Developing Framework of Tourism 4.0 Using Artificial Intelligence and Blockchain

M.Tech Project Part-II report submitted in partial fulfillment of the requirement for the degree of Master of Technology

in

Computer Science and Engineering

Specialization

in

Data Science

By

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DECLARATION

I now declare that this project has been done by me under the supervision of **Dr. Ruchi Verma, Assistant Professor (SG),** Jaypee University of Information Technology, and **Dr. Amit Kumar, Assistant Professor (SG),** Jaypee University of Information Technology. I also declare that neither this project nor any part of this project has been submitted elsewhere for the award of any degree or diploma.

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CERTIFICATE

This is to certify that the work which is being presented in the project report titled "Developing Framework of Tourism 4.0 Using AI and Blockchain" in partial fulfillment of the requirements for the award of the degree of M.Tech in Computer Science and Engineering, Specialization in Data Science and submitted to the Department of Computer Science and Engineering, Jaypee University of Information Technology, Waknaghat is an authentic record of work carried out by "Sukhpreet Singh, 225032002 during the period from Feb 2024 – May 2024 under the supervision of Dr. Ruchi Verma, Assistant Professor (SG), Department of Computer Science and Engineering, Jaypee University of Information Technology, Waknaghat and Dr. Amit Kumar, Assistant Professor (SG), Department of Computer Science and Engineering, Jaypee University of Information Technology, Waknaghat

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ABSTRACT

The digitalization of the tourist sector has brought about a new era with previously unheard-of potential and difficulties. A vision of intelligent, interconnected, and sustainable tourist ecosystems has been embodied by the notion of tourist 4.0, which has arisen in reaction to this transition. To advance the implementation of Tourism 4.0, this project attempts to offer a complete framework that uses the complementary capabilities of Artificial Intelligence (AI) and Blockchain. This framework's fundamental concept is the implementation of AI techniques to create immersive, personalized travel experiences for guests.

AI-powered recommendation engines may develop specific routes and propose suitable sights, lodgings, and activities through assessing enormous amounts of data, ranging from archaeological travel behaviors to contemporary environmental conditions. This contributes to tourist bliss and interest.

Moreover, tourist stakeholders can foresee changes in demand, improve resource allocation, and lessen congestion at popular sites thanks to AI-powered predictive analytics.

Decision-makers may make well-informed decisions about pricing strategies, infrastructure development, and capacity management by utilizing past data as well as modern prediction tools. This approach promotes a more robust and sustainable tourist environment.

Simultaneously, the tourist value chain benefits from the enhanced trust, transparency, and security provided by Blockchain technology. While decentralized identity management systems give travelers control over their personal data, reducing privacy concerns and improving data security, smart contracts allow automated and tamper-proof execution of agreements, facilitating seamless transactions and eliminating intermediaries.

Through the combined use of artificial intelligence and Blockchain technology into one system, this framework not only improves the efficacy and efficiency of tourist operations, but it also democratizes access to tourism amenities and encourages community involvement, therefore promoting inclusion and sustainability. Furthermore, it creates the groundwork for the creation of innovative income streams and business models, creating new opportunities for cooperation and innovation in the travel and tourist sector.

Essentially, the goal of this study is to advance the tourism sector toward a future of intelligence, adaptability, and sustainability in which tourists go out on life-changing adventures enhanced by seamless encounters and deep links with locations and people.

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Chapter 01:INTRODUCTION

1.1 Introduction

The emergence of Tourism 4.0 denotes a significant shift in the dynamic field of global tourism towards a digitally-driven paradigm. Technological advancements like Artificial Intelligence (AI) and Blockchain have the potential to transform the way we interact and experience destinations worldwide.

The goal of this introduction is to shed light on the revolutionary possibilities that arise from the combination of AI and Blockchain technology in the creation of a comprehensive framework for Tourism 4.0.

The first step to achieving Tourism 4.0 is realizing that the travel industry is changing due to a growing number of tech-savvy consumers or an explosion of online resources that make it easier to acquire travel-related knowledge and amenities.

Tourists of today look for absorbing, individual journeys that go beyond conventional limits and promote closer links to places, people, and traditions.

This creates a compelling opportunity for the lodging industry to embrace the digital era and redefine the travel experience for the twenty-first century, as technological developments and demand from consumers collide.

Blockchain software is at the front of this revolution, posing a threat to established norms in the tourist industry regarding trust, openness, and transaction integrity.

The decentralized design of Blockchain combined with cryptographic security measures can transform a number of tourism stakeholders' activities, from supply chain logistics and destination governance to identity management and financial transactions.Blockchain-powered smart contracts allow for automatic, impenetrable agreement implementation, promoting safe, open transactions with less need on middlemen. This improves the effectiveness and transparency of contractual ties between service providers and customers, while also streamlining the booking process for passengers.

Additionally, Blockchain has the potential to improve data security and privacy in tourism-related situations by giving tourists more control over their personal data and enabling smooth, interoperable data sharing among stakeholders.

Travelers' trust and confidence in the digital ecosystem may be increased by tourist firms utilizing Blockchain-based identity management systems to reduce privacy threats and fight identity theft.

Furthermore, important tourism data may now be exchanged and profited from using Blockchain-enabled data marketplaces that guarantee data ownership and access rules that protect privacy.

Accompanying Blockchain, Artificial Intelligence emerges as a game-changing facilitator of Tourism 4.0, equipping stakeholders with tailored suggestions, predictive modeling, and sophisticated analytics to maximize every traveler's experience. AI-powered recommendation engines employ machine learning algorithms to sift through enormous amounts of data, evaluate patterns of activity, and provide personalized travel experiences based on contextual elements, personal preferences, and behavior patterns.

Personalized itinerary suggestions, pricing strategies optimization, and demand fluctuations prediction are just a few of the ways AI-driven solutions help tourism firms in the digital age improve customer happiness, increase operational efficiency, and spur sustainable growth.

A new age of creativity and cooperation in the tourist sector is being heralded by the integration of Blockchain and AI technologies, giving players the ability to unleash fresh value propositions that break through conventional borders, rethink conventional business models, and form new collaborations.

The Tourism 4.0 framework establishes a foundation for a tourism ecosystem that is more resilient, inclusive, and sustainable by promoting a culture of experimentation, openness, and co-creation. This ecosystem utilizes technology's transformational potential to enhance the quality of life for tourists and communities throughout the globe.

Recognizing the moral, legal, and social ramifications of using Blockchain and AI in tourism settings is crucial as we set out on this path towards Tourism 4.0. Transparency, accountability, and social responsibility principles must direct the deployment of these technologies, as they address issues ranging from data privacy and algorithmic bias to digital inclusion and accessibility. The only way we can fully fulfill the potential of Tourism 4.0 as a catalyst for good change in the way people travel, experience, and connect with the world is by promoting a culture of responsible innovation and inclusive growth.

1.2 Problem statement

The difficulty facing the tourist sector is how to best use the abundance of internet reviews to raise consumer happiness and raise the caliber of services.

