco-tourism projects like predicting the tourist demand and support the sustainable activities and enhancing the competitive aspect.

Key Words: Artificial Intelligence, Sustainability, Tourism, Eco-Tourism.

توظيف الذكاء الاصطناعي لتعزيز استدامة السياحة البيئية
(دراسة حالة محافظة اللاذقية)

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الملخص:

تشكل السياحة البيئية أحد مجالات الاستدامة التي تسعى الكثير من دول العالم للوصول إليها في عالم اليوم الذي يشهد وعياً بيئياً يسير بخطوات ثابتة نحو الاستدامة في كافة المجالات. ويواكب هذا الوعي التطورات التكنولوجية السريعة التي تؤثر بشكل كبير في تحقيق تلك الخطوات المستدامة من خلال التطور الفكري والعملي في المجال التكنولوجي والاتصالات والتقنيات الفرعية للذكاء الاصطناعي التي تم إنتاجها نتيجة هذا التطور. يهدف هذا البحث إلى معرفة دور الذكاء الاصطناعي في تعزيز استدامة مشاريع السياحة البيئية في محافظة اللاذقية. ولتحقيق هدف البحث تم الاعتماد على المنهج الوصفي التحليلي لوصف وتحليل فوائد استثمار الذكاء الاصطناعي على استدامة مشاريع السياحة البيئية بالاعتماد على تقنيات الذكاء الاصطناعي المتمثلة في التعلم الميكانيكي، التعلم العميق، والشبكات العصبية، والأنظمة الخبيرة، والوكلاء الأذكياء، والخوارزميات الجينية. وتوصلت هذه الدراسة إلى عدة نتائج أهمها أن توظيف الذكاء الاصطناعي يحقق فوائد لمشاريع السياحة البيئية مثل التنبؤ بالطلب السياحي ودعم الأنشطة المستدامة وتعزيز الجانب التنافسي.

الكلمات المفتاحية: الذكاء الاصطناعي، الاستدامة، السياحة، السياحة البيئية.

Introduction:

Today's world is witnessing a rapid technological development that has a significant impact on the global economy. Technology has entered various economic and service sectors. Technological transformation has become a fundamental driver of structural and economic changes, which has contributed to improving the efficiency of services, developing innovations, and improving administrative and governmental work methods. With the development of the digital age , economic sectors have transformed to integrate new technologies to sustain the relationship between the producer and the consumer on the first hand, and adapt to the new system of things on the other hand (Stylianos. M .2021:4). Artificial intelligence has constituted an intellectual accumulative product of the of the digital age development, and also constituted a recent innovation that has grown and expanded in many business sectors, including the tourism sector, in which the use of artificial intelligence has become a must and necessary to maintain a sustainable character in a time of endless competition. The fact that tourism is one of the economic sectors most affected by the Internet and the introduction of automation into services highlights artificial intelligence as an important tool for ecotourism projects, coinciding with the environmental awareness witnessed in the last decades of the current century, which moved the environment from a marginal issue to a major issue driven by several factors such as consciousness and awareness of environmental problems, strict legislation and laws that attempt to preserve and sustain resources.

Importance of Research:

Its importance lies in addressing an important aspect of modern life, which is the entry of smart technologies into various economic fields, including the tourism field, and trying to understand the role of artificial intelligence in ecotourism projects, as it is expected that the results of this research will contribute to practical visions for those in charge of ecotourism projects to activate artificial intelligence in order to achieve the sustainability of these projects, and expand the market share of the eco-tourism destination, and its focus in an important position on the global map of ecotourism.

Research Objectives:

1- Clarifying the concept of artificial intelligence and introducing its technologies.
2- Introducing the elements of ecotourism in Latakia Governorate.
3- Highlighting the role of employing artificial intelligence techniques in supporting the sustainability of ecotourism projects.

Research problem:

Based on the fact that ecotourism is one of the aspects of sustainable development, and since it is a human activity that has negative as well as positive effects, governed by the forces of competition and the ability to survive and expand target markets, the research problem lies in answering the following question.
- Why is it important to integrate artificial intelligence technologies into ecotourism projects?
The following questions arise from this problem:
- What is artificial intelligence and what are its technologies?
- How can Artificial intelligence technologies be integrated into ecotourism projects?
- What is the benefit of integrating artificial intelligence technologies into ecotourism projects?

Research hypotheses:

1- Ecotourism constitutes a sustainable resource for achieving sustainable development.
2- Lattakia Governorate has tourism potential that qualifies it to stimulate sustainable ecotourism.
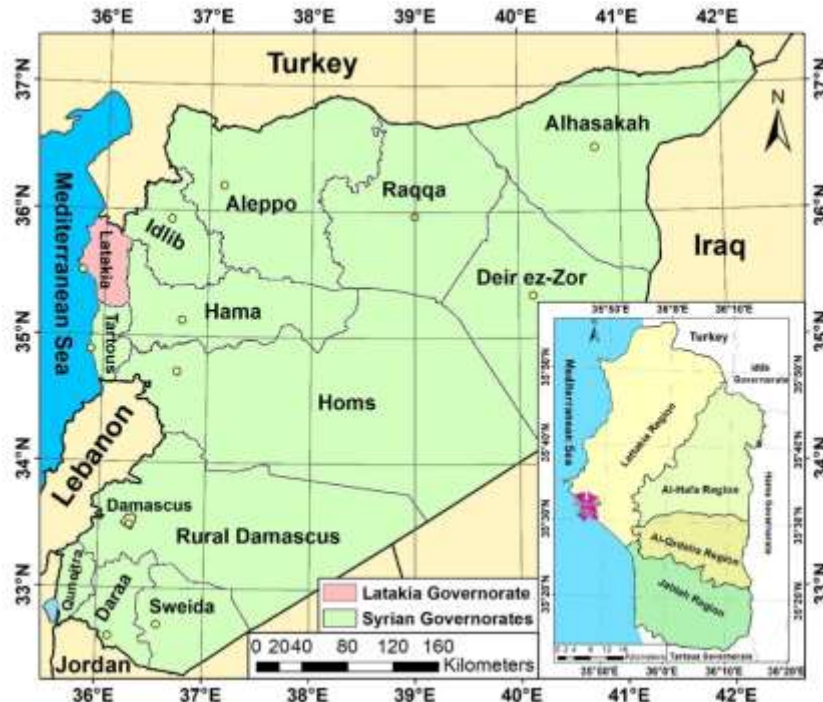3- Employing artificial intelligence applications positively affects the sustainability of ecotourism projects.

Research Methods:

1- Regional curriculum: it is used to study ecotourism in Lattakia Governorate with its administrative divisions.
2- Thematic approach: it is used to study the subject of artificial intelligence and ecotourism.
3- Inductive and deductive approach: it is used to study and extrapolate the necessary proposals to activate artificial intelligence applications in supporting the sustainability of ecotourism in Latakia Governorate

Research Limitations:

Latakia Governorate represented the spatial boundaries of the search with its administrative divisions and its boundaries, Map (1), as Latakia Governorate is located in the northwestern corner of the Syrian Arab Republic on the Mediterranean Sea, which borders it to the west, while it is bordered to the north by the Al Iskenderun District, to the east and northeast by the governorates of Idlib and Aleppo, and to the south by Tartous Governorate, and administratively divided into (4) cities, (30) towns, and (75) municipalities(BT

Walad.W, Kamash.F.A.2023.p4). The research was covered during the time period 2010/2023, thus forming its time limits.

