

## **BIBLIOMETRIC ANALYSIS OF THE LEGAL ISSUES RELATING TO ARTIFICIAL INTELLIGENCE TECHNOLOGY IN TOURISM**

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### **Abstract**

This study aims to map topics and the future research agenda regarding legal issues in artificial intelligence (AI) technology in tourism. The research was conducted using bibliometric analysis of published articles on ScienceDirect between 1999 and 2023. Data collection used the keywords "legal", "artificial intelligence", and "tourism" and found 899 published articles. Network visualization analysis with VosViewer identified seven clusters of topic research. The keywords related to legal issues were policy, governance, security, privacy, and ethics. As a result of the overlay visualization analysis, we found that legal issues in the area of AI technology in tourism differed from the recent topics. The density visualization analysis indicated that more research is needed in the areas of governance, policy, and ethics. As a result of these discussions, future legal issues related to AI in tourism research were raised.

Keywords: Artificial intelligence, Bibliometrics, Legal, Tourism, VOSviewer.

## 1. Introduction

Since its introduction in 1965, artificial intelligence (AI) has been developed as a human problem-solving technology, with significant progress made since 1999 [1]. AI technology encompasses computer-based systems, machine learning, logic systems, smart robots, and virtual and augmented reality [2]. In the tourism industry and information and communication technology, AI technology has been prevalent since 2000 [3]. AI technology in tourism is associated with robotic technology [4], big data [3, 5], and automation [6, 7]. It has the potential to transform the industry, with benefits such as marketing automation, customer segmentation, and smart tourism development [8, 9], as well as impacts on competition between tourism service providers [10]. Bibliometric analysis shows that research on AI technology in tourism has increased since 2017, with topics ranging from the forms of technology and the link between technology and tourism [11], the type of research [12], the main disciplines studying AI in tourism [13], the current state of AI in the hospitality domain [14], and the use of AI in the hotel industry [15]. Legal and ethical concerns are crucial research agendas for AI technology in tourism [13, 16], with environmental factors and government regulations being significant considerations [3, 4, 17]. Specific legal issues related to ethics, regulatory governance, legalization of output and technology production processes, local and global regulations, rules for using personal data or customer privacy, and safety and security issues must be addressed [7, 18-20]. However, there is insufficient research on bibliometric analysis of legal issues in AI technology in tourism. This makes this study essential for future research development and suggestions. Based on previous research [13, 16], this study aims to map the relevant legal issues in AI in Tourism, including (1) legal issues related to AI technology in tourism, (2) research trends, and (3) suggestions for future research agendas.

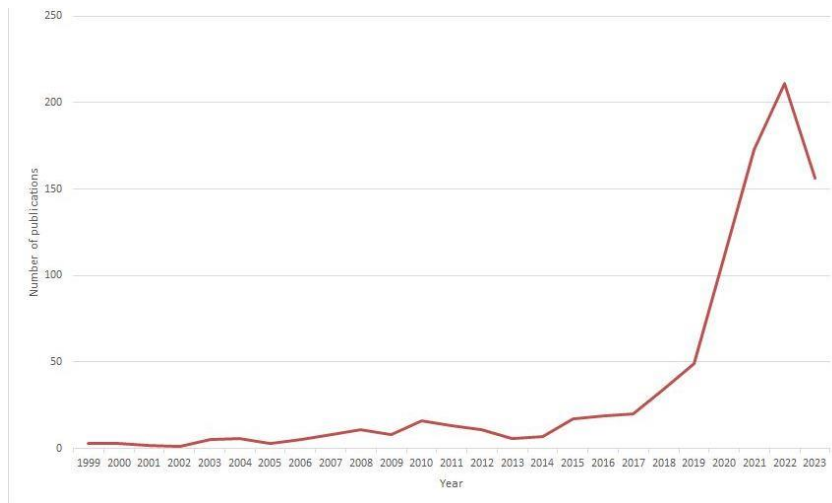
## 2. Method

We conducted a bibliometric analysis based on published articles on ScienceDirect from 1999 to 2023. This is a data source that presents publication data from Elsevier, the oldest publisher in the world [21]. Our data collection involved searching for articles using the keywords "legal", "artificial intelligence", and "tourism" which resulted in 899 published articles. We purposely did not use the keyword "technology" since AI is a form of technology [2]. To analyse the data, we used VosViewer edition 1.6.18 software, which created and visualized bibliometric maps [22]. We conducted a co-occurrence analysis between keywords with five-word co-words, resulting in 3416 keywords, with 76 meeting the threshold. VOSViewer then presented research topics per cluster. We used network visualization to analyse the link between topics, overlay visualization to identify research topic trends based on publication time, and density visualization to determine the density of research per topic [23, 24]. The network, overlay, and density visualization allowed us to analyse legal issues related to AI technology in the tourism topic study. We also analysed research trends by time and issues and suggested future research agendas.