The goal of this project is to design a complete machine learning (ML) framework that can analyze Google reviews in order to forecast and maximize consumer happiness in four important dimensions: taste, menu offers, outward atmosphere, and interior atmosphere. Through the resolution of challenges related to data collection, preprocessing, feature engineering, and model creation, the framework aims to provide tourist establishments with practical knowledge that will enable them to pinpoint problem areas and carry out focused interventions.

This project intends to transform how firms in the tourism sector understand and adapt to their customers' demands, thereby improving the entire travel experience for visitors worldwide. It does this by fusing powerful machine learning algorithms with rich textual data from internet reviews.

1.3 Objective

(1) To develop a prediction model for tourists to enhance and improve the tourist experience using the ensemble method.

(2) To develop a blockchain-based framework to secure tourist data.

1.4 Motivation

The goal of this M.Tech project is to solve some of the most pressing issues facing contemporary healthcare systems, namely in the area of medical image processing. The complexity of understanding medical imaging data and its exponential increase have highlighted the pressing need for sophisticated computational methods to support medical practitioners in diagnosis and treatment planning.

Manual medical picture analysis takes a lot of time and is subjective, which might result in different interpretations and sometimes incorrect diagnoses. This project intends to provide a strong framework for automated medical picture analysis, with an emphasis on applications like tumor identification, organ segmentation, and illness categorization. It does this by utilizing the power of machine learning and deep learning algorithms.

The main objective is to improve patient outcomes and streamline clinical processes by increasing the effectiveness and accuracy of medical imaging interpretation.

With this research project, we hope to further the field of healthcare technology and have a real influence on the provision of healthcare services. We envision a time when advanced computational techniques will enable physicians to provide patients with better care by providing them with insightful information.

1.4Language Used

The programming language used in the project is Python. The AI language used in the project is Machine learning. Blockchain is used for security purposes.(To secure tourist data).

1.5Deliverables/Outcomes

The "Developing Framework of Tourism Using AI and Blockchain" project's results, which combine cutting-edge technology to improve several aspects of the tourist ecosystem, have the potential to completely transform the tourism sector.

First and foremost, the creation of a thorough framework is an important first step, offering a guide for tourist industry participants to use blockchain and artificial intelligence (AI) to optimize resource use, decision-making, and sustainability projects. By utilizing AI-powered personalized recommendation systems, travel agencies may provide customized travel experiences that increase client happiness and loyalty.

Additionally, the tourist value chain is made more transparent, secure, and efficient by the inclusion of Blockchain, which speeds up transactions. By automating agreements, smart contracts lower administrative burdens and promote party confidence.

Furthermore, by utilizing AI for forecast analysis and understanding creation, the framework facilitates data-driven choice-making and gives stakeholders the ability to maximize pricing plans, distribution of resources, and promotional efforts. Adopting artificial intelligence and blockchain technology also encourages sustainable tourism practices since transparent supply chains enable ethical sourcing of products and services and decentralised management of identities provides safeguards for information and anonymity.

Moreover, the effective execution of the framework promotes industry-wide acceptance and cooperation, cultivating an ecosystem in which travel companies, governmental organizations, and technology suppliers work together to propel innovation and generate value. The tourism sector is ultimately positioned for long-term growth and resilience in an increasingly digital and competitive landscape by these results, which drive the sector towards a future marked by improved customer experiences, improved operational efficiency, data-driven decision-making, sustainability, and industry-wide collaboration.

CHAPTER 2
LITERATURE SURVEY

Although it originated in the computer sciences as a vague idea, artificial intelligence (AI) is today applied in many aspects of daily life. Its unique perspectives on difficult issues have piqued academic curiosity.

As a result, a bibliometric approach was used in this study to track the development of AI in the travel industry. 102 papers in all were gathered from the Scopus database. Using the co-occurrence network and most prevalent author keywords, research hotspots were found along with important criteria including the most prolific authors, partnerships, and institutions.

Thematic evolution analysis was used to depict the advancement of AI. The results show that after 2017, interest in AI grew, and articles with average citation counts have a high citation count.

As this constitutes the inaugural effort to do a bibliometric on artificial intelligence in the setting of vacations, it presents an extensive survey of AI, highlights research trends, and highlights popular articles, all of which may be of interest to scholars and tourism industry professionals.

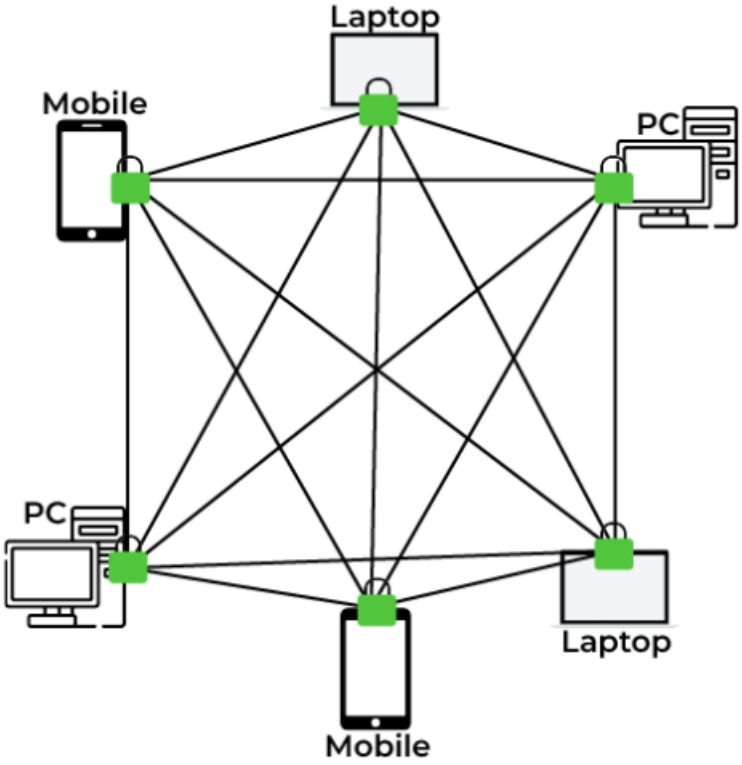

Figure 1:Blockchain Structure

2.1 Scope of AI in Tourism as an Industry

Despite being a modern problem, artificial intelligence (AI) is being used in the travel, tourism, and hospitality sectors due to a few intriguing discoveries.

Recent research on the application of AI in the travel, tourism, and hospitality sector by organizations such as Google Travel, Trip Advisor, Tata Consultancy Services, etc., are few. Some of the significant findings from this research are beneficial to travel and tourism businesses. 85% of travel and hospitality service companies integrate artificial intelligence in their operations, according to a Tata Consultancy Services (TCS) report. Research indicates that this could be related to the explosive growth in digital travel sales, which are predicted to surpass $800 billion by 2020. According to research by Google Travel & Trip Advisor, 74% of consumers use the Internet to plan their vacations, with over 45% of users using smartphones. According to other research, 85% of consumers choose their travel plans after arriving at their location. Eighty percent of consumers choose for self-service technology over traditional services, and thirty-six percent of them favor the interactive booking process.