Map (1) Location of Latakia Governorate and its Administrative Divisions

**Previous reference studies:**

- (Marzouki. 2021): The research aimed to shed light on the importance of artificial intelligence applications in the field of tourism, and the extent to which the Egyptian tourist destination benefits from these technologies, the researcher used the questionnaire as a tool for the study to identify the opinions of some employees of tourism companies, hotels and airlines in the Greater Cairo area about the benefit of the tourism sector in Egypt from artificial intelligence techniques and the problems facing achieving this, and the researcher reached a relationship between artificial intelligence applications and improving the quality of tourism services, and made some recommendations that would help Official authorities and tourism service providers to make the most of artificial intelligence applications, and overcome obstacles to their application.

- (Abul-Magd, et al. 2022): The study aimed to identify the latest technology and artificial intelligence techniques which are intertwined in the field of tourist guidance, and to show the extent of opportunities and challenges that faces the profession of tour guide. The study concluded that technology and artificial intelligence represent the biggest future challenges for tourist guides with their technologies, However, at the same time, it constitutes a great opportunity to enhance the sustainability of the tourist guide profession if it is employed correctly and innovatively, and it recommended to employ technology and digital devices as modern work tools which complete the traditional tour guide work tools instead of being a competitor to him.

- (Zayed. Zemmouri. 2021):The study aimed to highlight the importance of applying artificial intelligence techniques in the tourism field, and relied on the descriptive analytical approach in presenting concepts and reaching results, the most important of which was that the use of artificial intelligence greatly helps in collecting and analyzing tourist data, which increases the efficiency of the tourism sector, and the study recommended the need to provide study programs in artificial intelligence, support talents, encourage innovation and create the appropriate environment, and train workers within the tourism sector to use modern technology.

- (Jbeil. Lakhdari.2023):The study aimed to analyze and develop the Emirate of Dubai as a tourist destination and the extent to which artificial intelligence applications contribute to supporting it, and the researchers followed the descriptive analytical approach, and the research concluded that artificial intelligence in Dubai is witnessing a development after the adoption of artificial intelligence applications in the tourism sector, which led to an increase in tourism demand for it, and increased its competitiveness compared to Arab

countries, and the study recommended dealing with the dimensions of artificial intelligence applications as an urgent necessity in light of the current technological development.

- (Madurga. Mendez: 2023):The study aimed to collect the existing literature on tourism and artificial intelligence, and highlight the most important strengths and weaknesses by analyzing 31 articles on the application of artificial intelligence in tourism, so it reached a number of results the most important of which is the need for responsible and sustainable use of artificial intelligence in tourism, and the study recommended the effective and sustainable employment of artificial intelligence in the tourism industry, and stimulating scientific exploration about the relationship between technology and sustainability in the tourism sector.

First: The nature of artificial intelligence and its applications:

Artificial intelligence is a branch of computer science that enables machines to think similar to humans, and is defined as those characteristics of computer programs that make them able to simulate human mental abilities and their work patterns such as learning, deduction, and reaction to situations on which the machine is not programmed (Mohammed. 2021. p. 573). There are many applications of artificial intelligence, but specialists in this field have limited these applications to three areas (Natural environmental interface applications, natural languages, Smart science applications)(Zayed. Zamouri. 2021. p. 6).Since artificial intelligence is known for its advanced computing power, this enables it to deal with complex relationships and problems, and facilitate its work with large amounts of data, as artificial intelligence senses and understands external information, so that it works to achieve certain goals, learns from its own experiences, makes decisions, and deduces through certain data using smart machines (Kirtil.I.G. Askun.V.2021.p.206) and artificial intelligence branches off several techniques represented by Figure (1)
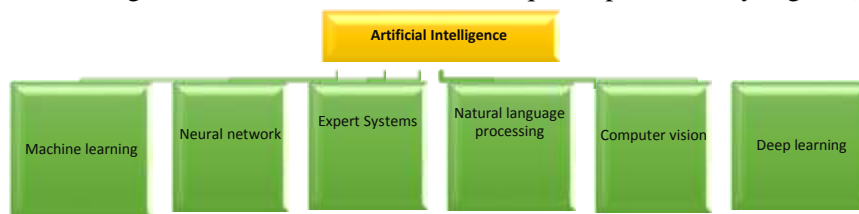
Figure 1 Artificial Intelligence Sub-Technologies
Source: Durmaz.Y, Baser.M.Y. 2023.P23

-Machine learning:It is a branch related to the ways in which the machine learns to perform certain tasks such as forecasting or classification based on existing data, and machine learning represents the ability of a computer system to learn and improve from the experience, Through algorithms that enable computing devices to learn and develop automatically through programs that are designed to generate ideas from the data presented to them and apply them to processes such as decision-making and predicting the future, it represents computer systems that develop automatically with experience by giving the machine the ability to learn and make decisions on its own without the need to program it by humans, so it learns from its previous procedures, stores data and benefits from it to improve performance in future tasks (Magdy. 2020, p. 6).

-Deep learning: It is a branch of machine learning used when the data being dealt with is too large to deal with and analyze appropriately using traditional artificial intelligence methods, and consists of multi-layered neural networks, The idea of deep learning is based on imitating the work of neurons in the human mind by creating an artificial neural network with different layers that can analyze huge amounts of unstructured data, which represent the input layer such as different languages and images, where it is translated by passing it through the neural network to identify it through several stages, and highlight it in the form of an output layer. Deep learning applications include the recognition of speech, images and sounds (Magdy: previous reference. p. 7)

-Neural networks: Neural networks are a computing system inspired by the human brain, which trains the machine to recognize and predict, neural networks represent circuits made up of a number of interconnected neurons organized hierarchically in layers, which are able to learn to perform very complex tasks of data. Each cell acts as a kind of specialized processing unit that converts input data into output signals. Then, gradually, the neurons collect their outputs layer by layer, until the network comes out with the final result (Abdul-Akher. 2024. p. 10).