## 3. Results and Discussion

Figure 1 illustrates a rise in publications discussing legal issues related to AI technology in the tourism industry since 2015. The year 2022 had the highest

number of publications so far. However, as of the time this research was conducted, 2023 had not yet shown an increase since there were still six months left when the study was conducted. This increasing trend suggests a growing focus on legal issues surrounding AI technology in tourism. This has been noted in previous studies [13, 16].

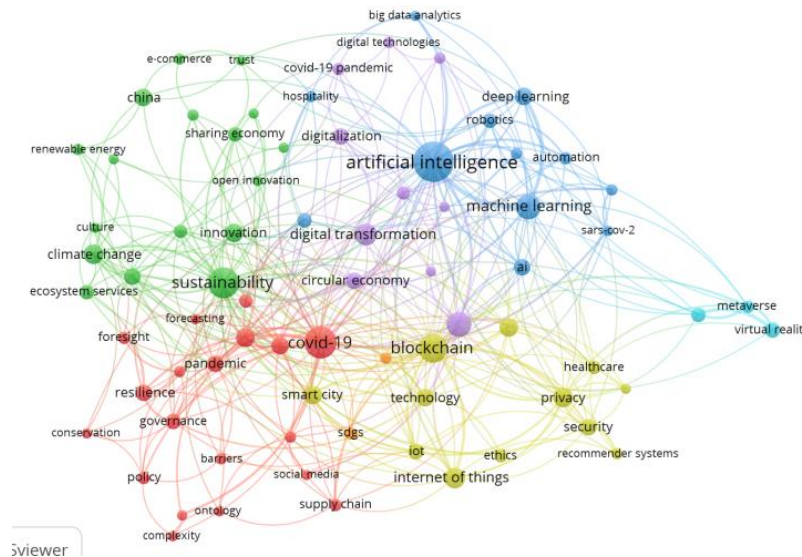


**Fig. 1. Publications on legal issues in AI technology in tourism.**

The research on legal issues related to AI technology in tourism is categorized into seven clusters. Each cluster contains different topics [22-24]. Cluster 1 has 19 items: Barriers, complexity, conservation, Covid-19, data mining, forecasting, foresight, governance, industry 4.0, literature review, natural language process, ontology, pandemics, policy, resilience, scenarios, social media, and supply chain. Cluster 2 has 17 items consisting of bibliometrics, business models, China, climate change, culture, e-commerce, ecosystem services, environment, innovation, open innovation, renewable energy, sharing economy, supply chain management, sustainability, sustainable development, tourism, and trust. Cluster 3 has 12: AI, automation, bibliometrics analysis, big data analytics, coronavirus, deep learning, hospitality, machine learning, research agenda, robotics, and sars-cov-2. Cluster 4 has 12: Blockchain, data management, ethics, healthcare, the Internet of things (IoT), privacy, recommender system, security, smart cities, smart city, and technology. Cluster 5 has ten items: AI, big data, case study, circular economy, Covid-19 pandemic, digital technologies, digital transformation, digitalization, IoT, and systematic literature review. Cluster 6 has three items: Augmented reality, metaverse, and virtual reality. Cluster 7 has two items consisting of e-government and SDGS

Figure 2 shows a visual representation of the connections between different topics. However, the keyword "legal" was not found in any ScienceDirect research topic. Previous studies have identified legal issues in AI technology related to governance and policy in Cluster 1, as well as ethics, privacy, and security in Cluster 4. Research on these topics was carried out in previous studies [3, 4, 7, 17-20]. The analysis of legal issues will continue to focus on these five topics. This figure also displays the relationship between different topics, with connecting lines indicating their connection to each other [22-24]. Figure 2 shows that previous research

examined policy topics related to barriers, complexity, governance, conservation, pandemic, and Covid-19. Governance is a topic that has been studied concerning policy, conservation, pandemic, Covid-19, IoT, blockchain, technology, sustainability, climate change, resilience, and AI. Security is another topic that has been explored in connection with privacy, recommender systems, the IoT, smart city, smart cities, blockchain, machine learning, automation, and AI. Privacy, on the other hand, has been studied regarding the security of the IoT, ethics, data management, blockchain, smart cities, smart cities, big data, virtual reality, augmented reality, machine learning, open innovation, and Covid-19. Lastly, ethics is researched concerning privacy, big data, sustainability, and technology.