When they are traveling to their destination, ninety per cent of consumers want pertinent information regarding the trip. When considered collectively, these research results seem to point to the consumer's liking for net and technological self-service. These results would encourage marketers to use interactive and the use of self- AI tools to improve consumer experiences. The results of these studies imply not just the customers' propensity for technology but also the element of "Timeliness." The promptness of the services they receive is highly valued by the clients.

A great deal of clients demand those amenities when they go, not when they are prepared to receive them beforehand. A vast majority of consumers favor technological self-service over established offerings, according to the findings. Artificial Intelligence is used extensively to enable these self-service technologies. In addition to these, the travel, tourism, and hospitality sectors are influenced by some additional variables. Resources from the earth, broad infrastructure amenities, the infrastructure for tourists, and the destination tourism infrastructure are significant determinants in the selection of tourism, travel, and hospitality services. Environmental assets included streams, rugged terrain, varied and distinctive wildlife, and meteorological factors like humidity, rainfall, and temperature in the area. Transportation on the roads, both public and private, is included in general infrastructure.

Hotel and lodging facilities, eateries, pubs, clubs, discotheques, water parks, zoos, casinos, treks, adventure activities, retail centers, and theme parks are all considered forms of tourism infrastructure. Infrastructure for destination tourism comprises personnel and local and safety precautions. A vast array of information on all the important components, including natural resources, general infrastructure facilities, tourist infrastructure facilities, destination tourism infrastructure facilities, etc., may be obtained by artificial intelligence. Artificial intelligence (AI) technology can outperform humans in this regard by providing a wealth of information on all the important elements quickly.

2.2Blockchain Technology

When Satoshi Nakamoto, the anonymous creator of the cryptocurrency Bitcoin, first developed the blockchain as a means of electronic value transfer, he soon realized that it could also be used for more general purposes. As a result, the technology quickly gained popularity, with tourism being just one area of use.

To create permanent and unchangeable records, transactions are logged and added to a blockchain in chronological sequence. A blockchain is a digital, decentralized, distributed ledger. This uses Bitcoin as an example to show a blockchain's fundamental and simplified structure.

Each transaction in the list is combined, and a hash function is computed for each of them. This results in a fixed-length integer that represents a single block and may be utilized to link blocks in the chain.

Subsequently, every single hash is mapped into one, kept in the block header, and referred to as the Merkle root. One notable characteristic of hash functions—of which there are many varieties—is that even a little change in the underlying data produces a whole new hash result, making it simple to identify data updates. Blockchain miners search for a nonce, or "number only used once," which is an arbitrary number, in addition to the Merkle root contained in the block header. Specialized computers called miners are used to verify transactions before adding them to the network.

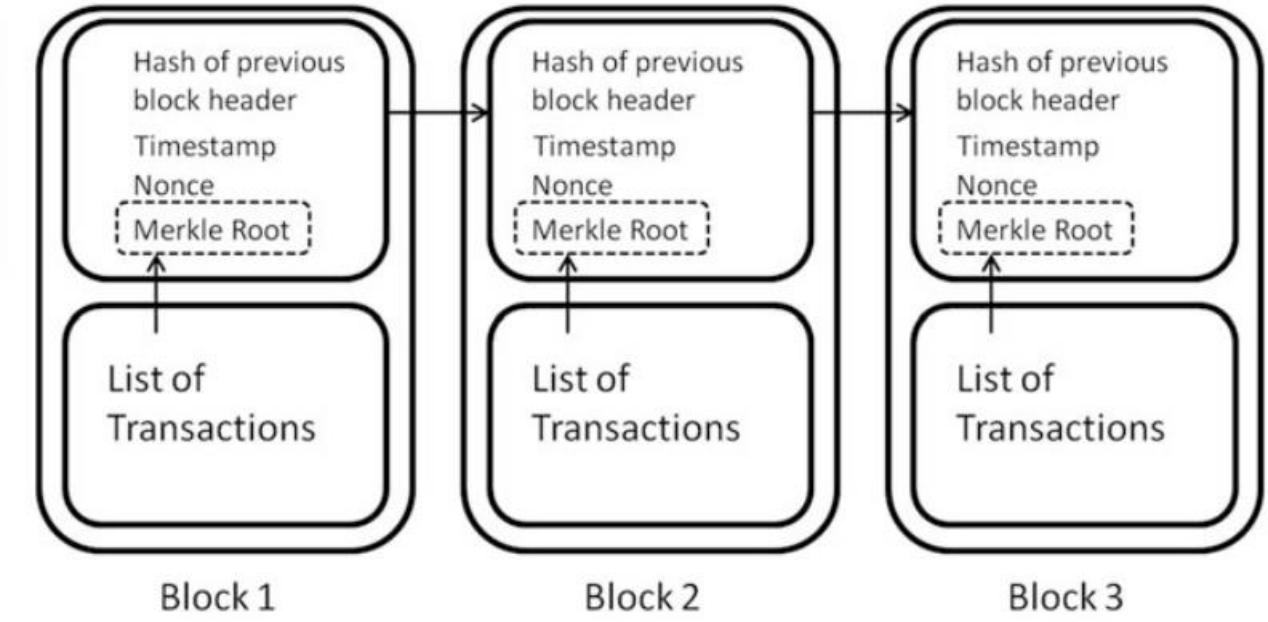

Figure 2:Simple Bitcoin structure for public blockchain

This mechanism ensures that the right to add new information only depends on computing power and is not granted by a central authority.

The hash function from the block that came before header being included in the header of the next block is a crucial component of the blockchain because it produces a data structure that cannot be changed without also compromising the integrity of the whole chain after the change.

The word "blockchain" is also frequently used to refer to similar technologies that lack a chainlike structure, however, they would be better characterized by the more inclusive phrase "distributed ledger technology" or the even more generic trustless systems.

In this sense, a book of accounts is an accountable record of each payment made.

Designed a graph with diagrams where the paths that connect within the individual nodes all point in the same direction and resemble networks, and the power source is Hedera The hash graph, depends on a rumors procedure that makes sure that data spreads throughout the network in a parallel fashion, are two examples of the building that lack a chainlike structure.

The name "blockchain" is often used to refer to a broad variety of such trustless systems since most writers and organizations are more interested in the fundamental characteristics of the technology, such as immutability and decentralization than in the technical details. In this chapter, I adhere to this protocol.

2.3 Digitalization

The use of technology is the process of transforming a physical environment into a digital ecosystem and then managing it digitally using technologies like blockchain. It is transforming and altering tourism as a result of how people live, work, travel, and conduct business.

The analysis makes clear that blockchain has the potential to accelerate the global tourism industry's digitization push, which will improve visitor experiences and open up new economic opportunities.

For example, blockchain-based solutions like digital identity management, digital payments, and smart contracts have significantly decreased inefficient paper-intensive operations in the tourist industry. For all parties involved, blockchain technologies have also reduced transaction costs, processing times, fraud, and mistakes, and maximized transparency.

The transition of governments to cashless economies can be aided by blockchain. Additionally, blockchain encourages contactless payments, which are highly recommended in light of the COVID-19 epidemic.