- Computer vision: It is a science that studies how to see machines, and aims to build intelligent applications with the ability to understand the content of images such as the ability of humans to understand them, in the sense that the computer can have the ability to see, process and analyze the surrounding medium, and include

the use of computers and cameras instead of the human eye in tasks such as perceiving, identifying, measuring and tracking objects, and different vision systems have been developed from facial recognition, to systems that automatically describe microscopic images of cells (Durmaz.Y, Baser.M.Y, 2023:2)

-Natural language processing: It expresses how to program computers to process natural language correctly, and it is a sub-science of computer science that deals with learning in understanding and producing human language such as chat bots that mimic human language and respond to user questions (Durmaz.Y, Baser.M.Y, 2023:24)

-Expert Systems is a branch of artificial intelligence that uses certain expertise to solve problems at the human level through intelligent computer systems which have professional knowledge and experience capable of solving problems by building models that simulate people's ability to solve problems (Durmaz.Y, Baser.M.Y, 2023:24)

Second: The role of ecotourism in achieving sustainability:

Technological developments had a clear impact on the tourism industry at the beginning of the twentieth century, which radically changed the dynamics of work in the field of tourism, facilitating the provision of innovative tourism service, and contributing to creating unique experiences for tourists, which consequently reflected on tourism revenues on the one hand and the satisfaction and loyalty of tourists on the other (Marzouki: 2021. p. 29). However, the development of the tourism industry at an accelerated pace and the increase in tourist traffic were accompanied by many variables in the natural and cultural environment of the tourist destination, which was accompanied by changes in the desires and requirements of tourists who have become today more aware of the importance of this industry, and the importance of preserving its components, so the modern intellectual trend emerged that calls for preserving the elements of the tourism industry, and urges its sustainability, and a new type of tourists emerged with a new behavior represented in their pursuit of values and their orientation towards a tourism pattern based on nature in particular accompanied by an environmental awareness represented by the realization of the value of the inputs and outputs of this industry, This prompted many countries of the world to adopt new methods to preserve their environmental heritage (natural and cultural) in order to have a greater share in the tourism market, and to remain in the modern competitive field of the tourism industry. Ecotourism was the most prominent tourism pattern that fulfilled the desires and aspirations of these tourists on the one hand, and the preservation of the sustainability of natural and cultural resources on the other. Ecotourism was defined by the International Ecotourism Association in 1990 as responsible travel to natural areas aimed at preserving the environment and seeking to improve the quality of life in those areas (Honey M, 2008, p. 6). Ecotourism is a responsible transition aimed at visiting natural sites in order to enjoy nature and cultural attractions in the tourist destination, in a way that ensures the sustainability of natural sites and cultural heritage, in a way that achieves the least negative effects of the visit, and provides opportunities for economic and social participation of the local population (Al-Rawdia. 2013. p. 18), and is based on basic principles that highlight the importance of this tourism pattern, including (Muhammad.S.A, Nur al-Din. J. A. 2021. p. 10-11).

-Economic importance as the places of ecotourism often enjoy scarcity that can be used to achieve sustainable development, thus reaping profits, providing job opportunities, diversifying economic returns, sources of national income, infrastructure, and increasing government revenues.

-Political importance in achieving environmental security and maintaining ecological balance.

Social importance through the development of social relations, the development of communities and converting the isolated ones to open ones, the maintenance of a society in a state of permanent work and the mitigation of tourism seasonality .

- Cultural importance as it contributes to the dissemination of cultures, the dissemination of knowledge and the preservation of human cultural heritage

- Human importance, as it provides a beautiful life for man through rest and recreation, restoring vitality, activity, mental and emotional balance, and purity of the soul, which is a treatment for the diseases of the age.

- Urban importance, as it adopts planning patterns that are homogeneous with nature, and local traditional building patterns that preserve the aesthetic of tourist sites and their integration with their environment.

There were many views on the concept of ecotourism, but they emphasized the idea of its sustainability, as it is an environmental activity in the first place, and targeting a segment of tourists concerned with environmental issues on the other hand.
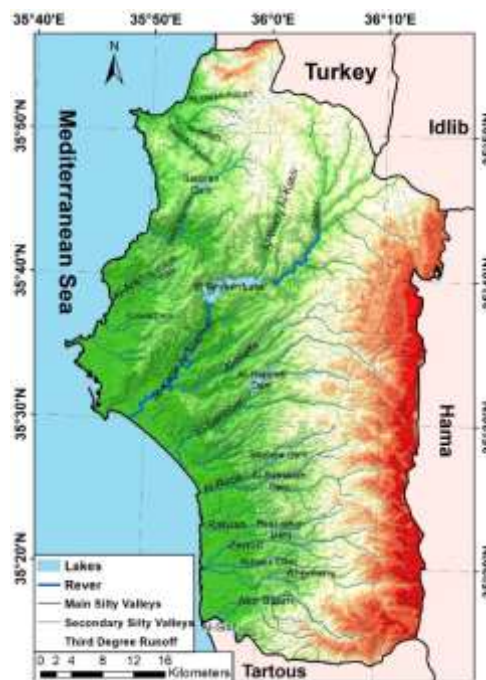
Third: Elements of ecotourism in Latakia Governorate:

Ecotourism, like other tourism patterns in Latakia Governorate, is based on three main components:

1- Natural Ingredients: Natural ingredients in Latakia Governorate constitute a major element of ecotourism, and clearly contribute to the possibility of diversifying its activities. The geographical location of the study area shown in map (1) formed a gateway to open it to internal and external markets, and contributed to the emergence and development of tourism movement in general towards it as a result of its proximity to the ranges of internal and external tourism demand, and its openness and non-isolation. Its astronomical position also contributed to determining its climatic characteristics, which played an important and vital role in stimulating tourism and diversifying its patterns. As for the topography of Latakia Governorate, it constitutes one of the most important elements forming environmental tourist attractions, as it contributes to the diversification of the tourist offer associated with the diversity of that terrain represented in map (2), which is divided into the coastal environment and coastal plains, the plateau environment, and the mountainous environment. Water resources in Latakia Governorate play an important role in tourism, both in terms of providing the needs of human activities, including tourism, and in terms of their ability to achieve tourist attraction, and map (3) represents the distribution of water resources in Latakia Governorate represented by the sea, rivers, lakes, and springs. The tourist value of water resources in Latakia Governorate increases through the surrounding vegetation cover represented by map (4), which constitutes one of the most important natural components of ecotourism. Its ability to attract eco-tourism varies through two indicators, the first is the degree of its growth, and the second is the amount of overlap, as open forests are the most powerful in terms of attraction as they provide spaces for practicing eco-tourism activities and allow the entry of light and sunlight. The nature reserves in Latakia Governorate shown in Map (5) constitute the beginning of government interest in ecotourism.
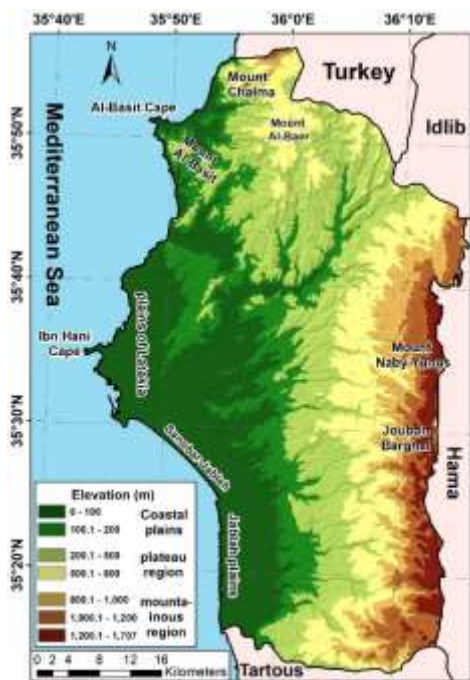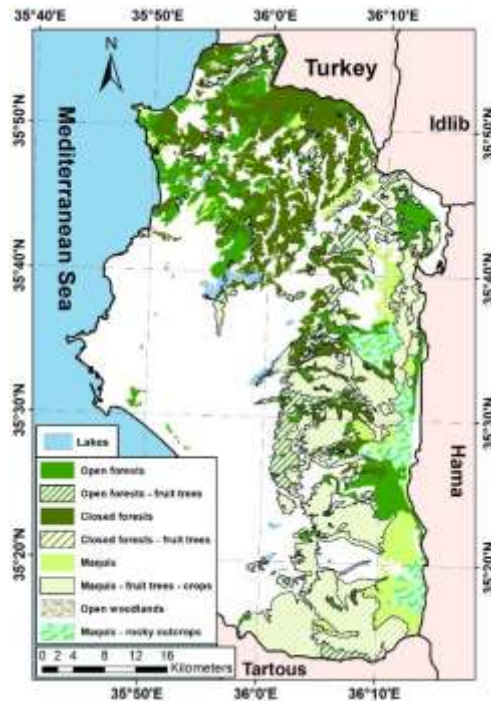