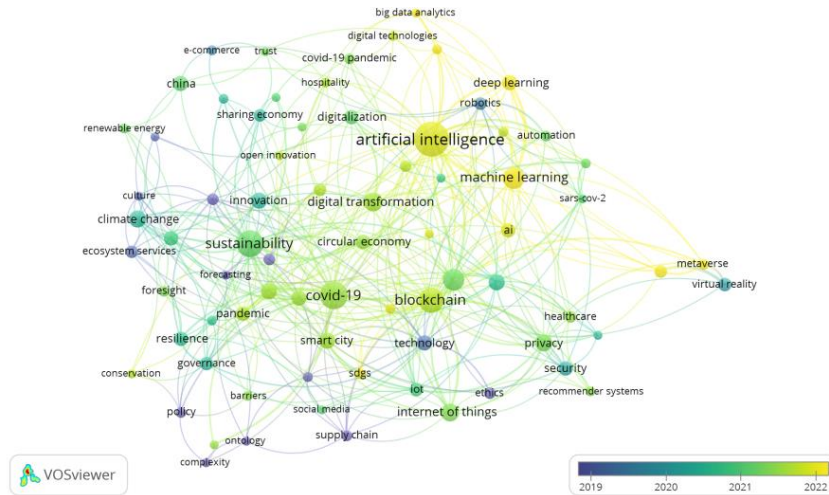


**Fig. 2. Network visualization of the legal issues in AI technology in tourism.**

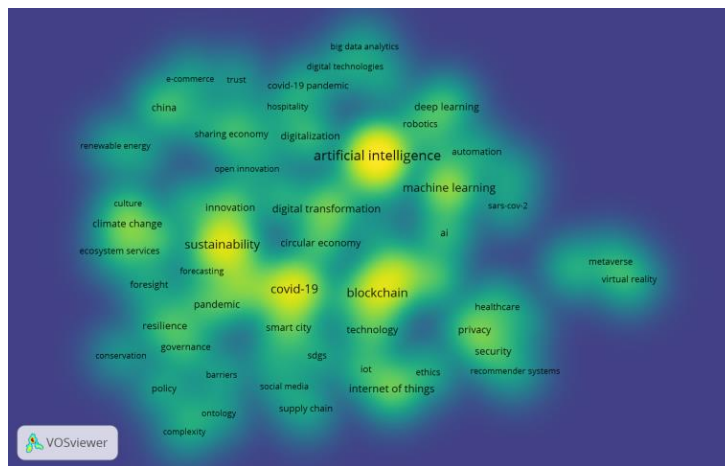
Figure 2 shows that open research opportunities link the main topics of legal issues in AI technology in tourism with other topics that have yet to be researched. This data also shows research opportunities in legal topics. Ethics needs to be researched, together with governance, security, and policy. Ethical factors relate to legal factors [13, 16], governance and policy [3, 4, 18], and security issues [7]. Figure 3 presents research trends, where the most recent topic is highlighted in bright yellow on the overlay visualization map. The latest topics identified were big data analytics, deep learning, and machine learning (cluster 3), systematic literature review (cluster 5), augmented reality and the metaverse (cluster 6), e-government, and SDGS (cluster 7). However, legal issues related to AI technology in tourism were not among the recent topics. Although some literature reviews published have touched upon this subject [7, 25], they have yet to explicitly discuss legal issues in AI technology in tourism. Other research studies have linked legal issues with the metaverse, machine learning, deep learning, big data [26], and tourism [27]. As a result of this data, it is possible to explore legal issues related to the most recent topics.

The density visualization's light colour indicates that a lot of research has been conducted on the topic [22-24]. Figure 4 illustrates a study on legal issues related

to AI technology in tourism, with a focus on privacy and security. Only a small amount of research has been conducted on governance, policy, and ethics. Previous studies have highlighted the government's crucial role in regulating AI technology in tourism [3, 4, 18]. Ethical considerations are also crucial for legalizing AI technology in tourism [18, 19]. The data suggested that there are opportunities for future research into governance, policy, and ethics in this field.



**Fig. 3. Overlay visualization of the legal issues in AI technology in tourism.**



**Fig. 4. Density visualization of the legal issues in AI technology in tourism.**

AI technology becomes more prevalent in many areas[28-30], including in the tourism industry. Since tourism relates to economy in countries [31-33], it is critical to consider legal factors, including ethical concerns in the development and use of technology [4] as well as legal considerations for customers [20]. As new forms of AI technology, such as machine learning, augmented reality, and the metaverse, continue to emerge, further research is needed to understand their legal implications for tourism. By conducting this research, policies can be developed and implemented to ensure responsible governance [3, 4, 18, 19]. Finally, since the

present explanations regarding bibliometric meet some limitations, detailed explanations on bibliometric are explained in elsewhere [34, 35].

#### 4. Conclusion

This study analysed the legal issues using bibliometric relating to AI technology in tourism research (from 1999 to 2023). The study identified seven clusters of research topics. Previous studies showed that legal issues were mainly related to policy, governance, security, ethics, and privacy. Legal issues are not the most recent research topic in the field. The network visualization analysis found that ethics is studied concerning privacy, big data, sustainability, and technology. However, it has yet to be explicitly studied concerning governance, security, and policy. There is still a need for more research on governance, policy, and ethics, as indicated by the density visualization analysis. Overall, these data suggest that future research opportunities remain in these areas. Legal concerns are paramount to these areas' development. As such, further research should be conducted to explore the implications for legal issues of these topics.

#### Acknowledgments

We would like to express our deepest gratitude and appreciation to Djuanda Reborn and the Chancellor of Universitas Djuanda.

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