Thus, having a unified contactless and cashless payment system might be advantageous for tourists visiting other countries since it eliminates the need to carry cash in other currencies. Finally, increasing P2P transactions via blockchain has the potential to grow the sharing economy. Numerous countries, particularly those that largely depend on tourism, have begun to invest significantly in blockchain technology to improve the travel and tourist industry. Additionally, there are other blockchain-based virtual travel options. For travelers who are unable to depart because to COVID-19 travel restrictions.

2.4 Automation

Across industries, automation has become a disruptive force changing social structures, business models, and operations.

Automation in manufacturing, healthcare, finance, transportation, agriculture, and services has reached previously unheard-of levels thanks to technological developments in robotics, artificial intelligence (AI), machine learning, and the Internet of Things (IoT).

Automation has many advantages, like higher output, efficiency, and cost savings, but it also has many potential and obstacles.

The possibility of job displacement, economic inequality, and ethical worries regarding AI and algorithmic decision-making bring up future employment and societal issues.

Businesses, researchers, and policymakers are attempting to balance the benefits of automation with minimizing its drawbacks. To successfully navigate the complexity of the automation era, efforts must be made to reskill the workforce, ensure responsible development of AI, and promote inclusive growth.

Moreover, developing laws and policies that support innovation, meet social demands, and advance the ethical use of AI requires cooperation between the public and private sectors as well as academia and civil society.

Interdisciplinary research, cross-sector collaborations, and continuous communication are essential for laying out a roadmap for a future that is more human- centered, sustainable, and egalitarian as automation develops.

2.5 Disintermediation

Disintermediation, a fundamental idea made possible by blockchain technology, has the power to completely transform a number of different sectors by doing away with middlemen and enabling peer-to-peer transactions.

Disintermediation, as used in relation to blockchain technology, is the process of doing away with middlemen like banks, financial institutions, and other third parties who typically carry out transaction processing and record-keeping duties.

Disintermediation offers several advantages such as lower prices, more efficiency, improved security, and higher transparency by utilizing blockchain's decentralized design, transparent ledger system, and cryptographic security mechanisms.

The financial industry is one of the most well-known uses of blockchain disintermediation, since decentralized finance (DeFi) platforms are upending established banking and lending practices.

Without the need for middlemen, DeFi protocols let users to access financial services including lending, borrowing, trading, and asset management directly on blockchain networks.

Access to financial services is made more democratic by this decentralized method, especially for marginalized groups who might not have access to traditional banking infrastructure.

Furthermore, blockchain disintermediation affects not just the financial industry but also supply chain management, real estate, healthcare, and the distribution of digital content.

Blockchain-based supply chain management solutions maintain unchangeable records of transactions, shipments, and product provenance, making supply chains transparent and traceable.

Blockchain increases supply chain efficiency, lowers fraud, and strengthens stakeholder trust by doing away with middlemen and offering real-time visibility into the flow of commodities.

Similar to this, blockchain-based systems in the real estate industry enable peer-to-peer property sales, title transfers, and rental agreements facilitated by smart contracts, simplifying the process and lowering dependency on pricey middlemen like real estate brokers and title agencies.

Blockchain enhances data security, patient privacy, and healthcare results by facilitating the safe and interoperable exchange of prescription information, medical records, and patient data between patients, insurers, and healthcare providers.

In addition, authors may now directly monetize their work and get just remuneration without middlemen taking a hefty cut of profits thanks to blockchain-based solutions for digital content distribution.

Content producers may skip traditional publishing or distribution channels and provide their work directly to customers by utilizing blockchain's decentralized nature, smart contracts, and tokenization.

Disintermediation in blockchain has the potential to be beneficial, but it also has dangers and obstacles. These include worries about privacy, security, and governance, legislative ambiguity, and constraints on scaling. Ensuring the responsible adoption and general acceptance of blockchain-based disintermediation is contingent upon regulatory compliance, interoperability standards, and user education.

To fully solve these issues and realize the promise of blockchain disintermediation across sectors, cooperation amongst industry players, legislators, regulators, and technologists is vital.

To sum up, disintermediation in blockchain technology has the potential to drastically change sectors by facilitating peer-to-peer transactions directly, cutting costs, boosting productivity, and improving transparency and trust.

To fully realize this promise, though, several technological, governance and regulatory issues must be resolved while encouraging cooperation and creativity among players. Disintermediation has the potential to fundamentally alter how we communicate, transact, and do business in the digital age as blockchain technology develops.

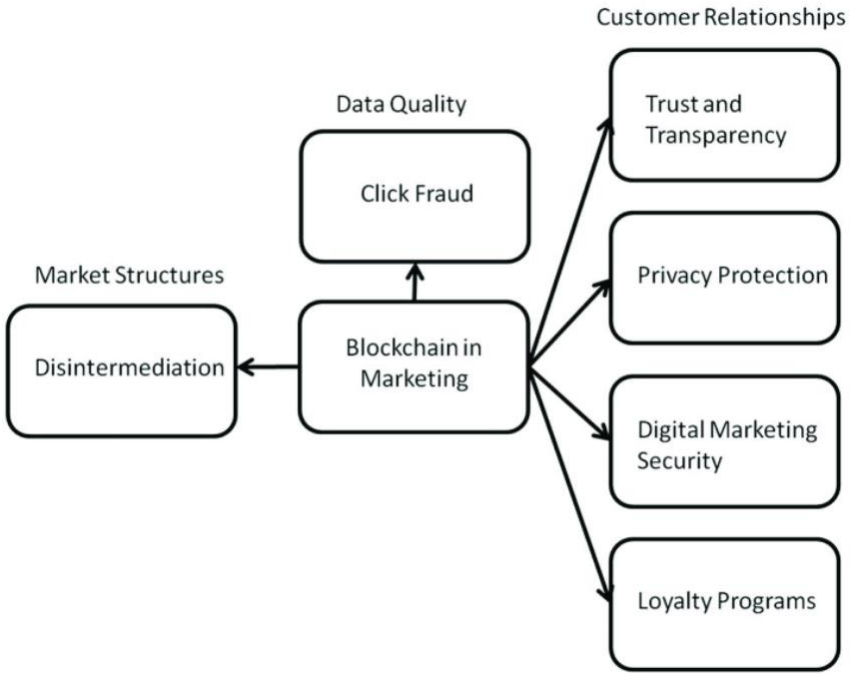

Figure 3:Disintermediation

Table 2: Literature Survey

S.no.	**Paper Title**	**Journal/Conference/author(year)**	**Tools/ Techniques/Dataset**	**Results**
1.	The Role of Blockchain Technology in the tourism industry: analyzing the factors affecting its adoption	Department of Economics, Itlay	Block chain Techn ology used	Blockc hain Applica tions
2.	Blockchain Technology for Smart Tourism Destinations	Campus Of Teatinos, Spain	Block chain Techn ology used	Blockc hain Applica tions
3.	Blockchain Technology in the Tourism Industry: New Perspectives in Switzerland	IDRAC Business School Lyon, France	Block chain Techn ology used	Blockc hain Applica tions
4.	Blockchain Propels Tourism Industry—An Attempt to Explore Topics and Information in Smart Tourism Management through Text Mining and Machine Learning	Department of Marketing, and Innovation, Duy Tan University, Da Nang 550000, Vietnam	Block chain Techn ology used	Blockc hain Applica tions
5.	Customer Segmentation in the Tourism Industry Using Machine Learning Models	Department of Computer Science and Engineering, Dayananda Sagar University, Karnataka, India.	Custo mer Segm entati on Datas et Used	Predicti ons on Custom er Segmen tation
6.	Assessing gastronomic tourism using machine learning	University of Sharjah, Sharjah	Googl e Revie	Used to predict

	approach: The case of Google review	27272, United Arab Emirates	ws Datas et used	google reviews
7.	An enabling Framework for Blockchain in Tourism	University of Science and Technology Beijing, China.	Block chain Frame work made	Blockc hain Applica tions