Map (2) Topography of Latakia Governorate   Map (3) Water Resources in Latakia Governorate

Map (4) Forests of Latakia Governorate   **Map (5) Nature Reserves in Latakia Governorate**

2-Social components: The elements of social contribute to maximizing the attractiveness of the eco-tourism site, and it is not less important than the elements of the natural environment, as the social product constitutes an element of attraction for a wide segment of tourists, starting with the population, their tourism awareness and their ability to deal with tourists, and how they display their traditional industries and cultural heritage through exhibitions and held festivals , to the cultural buildings and archaeological sites that abound in their area, which reflect their cultural heritage. The components of the social environment in Latakia Governorate can be classified into two categories: the material social components, and the non-material social components Figure (2).
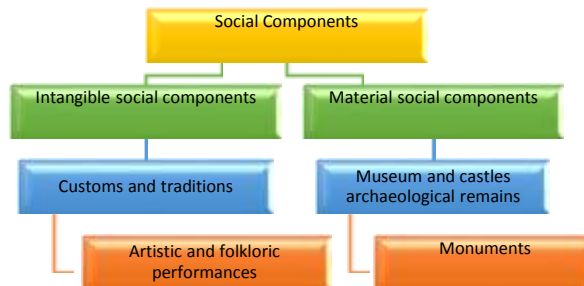
 The previous figure indicates the diversity of material social components in Latakia Governorate, which represents a witness to consecutive historical events that today constituted an element of tourist attractions, due to the importance of the location of Latakia Governorate on the coastal pilgrimage route during the Ottoman Sultanate , an urban movement was active in that era represented by the construction of khans that were used as hotels, hostels and centers for trade exchange, including Khan Tobacco, which was chosen to be a private museum in and around the city of Latakia, As for the castles (Salah al-Din, Al-Muniqa, Al-Mahalaba..) and the archaeological remains (Ugarit, the Arc de Triomphe, the Roman Amphitheater..) reflect the historical stages of the development of the province and the consecutive civilizations it witnessed, to highlight the archaeological religious monuments as a link to Islamic history with its historical mosques (Al-Jadeed, Al-Maghribi, Al-Salibiya, Al-Kabir, Al-Mina, Al-Masoud bin Hani, Al-Hashash, Al-Bazaar, Sheikh Daher), and as evidence of the diversity of Syrian society with its churches and monasteries spread throughout the governorate (Sayyida Marsaba, Margirgis, Marnicholas, Armenians, Latins, Greek Orthodox, Sayyida The Virgin Mary of the Greek Orthodox, Our Lady of the Armenians, Sections, St. Stephen, Monastery of Thomas).

As for the intangible social components, they represent a cumulative product of consecutive cultures, represented by the customs and traditions of the local community of the inhabitants of Latakia Governorate, and the cultural events represented by artistic and folkloric performances held there.

2- Service components: Regardless of the share of the tourist site of privileges and natural and historical diversity, this site loses its value by lacking service elements that represent the backbone of daily life, and the main pillar of economic activities, including tourism. Whether those public service components directed to serve the people of Latakia Governorate, whose presence is a major condition for the establishment of tourism activity such as electrical services, water and sewage network, the availability of transportation, the Internet and technological services, or tourist service components (accommodation establishments, restaurants, cafes..) Table (1)

Table (1) Number of tourism service components in Latakia Governorate for the year 2023

classification	5 stars	4 stars	3 stars	2 stars	1 stars	Other	Total
Overnight stay	4	9	7	26	13	16	75
Food and drink	1	4	13	180	_	201	399

Source: Syrian Arab Republic, Ministry of Tourism, Directorate of Tourism in Latakia Governorate

The above table indicates the number of tourist service components in Latakia Governorate according to the classification approved by the Ministry of Tourism, where it is noted that the number of tourist service components in the two-star classification increases, and other overnight facilities refer to furnished houses and hotels outside the classification, while it includes (temporary rehabilitation restaurants, field restaurants, cafes, fast food, tea halls) for food and drink facilities. These establishments provided tourism services to the tourist demand in Latakia Governorate, which was characterized by variation in size and markets during the time period (2010-2023) as a result of the war on Syria and the accompanying economic and political repercussions, Foreign markets declined significantly, with a clear development of the internal tourism market, which is shown by the data of hotel guests in Latakia Governorate, shown in the following table:

Table (2) Hotel Guests in Latakia Governorate by Nationalities during the Period (2010-2023)

Years	Arabs	Foreigners	Syrian	Total
2010	23415	28468	84546	136429
2011	5215	10717	79921	95853
2012	12259	5429	78043	86731
2013	2085	2067	78585	82737
2014	434	146	161042	161622
2015	593	589	151266	152884
2016	1410	4994	145441	151845
2017	5669	5141	186850	197660
2018	6048	5057	204533	215638
2019	4974	3313	243345	251632
2020	1214	1141	201970	204325
2021	1860	1368	334873	338101
2022	4435	2857	218710	226002
2023	4774	7219	250989	262982

Source: Syrian Arab Republic, Ministry of Tourism, Directorate of Tourism in Latakia Governorate

Ecotourism, with its previous components, constitutes the effective mechanism for sustainable development, as it is an export industry that has a prominent role in achieving sustainable development that works to achieve the development goals and protect the environment and its sustainability. Ecotourism is a tourism based mainly on the environmental history of the tourist destination with its natural and cultural environment, and it is a nature-based tourism pattern based on four elements: environment, learning, sustainability, and ethical planning for tourism projects. However, any of these components may be exposed

to negative effects as a result of wrong and irresponsible tourism practices, or failure to take into account the absorptive capacity of tourist sites, especially fragile ones, which distracts and obstructs the goals aimed at ecotourism projects, hence the importance of relying on advanced technology to maintain the sustainability of these components, especially artificial intelligence techniques, which have multiple applications that can be relied upon in the field of tourism as follows (Bazazo: 2018):

- Managing heritage and cultural sites digitally in order to reach sustainability in development and planning.
- Multiple hotel designs that meet the needs and expectations of tourists in an optimal manner.
- Providing optimal tourism management in the face of security, natural and human challenges
- Providing a networking system between tourism establishments in a way that contributes to achieving significant economic savings, eliminating value chain problems and achieving high added value.
- Improving the quality of airport and airline services and increasing security and safety rates.

Expanding the spread of digital or virtual museums, and expanding virtual reality technologies and multilingual digital tourist guides.