2.6 Blockchain Applications in Tourism

Table 3:Blockchain Applications

S.no.	**Applications**
1.	Inventory Management
2.	Baggage Tracking
3.	Smart Contracts
4.	Daaps for Smart Tourism

2.6.1 Inventory Management

The ordering, storing, and use of commodities are all under the supervision of inventory management, which is the foundation of supply chain activities.

This procedure has historically been difficult due to fraud susceptibility, inefficiencies, and a lack of openness. However, the emergence of blockchain technology holds the potential to completely transform inventory management by bringing previously unheard-of levels of efficiency, security, and transparency.

Blockchain is a decentralized digital ledger that keeps track of transactions across several computers, making it impossible to change the record in the past.

The intrinsic properties of this technology—transparency, decentralization, and immutability—are very helpful for inventory control. Increased transparency is among the biggest advantages blockchain offers inventory management. Information is frequently segregated across various departments or stakeholders in traditional systems, which causes inaccuracies and breaks in communication. Thanks to blockchain technology, manufacturers, suppliers, distributors, and retailers may access a single, unchangeable ledger.

Since every transaction is captured in real-time, a precise and thorough picture of inventory movements, levels, and status is possible.

By lowering the possibility of mistakes, fraud, and inconsistencies, this transparency promotes confidence among all stakeholders.

Furthermore, blockchain uses smart contracts and automation to increase inventory management efficiency. Self-executing contracts, or smart contracts, have their terms encoded directly into the code. When certain criteria are satisfied, they immediately start acting. For example, a smart contract can place an order with the supplier automatically when inventory levels drop below a predetermined threshold.

2.6.2 Baggage Tracking

The airline industry places a high value on baggage tracking since it has a direct effect on customer happiness and operational effectiveness.

Luggage tracking has always been done manually, which makes it prone to mistakes and inefficiencies and frequently results in misplaced or handled bags.

But baggage tracking systems have been completely transformed by technological advances, especially with the combination of RFID (Radio Frequency Identification) and IoT (Internet of Things).

When RFID tags are affixed to baggage, real-time tracking is made possible from the time of check-in to the point of arrival, loading, and transfers.

Through airline applications, travelers can track the whereabouts of their luggage, giving them piece of mind and lowering their anxiety over possible mishandling. By gathering and sharing information about the bag's location and state, IoT devices improve this procedure even more and guarantee a smooth tracking experience.

These technology developments are very beneficial to airlines. By reducing the frequency of misplaced luggage, real-time tracking lowers compensation expenses and boosts operational effectiveness. Additionally, since ground crew may prioritize handling based on precise, real-time data, it helps with improved resource management.

Installing these devices can also expedite airport operations by reducing the amount of time it takes to find and process misplaced or improperly handled baggage.

A decentralized, tamper-proof ledger for tracking each bag's route is provided by blockchain technology, which is also being adopted in this industry, improving accountability and transparency.

Blockchain further minimizes disagreements and errors by guaranteeing that luggage handling data are unchangeable and available to authorized parties.

In summary, customer pleasure and airline efficiency are greatly improved by contemporary luggage tracking technologies.

Airlines can offer a dependable, transparent, and effective service that reduces the hazards connected with conventional baggage handling systems by utilizing RFID, IoT, and blockchain.

This technological integration has raised the bar for the sector by significantly improving customer satisfaction and operational effectiveness.

2.6.3 Smart Contracts

Self-executing contracts with the terms of the agreement explicitly encoded into code are known as smart contracts, and they are the cornerstone of blockchain technology.

When certain criteria are met, these contracts operate automatically and enforce the agreed terms without the need for middlemen.

This breakthrough, which was made widely known by the Ethereum blockchain, has the potential to completely transform how transactions and activities are carried out and has broad implications for many different industries.

The main benefit of smart contracts is that they can lessen or do away with the need for middlemen. Traditional contracts require intermediaries—such as banks, brokers, and attorneys—to be verified, carried out, and enforced. These parties sometimes incur high expenses and cause delays in these processes.

By automating these procedures, smart contracts save transaction costs and boost productivity. For example, in real estate transactions, a smart contract can streamline the process and cut down on the time and expense involved with traditional techniques by automating the transfer of ownership after payment is confirmed.

The increased security and reliability of smart contracts is another important advantage. Because blockchain technology is decentralized, smart contracts are transparent and immutable—that is, once they are implemented, they cannot be changed.

The contract's terms and execution can be independently verified by each party, reducing the possibility of fraud and fostering trust. Industries like finance, supply chains, and healthcare that greatly depend on trust and transparency would benefit most from this immutability.

Smart contracts, for instance, can automate and validate the movement of commodities from producers to customers in the supply chain sector.

The blockchain allows for the transparent and impenetrable recording of every stage of the supply chain. By enabling all parties to confirm the legitimacy and state of the items, this degree of traceability lowers the likelihood of fraud and mistakes. Furthermore, smart contracts have the ability to automatically initiate payments upon delivery, thereby enhancing cash flow and minimizing administrative burden.

Smart contracts have a lot to offer the healthcare industry as well

These agreements can oversee permission from patients, handle insurance claim processing, and guarantee safe exchange of medical records. For instance, if a healthcare practitioner provides the required paperwork, a smart contract can automatically handle an insurance claim, cutting down on processing times and overhead.

In a similar vein, patients can improve security and privacy by using smart contracts to restrict access to their medical records. This way, only those with permission can examine the data.

Furthermore, the development of decentralized autonomous organizations (DAOs) and decentralized apps (dApps) can be aided by smart contracts. dApps use smart contracts to run their activities decentralized from a central authority.

DAOs, on the other hand, are entities that are fully managed by smart contracts and that use decentralized voting to make decisions. These organizations and applications serve as prime examples of how smart contracts may revolutionize governance and cooperation.

Smart contracts provide many benefits, but they also have drawbacks and restrictions. Smart contract code must be written flawlessly because any errors or vulnerabilities might result in serious problems, including monetary losses.

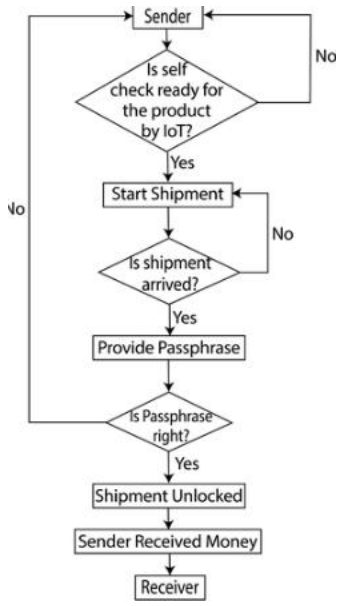

Figure 4:Smart Contracts

2.6.4Daaps for Smart Tourism

Smart contracts enable decentralized apps (dApps) to function without a central authority, providing improved security, openness, and independence.

dApps leverage smart contracts to automate procedures, enforce policies, and enable transactions in a trustless setting by operating on blockchain networks.

This eliminates the possibility of censorship, fraud, or downtime and guarantees that the application runs exactly as intended.

Supply chain management systems that improve efficiency and traceability as well as decentralized finance (DeFi) platforms that offer financial services without the need for traditional middlemen can be developed thanks to the integration of smart contracts in dApps.

Therefore, dApps are a big step forward in using blockchain technology to create more dependable, decentralized, and user-focused applications.

Chapter 03 : Feasibility Study, Requirements Analysis and Design

3.1Feasibility Study

3.1.1 Problem Definition

The travel and tourist sector is vulnerable to fraud, such as fraudulent bookings, phony reviews, and bogus tickets. The confidence of stakeholders is weakened by this lack of transparency.

Travelers who transact internationally frequently pay exorbitant costs, endure protracted processing periods, and have problems with currency exchange. Traveler personal data, such as payment card numbers and itinerary details, is vulnerable to theft and exploitation.

Traveler identity verification can be time-consuming and error-prone, increasing the risk to security and causing delays. Organizing the tourism supply chain, which consists of lodging, travel, and other services, is difficult and frequently ineffective.

Loyalty programs are generally less useful and appealing since they are frequently dispersed and restricted to particular service providers.

3.1.2 Solution

Travelers may benefit from more flexibility and value when global, interoperable loyalty programs are created because to blockchain technology. The unchangeable ledger of blockchain technology may provide transparent and verifiable records of reviews and transactions, lowering fraud and boosting confidence.

Blockchain reduces transaction costs and delays by enabling cross-border payments using cryptocurrencies and stablecoins that are quicker, less expensive, and more secure.

By utilizing decentralized storage and encryption, blockchain technology can provide increased security, shielding private information from breaches and unwanted access.

Digital identities based on blockchain technology may expedite and safeguard the verification process, guaranteeing precision and cutting down on waiting periods.

3.2Requirements

3.2.1 Functional Requirements

For a mobile application to meet user expectations and provide a seamless experience, it must fulfill many functional requirements.

Robust user authentication with role-based access, comprehensive management of user profiles, efficient search functions, efficient data input and output procedures, integrated messaging and alerts, secure transaction processing, trustworthy geolocation services, simple integration with external apps.

Strict data protection security measures, easy-to-use feedback and support features, accessibility standards compliance, and offline capability to handle connectivity issues are just a few of these.

These requirements work together to make the app functional, user-friendly, and effective in meeting a variety of user demands.

3.2.2 Non-Functional Requirements

These are the parts of a program that focus on factors like performance, reliability, and user experience instead than just a few specific features.

A few of these are compatibility with a variety of platforms and devices, scalability to handle increasing user loads, responsiveness to ensure speedy interactions, availability for consistent service, security features like data protection and encryption, usability for an intuitive interface, and compliance with industry regulations.

Performance indicators, such response time or system uptime, may also be included in non-functional criteria to ensure the application's overall effectiveness, reliability, and compliance with technical and user-oriented standards.