Fourth: Integration of artificial intelligence techniques in ecotourism projects:

Artificial intelligence technologies proved their ability to face crises after the spread of the Covid-19 pandemic, with the complete or partial closure of tourist facilities in that period, virtual tourism emerged as a solution that proved its worth in the confrontation, as many virtual museums were established worldwide, which constituted a successful and distinctive experience to cope with this emergency circumstance in the tourism field by offering virtual tours, and providing content on social media pages and digital platforms (Marzouki, previous reference, p. 34). However, the adoption of artificial intelligence technologies in the tourism industry is not limited to being a solution to emergency crises, or directed to changes that impose themselves in real time and quickly. The transformation of the global economy from a service-based economy to an economy based on expertise in providing those services and focusing on providing them in the form of meaningful and impactful experiences in the minds of consumers, this transformation has led to a shift in the global economy from a service-based economy to an economy based on expertise in the provision of those services and a focus on providing them in the form of meaningful and impactful experiences in the minds of consumers, When talking about tourism as an influential sector in the economy of countries and affected by technological changes - and with the transformation of the economy of most countries to a digital economy - the impact of this transformation is noticed in the tourism business environment, which is intensifying competition between its makers day by day, so the shift towards artificial intelligence and its technologies emerges as an inevitable necessity, especially with the transformation of the tourist into an interactive and expressing his opinion, looking for information that corresponds to his desires , choosing the amount of details that he prefers to obtain, and making the decision to travel to destinations previously unknown to him, in a host community that seeks to conserve its resources and aims to achieve sustainable development (Kondala Rao G. 2017. p 36), achieving balance between tourism supply and demand. This transformation requires the provision of a database that includes the presentation of available ingredients in innovative ways, leaving distinct impressions on tourists according to their desires and tastes, and the adoption of smart technologies to contribute to predicting and working to achieve future trends (Kirtil I. 2021. p205-208). Since artificial intelligence relies on big data and high processing capacity, these elements have evolved with the accumulation of cognitive experience. Today, artificial intelligence is able to analyze and automate huge amounts of data, and use it to improve marketing strategies, improve customers' perception of the product, understand their needs and requirements, as well as target a specific category of them and follow a focus strategy to create an effective competitive advantage. Artificial intelligence is also characterized by a great ability to communicate interactively with data, and to carry out an effective link between it and tourist sites in the destination country, and there is no doubt that artificial intelligence contributes to doubling the profits of tourism institutions that rely on digital media by focusing on a specific category of tourists and targeting them through ads designed in a smart way to attract their attention and repeat their visits and earn their loyalty in a sustainable way. Machine learning uses computational algorithms that learn (pattern recognition) and improve the experience of real-world data (training group) to predict the outcome and make a decision on its own, as this neurological system consists of a combination of artificial neural checks capable of predicting various variables, for example, machine learning was used to accurately predict the arrival of tourists to famous tourist destinations in China, and to predict hotel room prices in the Gulf Cooperation Council countries, so machine learning was used as a technique to predict preferences for choosing Machine learning methods have also been used to predict potential situations of

over tourism in tourist destinations, thus AI-based models have become a new trend in tourism demand forecasting studies. Machine learning techniques are also suitable for predicting and planning in the long and medium term by building a mathematical model for predicting or making decisions without human interventions, and the application of this approach in environmental studies has shown that it is able to accurately predict potential human behavior and make a valuable contribution to facing environmental challenges and preserving the environment through data training and establishing a pre-assessment of tourist behavior, which can be used to increase the tendency of pro-environmental behavior at the individual and collective levels as well (Rezapouraghdam. A, Akhshil. A, Ramkissoon.H,2021:2-6). It can be said that the dynamic use of information technology in the tourism industry began two decades ago when companies began to realize the enormous impact that information technology can have in the industry by applying automation to many tasks and services (Stroumpoulis. A, Kopanaki.E,Varelas.S,2022:99) From this standpoint, and in line with the acceleration of the entry and development of technological technologies in the tourism industry, the process of integrating artificial intelligence techniques into ecotourism projects can be considered a major step in today's world based largely on technological progress, Where this process can be seen as an integrated work system that requires high expertise in the technological fields, whether in terms of the workforce in the tourism field, or the tourist himself, in order to facilitate the establishment of interactive relations between them, which contributes to the success of ecotourism projects, raising their efficiency and transforming the tourist destination into smart tourist destinations (3).

The success of the system requires a smart relationship between the tourist and the workforce within this system, as the digital data it provides gives accurate information about the target tourist segment and allows to identify their tendencies in order to display the inputs represented by smart eco-tourism products and services on them, which will enrich the tourism experience, and provide data on the impressions of tourists before, after and during the trip, On the other hand, the smart tourist who is proficient in dealing with modern smart technologies will be able to obtain all tourism information and benefit from it in a sustainable manner, through the outputs represented by environmental awareness resulting from media campaigns supported by artificial intelligence and directed towards raising awareness of environmental problems resulting from unsustainable tourism practices, which will transfer environmental issues from marginal issues to major issues that provide environmentally friendly tourism products that achieve the ambition of the environmental tourist, which achieves overall sustainability of ecotourism projects.
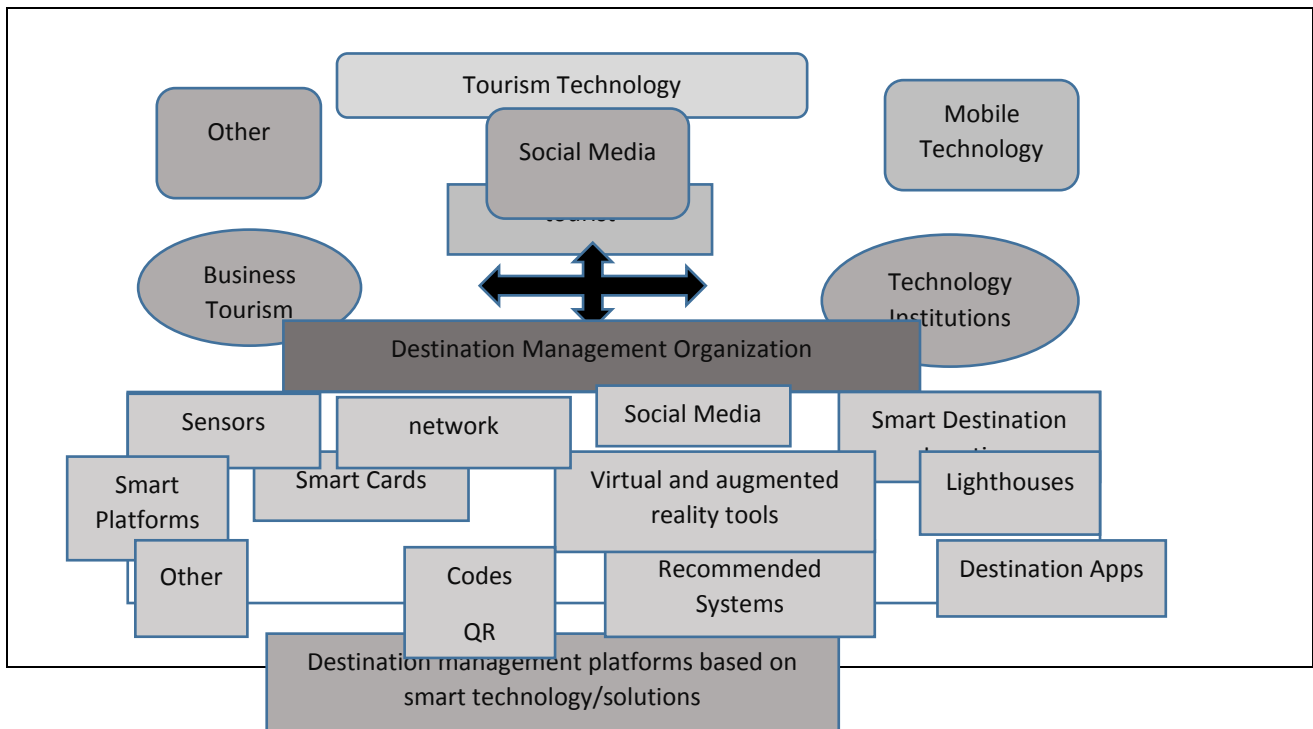

Figure 3 Smart Destinations: Technology Classification and Interaction
Source: Femenia Serra.F&Ivars Baidal.J.2018:138

The adoption of this system in the eco-tourism destination requires moving towards smart cities, which is the first condition necessary for the application of artificial intelligence techniques in achieving the sustainability of eco-tourism projects, in addition to steps and efforts aimed to follow sustainable steps in tourism projects, especially with regard to saving energy and water, recycling waste, reducing the consumption of plastics, and preserving the environmental and cultural heritage of the host community, which constitutes distinctive eco-tourism inputs, as follows:

-**Neural network**:

Neural networks have the ability to retain tourist data, direct appropriate publicity to him, and create appropriate content for him, and on the other hand, they help analyze huge amounts of data and information that can be deduced from the number of views of a tourist promotion or comments on an image of a tourist site, or the number of likes on a promotional video for a traditional craft. And the use of this data and information to determine the most appropriate tourism media messages, and then predict the number of potential tourists and know their needs and achieve the necessary strategies to meet this tourism demand, and provides the ability to flexibility by predicting changes that may occur in the ecotourism landscape and speed in responding to them, employing artificial intelligence in ecotourism provides neural networks that have the ability to analyze and automate huge amounts of data in a way that enhances tourism marketing strategies for ecotourism facilities in the tourist destination. The integration of big data provided by neural networks and premium tourism media content is a competitive advantage that contributes to supporting environmental tourism projects in this destination.

-**Expert Systems**:

 Expert systems can be invested in the dissemination and consumption of the ecotourism product in its various forms to serve ecotourism projects, as the expert systems help greatly in the presentation of ecotourism products and services appropriate to the requirements and desires of tourists and in a way that achieves a balance between the supply and demand of tourism on ecotourism projects, and the expert systems are able to display the ecotourism heritage in innovative and more attractive ways, as they provide specialists in the field of tourism with enhanced capabilities that allow them to understand the needs of Tourists proactively and respond to them in a way that enhances the mental image of ecotourism projects. In addition to its ability to provide a reference base for decision-makers to improve the tourism performance and sustainability of ecotourism projects.

-**Smart Agents**:

They represent the best promotional means for ecotourism projects through their ability to provide media campaigns that go beyond the elements of time and place.

The adoption of artificial intelligence in tourism media for ecotourism projects works to reduce costs and expand the tourism market, as artificial intelligence contributes to reducing routine procedures in media operations in order to save time and effort and save larger offers, which gives the tourist the possibility of comparing those offers and choosing the most appropriate for him

- **Genetic Algorithms**:

 Genetic algorithms support the ecotourism experience, and enhance the benefit of cumulative experiences in the field of ecotourism, thus helping to translate the results and predict the inflation of the tourism market, which facilitates the process of making strategic decisions based on reliable analyzes of tourism data, and on the other hand, genetic algorithms improve the tourist experience through Smart interaction with media campaigns directed to him, and the search algorithms used by the tourist help in providing the dimension of focus as one of the dimensions of competitive advantage by targeting environmental tourists to ensure an increase in tourism demand for ecotourism projects in the tourist destination, and providing smart tourism media capable of transmitting information and ideas, raising the mental level of the tourist, delivering the correct tourist information, spreading tourism culture and convincing the tourist intelligently and accurately to ensure the stimulation of sustainable ecotourism practices.

- The importance of integrating artificial intelligence techniques in supporting ecotourism projects in Latakia Governorate:

 The input of artificial intelligence technologies to ecotourism achieves many benefits, as it is able to provide virtual tours, which is an innovative technology that allows the tourist to move between the different geographical environments of Latakia Governorate, interact within the tourist site, and identify the details of the place, so that the data of this tourist is kept and the appropriate publicity is directed to him according to his desires depending on his tours, and since the smart tourist is characterized by his high requirements and

the multiplicity of his channels, determining what he is looking for and creating content suitable for his inclinations provides a degree of satisfaction and loyalty, This means predicting the number of tourists and their preferences, and working to achieve their desires and needs. The algorithms use codes that determine the tourist's orientation to the search engine, which helps predict his requirements.

On the other hand, as a result of the ability of artificial intelligence techniques to predict and respond to changes that may occur in the tourism scene faster, and to display the environmental and cultural tourism heritage of Latakia Governorate in more attractive ways, and to design enhanced eco-tourism products and services that take into account the aspirations and capabilities of tourists, and display appropriate algorithms for it as the appropriate price algorithm which is suitable for his buying abilities , with the possibility of statistical review and dynamic pricing, and promote the most interactive tourism programs based on the data collected, This improves the mental image of the eco-tourism destination in Latakia Governorate, which has clearly declined in recent years as a result of the war on Syria and the accompanying misleading media campaigns, thus restoring the tourist markets on the one hand and expanding the target market on the other hand.

Artificial intelligence techniques also provide data extraction, improve search methods, and shift from the process of searching for tourist areas and components to a process of attracting him by relying on search algorithms. And matching the tourism demand with the product provided for the benefit of both tourists, organizations and tourist agents (Gidumal J. 2022. P.1945) Artificial intelligence technologies contribute to providing a reference base for decision-makers in the tourism industry and tourism businessmen to improve tourism performance and sustainability, which achieves the overall ability to face regional and international competitive challenges and search for excellence in the tourism business market, and create a competitive advantage and an important strategic location in that market.