3.3 E-R Diagram / Data-Flow Diagram (DFD) / Framework

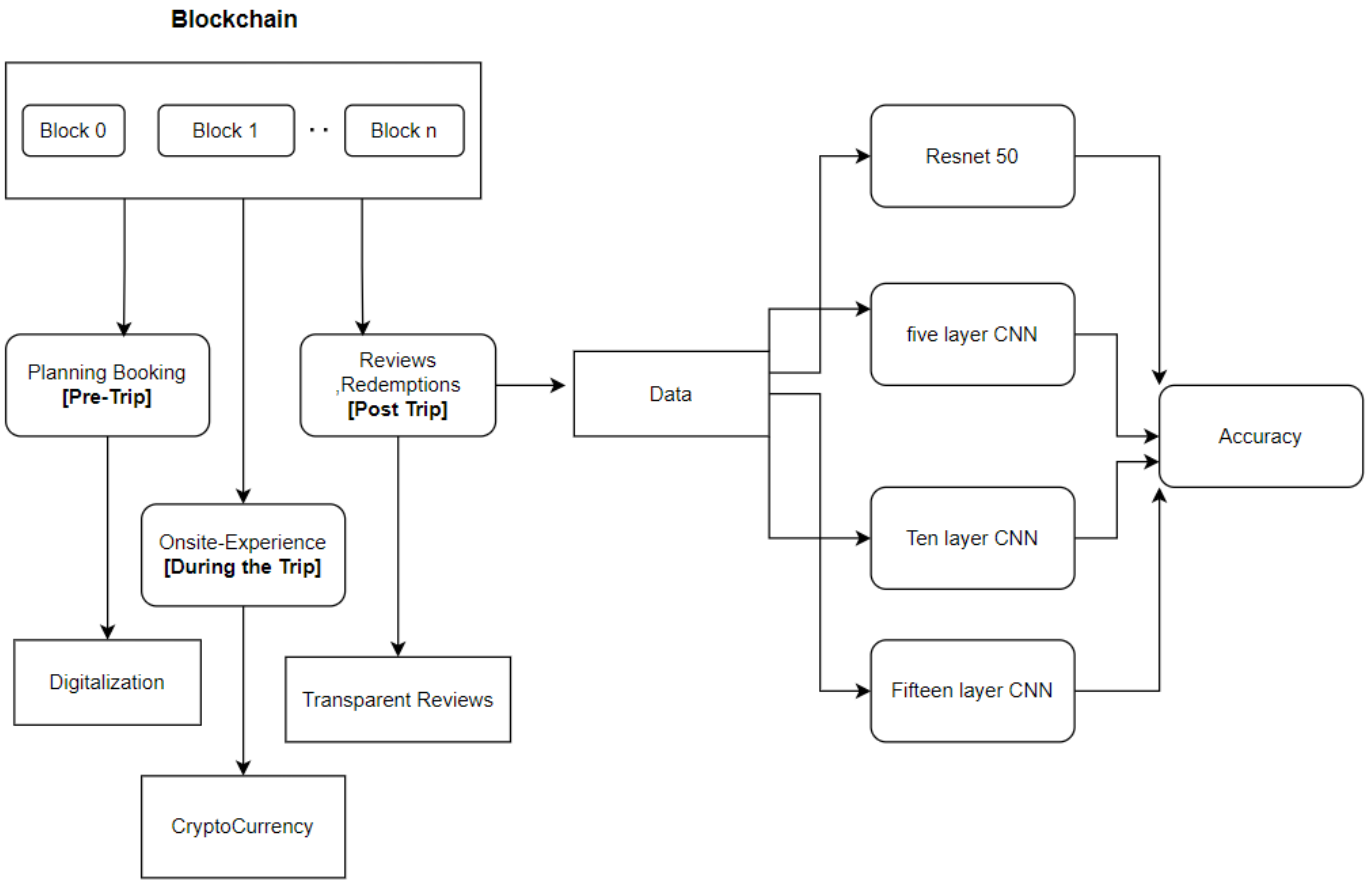

Figure 5:Framwework

Chapter 04: IMPLEMENTATION

4.1 Date Set Used in the Project

A google Maps search was conducted in restaurants in America. To find the eligible traditional restaurants, relevant phrases like "taste," "menu," "outside_atmosphere," and "indoor_atmosphere" were used.
In all, there were a large number of eateries and cafés, with 1100 reviews. Second, businesses with less than seven reviews, reviews written in languages other than English, or evaluations that did not meet the traditional or downtown Amman requirements were excluded.
Consequently, 1100 reviews of the 18 restaurants that met the requirements were gathered using the Webharvy program. The table below lists every restaurant and café in the study along with the quantity, kind, and rating of reviews for each.

Table 4:Dataset

Bussiness_name	**Author_name**	**Reviews**	**Photo**	**Rating**	**Rating category**
Haci'nin Yeri - Yigit Lokantasi	Gulsum Akar	We paid only 84 TL for all the meals here.	dataset/menu/hacinin_yeri	5	menu
Pizza Fellas	Kadir Tasci	Two people were easily satisfied ; a lot of patterns.	dataset/inr_atmosphere/pizza	3	Inner_atmosphere

Cafe Inn	Hooman Sadati	Without any taste how they are at the first rank	Dataset/Taste/cafe	4	Taste
Gold Semaver	Yasemin Uzuner	The place is beautiful	dataset/outdoor_atmosphere	2	Outdoor_atmosphere

4.2 Date Set Features

4.2.1 Types of Data Set

These datasets are used for statistical analysis, natural language processing with text, computer vision with images, voice and sound analysis with audio, motion analysis with video, and temporal trends with time series datasets . The different kinds of datasets that are available include: geospatial datasets for location-based information; tabular structured datasets; unstructured datasets like text documents and images; semi-structured datasets with partial organization; transactional datasets for business records; social media datasets for user interactions; biological datasets for genetics research; machine learning datasets customized for model training; and network datasets illustrating relationships.

Each kind satisfies certain analytical or practical needs, which range from language understanding and picture recognition to numerical modeling and more.

4.2.2 Number of Attributes, fields, and description of the data set

The number of attributes is 6.

The fields are

(1) Restaurant name

(2) Restaurant Owner Name

(3) Review

(4) Photo of Review

(5) Review Category

(6) Rating category

The description of dataset is as follows:

A text dataset is an assemblage of textual data, usually consisting of phrases, paragraphs, or texts.
These databases are multifaceted and might include content from books, papers, reviews, social media posts, and more. Every text unit in the dataset is regarded as a data point, and the dataset is organized overall to make analysis easier—often for tasks involving natural language processing (NLP).
Text datasets are frequently used for tasks like sentiment analysis, text categorization, language modeling, and information retrieval. They can be labeled, indicating the existence of certain features or categories.
Text datasets are frequently used for tasks like sentiment analysis, text categorization, language modeling, and information retrieval. They can be labeled, indicating the existence of certain features or categories.

4.3 Design of Problem Statement

The research contains the following method:
(1) Blockchain technology used
(2) Data collection
(3) Data Preprocessing
(4) Ground Truth Table
(5) Data Vectorization
(6) ML algorithms
(7) Results and discussion

4.4 Algorithm / Pseudo code of the Project Problem

(1) Resnet 50

(2) Five layered CNN

(3) Ten layered CNN

(4) Fifteen layered CNN

4.5 Screenshots of the various stages of the Project

```
import keras.utils
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
from PIL import Image
from sklearn.preprocessing import LabelEncoder
from keras.layers import Input, Dense, Activation, BatchNormalization, Flatten, Conv2D, Averag
ePooling2D, MaxPool2D, ReLU, concatenate, Dropout, RandomFlip
from keras.models import Model
from sklearn.model_selection import train_test_split
from keras import Sequential
from keras.applications.inception_v3 import InceptionV3
from keras.models import model_from_json, load_model
from keras.optimizers import Adam
from keras.regularizers import l2
import tensorflow as tf
```

Figure 6 :Various Library used

```
def convert_to_one_hot(Y, C):
    """
    This function implements one-hot encoding
    :param Y: Array to encode
    :param C: Number of classes to encode
    :return: One hot encoded array
    """
    Y = np.eye(C)[Y.reshape(-1)].T
    return Y
```

Figure 7 :One hot encoding

```
def data_augmenter():
    """
    A data basic data augmenter
    :return: tf.keras.Sequential model
    """
    data_augmention = Sequential()
    data_augmention.add(RandomFlip("horizontal"))
    #data_augmention.add(RandomRotation(0.2))

    return data_augmention
```

Figure 8:Data Augmenter

Chapter 05: RESULTS

5.1 Discussion on the Results Achieved

Table 5:Results Archived

Algorithm	Accuracy
Resnet 50	81%
Five layered CNN	76%
ten layered CNN	85%
Fifteen layered CNN	71%

5.2 Application of the Project

The results of the study are divided into two categories. Machine learning (ML) models created to categorize visitor evaluations into the three CAC model components are the focus of the first section.

During this stage, machine learning (ML) models are assessed using ground truth data based on the goal visual component (taste, menu, outdoor environment).

The "Latent" classification of the CAC model dimensions into sub-dimensions using subject modeling constitutes the second level. One may utilize "Dirichlet Allocation" to locate abstract subjects within a corpus. The goals of this study were to determine the level of visitor satisfaction in OPC, identify some of the factors that may influence it, and create a benchmark for continuing assessments of visitor happiness in order to maintain high levels of satisfaction.

These will boost the likelihood of repeat business, visitor loyalty, and word-of-mouth recommendations to friends and family. Very satisfied visitors will remain at OPC longer, boosting income creation.

The recently constructed Morani restaurant will assist in providing refreshments to visitors since many respondents—particularly locals—identified a need for a refreshment station during the survey period.

5.3 Future Work

To guarantee that visitors will be happy when they return, the Conservancy must make sure that the complaints raised by visitors about different concerns that appeared to have negatively impacted their pleasure are remedied.

As a consequence, their faith in the Conservancy will increase and they will become more devoted. As a result, I would like to suggest the following actions:

examining resident park and camping rates, as many locals claimed the prices were excessive, discouraging people from coming back.

The main objective of teaching the public about various concerns impacting conservation will be achieved by hiring expert guides to help take tourists around the reserve and explain different parts of it and conservation challenges in general.

Additionally, it is necessary to support guide education on a range of topics, such as guiding ethics and values, in various tourist locations. This will enhance the hospitality at these venues and enhance the Conservancy's reputation.