The benefits of applying artificial intelligence techniques in ecotourism can be summarized as follows:
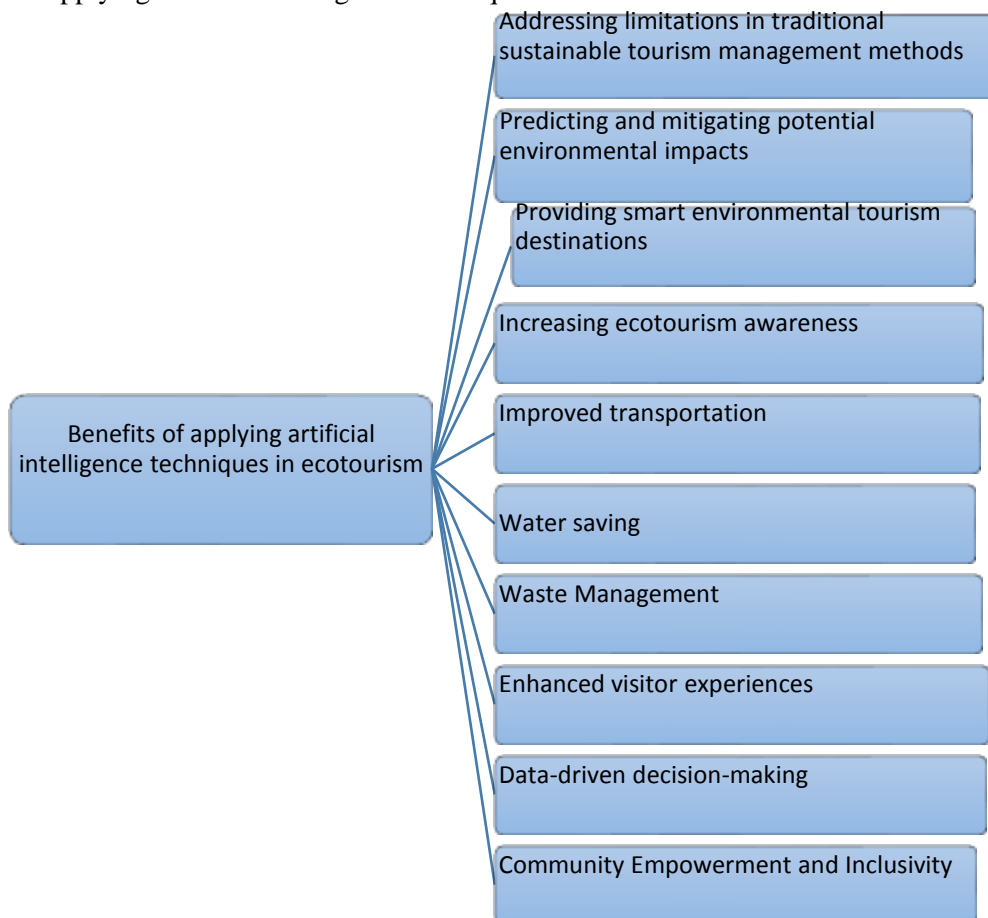
Figure 4 Benefits of applying AI techniques in ecotourism
Source: Rane.N.l, Choudhary.S.p& Rane . J, 2023:1-4)

-**Addressing the limitations of traditional sustainable tourism management methods**:
 This is in processing the complex interaction between environmental, social and economic factors where the integration of artificial intelligence, blockchain, the Internet of things, augmented reality and virtual reality represents a fundamental opportunity to revolutionize the tourism industry by providing innovative tools for sustainable development. Through AI's ability to process end-to-end data and extract meaningful insights as a catalyst for sustainable tourism development .

-The field of predicting and mitigating potential environmental impacts: Artificial intelligence technologies help predict the potential environmental impacts from a tourist visit, as chat bots and virtual assistants based on intelligence in tourism and travel experiences contribute to guiding tourists towards environmentally friendly activities and responsible behavior, and artificial intelligence facilitates smart management of resources, optimizes energy consumption in tourism facilities, and helps with waste reduction strategies. Smart systems can dynamically adjust resource usage based on demand in real time, ensuring the efficient operation of tourism infrastructure while reducing environmental footprints. Intelligence technologies contribute to reducing the negative environmental impact and help reduce the carbon footprint of tourism operations by improving energy use, as smart electrically powered building management systems can adjust lighting, heating and cooling based on occupancy in real time, resulting in energy savings in hotels, resorts and other accommodation facilities.

-Providing smart eco-tourism destinations: The Internet of Things contributes by linking devices and remote sensors to the creation of smart eco-tourism destinations capable of responding to the needs of both tourists and the environment, where smart infrastructure equipped with internet sensors can monitor and perceive energy consumption and waste generating, and wearables devices that support the Internet of Things enhance the tourism experience by providing personalized recommendations based on tourist preferences and tourist environmental conditions, and this does not only enrich the overall ecotourism experience but also guides tourists towards sustainable options such as less crowded attractions, or eco-friendly transportation options.

-The field of increasing environmental tourism awareness: Augmented reality and virtual reality technologies provide innovative ways to engage tourists in educational experiences that enhance sustainability, and give information about the environmental and cultural importance of tourist sites, which enhances appreciation for this site among tourists, and on the other hand, virtual reality allows virtual visits to environmentally sensitive areas, which reduces physical footprints and the environmental impact associated with them, and virtual reality can raise awareness about environmental preservation efforts and encourage responsible behavior

-Transportation optimization: AI-based algorithms help facilitate efficient transportation planning and reduce fuel consumption, as predictive analytics optimize routes, ensuring smoother traffic flow and reducing the environmental impact of transportation services. In addition to that the artificial intelligence supports the development of electrical cars and self-driving vehicles which is accompanies with the sustainable practices.

- Water saving: Smart sensors and monitoring systems allow the efficient use of water resources to ensure rational consumption and maintain their sustainability.

-Waste management: Artificial intelligence improves waste management by monitoring waste levels in smart boxes equipped with sensors, and this ensures timely waste disposal which reduces the risk of environmental pollution.

-Biodiversity Conservation: Artificial intelligence plays a crucial role in monitoring and protecting biodiversity in eco-tourism destinations, as machine learning algorithms analyze data from satellite imagery and remote sensing networks, and then track changes in ecosystems and detect illegal activities, supporting biodiversity conservation efforts.

-Enhanced visitor experience domain: Intelligence algorithms analyze user preferences, behaviors, and historical data to provide personalized travel recommendations, which not only enhances the experience, but encourages tourists to explore sustainable options such as eco-friendly accommodations and responsible tours activities, and AI-powered language translation contributes to breaking the language barrier, which promotes better communication between tourists and locals, and AI-led augmented and virtual reality technologies provide distinctive experiences that educate and urge the tourist. On preserving the environment, virtual tours of reserves and historical sites contribute to increasing awareness and appreciation of local ecosystems and cultures.

- The field of decision making based on data : AI technologies help provide predictive analytics for demand management, enabling tourism penefitiaries to analyze data trends and predict future demand for specific destinations, this allows for better planning, resource allocation, preventing potential negative impacts of ecotourism and ensuring that tourism activities are in line with the carrying capacity of a particular site, and AI also helps in real-time monitoring and crisis response by monitoring real-time data. Such as weather conditions, or sudden visits in the tourism movement, this information is necessary for tourism authorities and institutions to respond quickly to emergencies, and to ensure the safety of both tourists and local communities.

-Community Empowerment and Inclusivity: AI-powered platforms contribute to artisan analysts, service providers and tour guides in reaching a global audience, promoting local economic development, helping empower communities, and achieving sustainable economic development.

Fifth: Steps to be followed to integrate artificial intelligence technologies in supporting the sustainability of ecotourism projects:

Phase 1: Creating Conditions: This stage is based on the current tourism reality of ecotourism in Latakia Governorate, where an in-depth study of the tourist demand for ecotourism, its projects and trends, which began to appear through tourist groups organizing tourist trips of an environmental nature and taking permits and approvals to carry out eco-tourism activities in the study area such as camping, mountaineering and visiting reserves, especially the Shuh and Rice Reserve, and then providing the necessary data on the size of the real and potential tourism demand, to achieve a balance between movement and potential. After conducting a comprehensive survey of the components, and merging traditional data with interactive digital data in preparation for the introduction of a clear plan with objectives that includes the promotion of each project separately in order to clarify its competitive advantage, Since this eco-tourism movement in Latakia Governorate is still internal, tourism influencers (public figures, celebrities, YouTube stars) can be relied on in the process of tourism promotion and marketing through search engines and social media to expand the target market, and move to innovative pricing based on studying the economic capabilities of tourists and keeping pace with international and local prices and offers, and providing commodity packages compatible with the capabilities of tourists (Syrians, expatriate Syrians, Arabs, foreigners) that increase the value of the product and stimulate the purchase behavior of the tourist, in addition to Establishing projects to invest in eco-tourism facilities throughout the governorate and supporting them for digital transformation and training and qualifying human cadres working in them.

Second Stage: Treatment:

 It includes processing the data obtained from the previous stage and sharing it in a way that highlights the national identity of Lattakia governorate through electronic means this stage is based on activating interactive services and promoting the use of technology based on augmented reality and virtual reality such as showing films that simulate historical events in a certain time period in castles, or three-dimensional films of traditional crafts that characterize the residents of Latakia Governorate to learn about the way they are made and promote to these crafts locally and internationally, In addition to the smart management of eco-tourism sites that organize and monitor the movement of tourist flow through smart sensors, or display virtual tours within those sites, and propose environmental tourist paths within the administrative areas of Latakia Governorate which is suitable to the aspirations and desires of tourists. This stage must include several procedures represented in Figure (5)
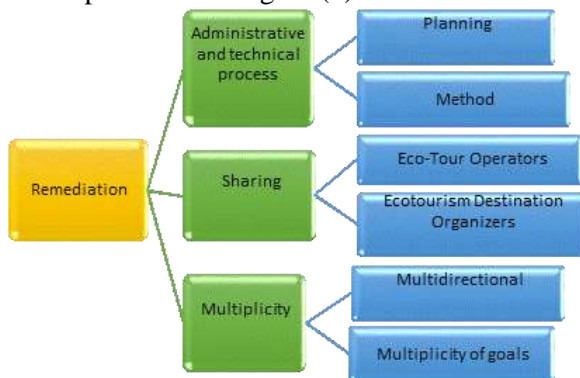
Figure (5) Process Procedures for Addressing the Employment of Artificial Intelligence in Supporting the Sustainability of Ecotourism Projects

From the previous figure, it is clear that the processing stage to employ artificial intelligence in supporting the sustainability of ecotourism projects starts from considering it an administrative process that needs planning and guidance to reach the best method, using an approach based on artificial intelligence techniques, and choosing the appropriate strategy that is jointly organized by both relevant bodies and institutions, which is a multi-directional process that starts from within ecotourism projects in Latakia Governorate and extends towards diverse markets. Its objectives vary from eco-tourism programs, building reputation, satisfying needs, and achieving sustainable economic profit for these projects.

- Third Stage: Growth and Integration:
This stage aims to choose the appropriate smart strategy to build a sustainable mental center for Latakia Governorate in the target markets depending on the advantage of the eco-tourism product provided, the desired benefit from it, and the target group, and the transition to advanced transformations supported by artificial intelligence that allow reflecting the local architectural character of ecotourism projects, and help promote the local culture of the local community, identify the customs and traditions of this community, provide distinctive eco-tourism offers and promote services and environmentally friendly products , encouraging existing tourist establishments in Latakia Governorate to adopt practices that would promote the rationalization of energy and water consumption , reducing the consumption of plastics and glass, and encouraging the sorting and recycling of waste, as this stage will reflect the ability of artificial intelligence integration in spreading and adopting enhanced behaviors to preserve the environmental heritage by improving the content and mixing between the links received from the previous stages and those issued by the reactions of tourists towards existing ecotourism projects, and keeping up with the changes in research algorithms to update the strategy followed in a timely manner.

-Result:
-The employment of neural networks in ecotourism contributes to the analysis of huge amounts of data, facilitates the process of predicting the number of tourists, provides flexibility and contributes to achieving a competitive advantage that supports ecotourism projects
- Expert systems are characterized by the ability to spread and consume the eco-tourism product to serve ecotourism projects as they contribute to the presentation of tourism heritage in distinctive ways and provide a reference base for decision-makers that helps improve tourism performance and its sustainability
-The adoption of smart agents in tourism media provides media campaigns that transcend the elements of time and place and constitutes the best promotional means for eco-tourism projects, as it contributes to reducing routine procedures
-The employment of genetic algorithms helps in translating the results, predicting the inflation of the tourism market, and contributes to improving the tourist experience.
-The use of artificial intelligence contributes to enhancing the sustainability of ecotourism projects in terms of promoting sustainable tourism practices, promoting environmentally friendly products and services, and introducing cultures and civilizations to the host community.

-Recommendations:
- Benefiting from artificial intelligence techniques in analyzing and correcting tourist routes in ecotourism places to ensure the preservation of their absorptive capacity and ensure the sustainability of their biodiversity.
- Focusing on research algorithms to understand the requirements of tourists and work to meet them on the one hand, and proposing specific environmental tourism areas in Latakia Governorate at affordable prices that enrich their tourism experience and achieve more satisfaction and loyalty to the eco-tourist destination in it.
- Offering eco-tourism projects in Latakia Governorate go along with the local character, and focusing on distributing them geographically to their administrative areas in a balanced manner.
- Activating the smart tourism promotion axis to ensure an increase in the positive results of marketing campaigns for ecotourism projects in Latakia Governorate
- Activating the environmental tourism content industry, and employing smart chat bots on social interaction platforms and tourist sites of the Directorate of Tourism in Latakia Governorate, and the Ministry of Tourism in the Syrian Arab Republic to provide assistance and answer tourists' inquiries in a timely manner for them.
- Training the employees of the Directorate of Tourism in Latakia Governorate and workers in tourist facilities on artificial intelligence to develop their performance and provide them with the ability to keep up with technological developments in their external environment.

- Relying on the analysis of images and videos of eco-tourism areas and projects in Latakia Governorate, to determine their features and automatically create signs and descriptions in a way that enhances the possibility of discovering tourism information in an easy and simple way.
- Introducing artificial intelligence in educational curricula at an early age, and focusing on it in tourism curricula.

-The end:

The employment of artificial intelligence in ecotourism plays a positive role in enhancing the sustainability of its projects, by encouraging sustainable tourism practices by all parties concerned with the tourism process, and clarifying the benefits that can be reaped from these sustainable tourism practices, and this employment has a great ability to predict everything that may happen in the tourism scene, and the speed to respond to the changes that may occur to it, which means staying in the tourism market on the one hand, and the preservation of environmental and cultural tourism heritage on the other hand. Based on this point, the research recommends the need to employ artificial intelligence techniques in the ecotourism industry, and to provide an environment that allows the use of advanced technology to form a mediation between tourism and society and provide distinctive offers and employ them in favor of enhancing the sustainability of tourism projects and preserving the environment**.**

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