According to several respondents, there are too many tourist groups on the chimp platform, and the noise levels might be detrimental to the chimpanzees. They said that some chimps were furious and others were bored depending on the situation, and that there shouldn't be too many people here to prevent congestion. Long-term effects on their usual conduct may result from this.

Ensuring that all employees who have direct interaction with visitors are wearing name tags is crucial. By doing this, you will be able to maintain a high level of professionalism and gain the trust of the visitors.

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APPENDIX

CODE:

```
import keras.utils
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
from PIL import Image
from sklearn.preprocessing import LabelEncoder
from keras.layers import Input, Dense, Activation, BatchNormalization, Flatten, Conv2D, AveragePooling2D,
    MaxPool2D, ReLU, concatenate, Dropout, RandomFlip
from keras.models import Model
from sklearn.model_selection import train_test_split
from keras import Sequential
from keras.applications.inception_v3 import InceptionV3
from keras.models import model_from_json, load_model
from keras.optimizers import Adam
from keras.regularizers import l2
import tensorflow as tf
def convert_to_one_hot(Y, C):
    """
    This function implements one-hot encoding
    :param Y: Array to encode
    :param C: Number of classes to encode
    :return: One hot encoded array
    """
    Y = np.eye(C)[Y.reshape(-1)].T
    return Y
def convert_images_list_to_matrix(images_list, image_size = (224, 224)):
    """
    This function converts array of images to pixel matrix
    :param images_list: A python list that includes images
    :param image_size: image size (nw,nh)
    :return: Pixelled image array
```

```
    """
    num_images = len(images_list)
    image_size = image_size  # Size of the target variable
    images_array = np.zeros((num_images, *image_size, 3), dtype=np.uint8)

    for i, img in enumerate(images_list):
        img = img.convert("RGB")
        img = img.resize(image_size, Image.LANCZOS)
        img_array = np.array(img)
        images_array[i] = img_array

    return images_array
def plotImage(img_path, showTitle=False):
    """
    This function plots the image in the given file path.
    :param img_path: a string file path
    """
    img = Image.open(img_path)
    plt.imshow(img)
    if showTitle:
        title = img_path.split("/")[1].upper() + " | " + img_path.split("/")[2].split(".")[0]
        plt.title(title)
    plt.axis("off")
    plt.show()
def resnet_block(x, filters, kernel_size, strides=1, padding='same'):
  """ResNet block."""
  x = Conv2D(filters, kernel_size, strides=strides, padding=padding)(x)
  x = BatchNormalization()(x)
  x = Activation('relu')(x)
  x = Conv2D(filters, kernel_size, strides=1, padding=padding)(x)
  x = BatchNormalization()(x)
  return x + x
```

```
        def resNet50(input_shape=(224, 224, 3), data_augmentation=data_augmenter()):
            """ResNet-50."""
            input_tensor = Input(input_shape)
            x = data_augmentation(input_tensor)
            x = Conv2D(64, (7,7), strides=(2,2), padding='same')(x)
            x = BatchNormalization()(x)
            x = Activation('relu')(x)
            x = MaxPool2D(3, strides=2)(x)

            x = resnet_block(x, 64, 3)
            x = resnet_block(x, 128, 3, strides=2)
            x = resnet_block(x, 256, 3, strides=2)
            x = resnet_block(x, 512, 3, strides=2)

            x = AveragePooling2D(7)(x)
def five_layered_cnn(input_shape=(224, 224, 3), data_augmentation=data_augmenter()):

    input_tensor = Input(input_shape)
    x = data_augmentation(input_tensor)
    Z1 = Conv2D(filters=32, kernel_size=4, padding="same", strides=1)(x)
    A1 = ReLU()(Z1)
    P1 = MaxPool2D(pool_size=8, strides=8, padding="same")(A1)
    Z2 = Conv2D(filters=64, kernel_size=2, padding="same", strides=1)(P1)
    A2 = ReLU()(Z2)
    P2 = MaxPool2D(pool_size=4, strides=4, padding="same")(A2)
    F = Flatten()(P2)
    outputs = Dense(units=4, activation="softmax")(F)

    model = Model(inputs=input_tensor, outputs=outputs)
    return  model def fifteen_layered_cnn(input_shape=(224, 224, 3), data_augmentation=data_augmenter()):
    input_tensor = Input(input_shape)
    x = data_augmentation(input_tensor)
    Z1 = Conv2D(filters=32, kernel_size=4, padding="same", strides=1)(x)
```

```
A1 = ReLU()(Z1)
    P1 = MaxPool2D(pool_size=4, strides=4, padding="same")(A1)

    Z2 = Conv2D(filters=64, kernel_size=2, padding="same", strides=1)(P1)
    A2 = ReLU()(Z2)
    P2 = MaxPool2D(pool_size=2, strides=2, padding="same")(A2)

    Z3 = Conv2D(filters=128, kernel_size=2, padding="same", strides=1)(P2)
    A3 = ReLU()(Z3)
    P3 = MaxPool2D(pool_size=2, strides=2, padding="same")(A3)

    Z4 = Conv2D(filters=256, kernel_size=2, padding="same", strides=1)(P3)
    A4 = ReLU()(Z4)
    P4 = MaxPool2D(pool_size=2, strides=2, padding="same")(A4)

    Z5 = Conv2D(filters=512, kernel_size=2, padding="same", strides=1)(P4)
    A5 = ReLU()(Z5)
    P5 = MaxPool2D(pool_size=2, strides=2, padding="same")(A5)

    F = Flatten()(P5)
    D1 = Dense(units=128, activation="relu", kernel_regularizer=l2(0.01))(F)
    D2 = Dense(units=64, activation="relu")(D1)
    #dropout = Dropout(0.2)(D2)
base_path = "/kaggle/input/google-maps-restaurant-reviews/dataset/"

# Data loading
df = pd.read_csv("/kaggle/input/google-maps-restaurant-reviews/reviews.csv")

# A sample from the data
img_path = df.iloc[489,3]
plotImage(base_path+img_path, True)
```

```
# Head of the data frame
print("Head of the initial data frame:")
print(df.head())
print("-------------------------------------")

# Value counts of rating_category column
rating_categories = df["rating_category"]
print(rating_categories.value_counts())
print("-------------------------------------")
X_train_orig, X_test_orig, Y_train_orig, Y_test_orig = train_test_split(images, rating_categories, test_size= 0.25, random_state=42) useSavedModel = True
if useSavedModel:
    model = load_model("/kaggle/input/fifteenlayeredmodeltogooglemapsreviewsapp/model.h5")
else:
    # Creating the model
    model = fifteen_layered_cnn()

    epochs = 30
    l_rate = 4e-4
    adam = Adam(learning_rate=l_rate, decay=(l_rate/epochs))
    model.compile(optimizer=adam, loss='categorical_crossentropy', metrics=['accuracy'])

    # Fit the model
    model.fit(X_train, Y_train, epochs=epochs, batch_size=32)
print(model.summary())
# Evaluate the model on test data
print("Performance of the model on X_test set:")
model.evaluate(X_test, Y_test)
print("-------------------------------------")
```