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REFERENCES

[1] S. Naseem and A. Dionísio, "The role of tourism in economic growth: Empirical evidence from saudi arabia," *Economies*, vol. 9, p. 117, 2021. [Online]. Available: https://doi.org/10.3390/economies9030117

[2] A. Arifin, "The contribution of tourism to economic growth: The case of central java, indonesia," *Sustainable Competitive Advantage (SCA)*, vol. 11, 2022.

[3] M. Enilov and Y. Wang, "Tourism and economic growth: Multi-country evidence from mixed-frequency granger causality tests," *Tourism Economics*, vol. 28, pp. 1216–1239, 2022.

[4] H. Rasool, S. Maqbool, and M. Tarique, "The relationship between tourism and economic growth among brics countries: a panel cointegration analysis," *Future Business Journal*, vol. 7, pp. 1–11, 1 2021. [Online]. Available: https://fbj.springeropen.com/articles/10.1186/s43093-020-00048-3

[5] Statista, "Total contribution of travel and tourism to gross domestic product (gdp) worldwide in 2019 and 2024, with a forecast for 2025 and 2035," 2026. [Online]. Available: https://www.statista.com/statistics/233223/travel-and-tourism-total-economic-contribution-worldwide/

[6] T. Rasul, "The trends, opportunities, and challenges of halal tourism: a systematic literature review," *Tourism Recreation Research*, vol. 44, pp. 434–450, 2019.

[7] A. Vargas-Sánchez and M. Moral-Moral, "Halal tourism: state of the art," *Tourism Review*, vol. 74, pp. 385–399, 2019.

[8] M. Battour and M. Battour, "Muslim travel behavior in halal tourism," *Mobilities, Tourism and Travel Behavior - Contexts and Boundaries*, 12 2017. [Online]. Available: https://www.intechopen.com/chapters/56647

[9] H. El-Gohary, "Halal tourism, is it really halal?" *Tourism Management Perspectives*, vol. 19, pp. 124–130, 2016. [Online]. Available: http://dx.doi.org/10.1016/j.tmp.2015.12.013

[10] M. Battour and M. N. Ismail, "Halal tourism: Concepts, practises, challenges and future," *Tourism Management Perspectives*, vol. 19, pp. 150–154, 7 2016. [Online]. Available: http://dx.doi.org/10.1016/j.tmp.2015.12.008

[11] Mastercard-CrescentRating, "Global muslim travel index 2024," 2024. [Online]. Available: https://www.crescentrating.com/reports/global-muslim-travel-index-2024.html

[12] P. P. Biancone, S. Secinaro, M. Radwan, and M. Kamal, "Halal tourism: An opportunity for the global tourism industry," *Tourism Analysis*, vol. 24, pp. 395–404, 2019.

[13] E. Boğan and M. Sarıışık, "Halal tourism: conceptual and practical challenges," *Journal of Islamic Marketing*, vol. 10, pp. 87–96, 2019. [Online]. Available: www.emeraldinsight.com/1759-0833.htm

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Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

[14] Market Research Future, "Halal tourism industry overview market analysis, size, share, trends, 2032," https://www.marketresearchfuture.com/reports/halal-tourism-industry-overview-market-26388, March 2025, market projection: USD 256.51 billion in 2023 to USD 410.9 billion by 2032, CAGR 5.38%.

[15] Credence Research, "Halal tourism market size, growth, share and forecast 2032," https://www.credenceresearch.com/report/halal-tourism-market, March 2025, market projection: USD 301.95 billion in 2024 to USD 499.73 billion by 2032, CAGR 6.5%.

[16] M. F. Said, K. A. Adham, N. S. Muhamad, and S. Sulaiman, "Exploring halal tourism in muslim-minority countries: Muslim travellers' needs and concerns," *Journal of Islamic Marketing*, vol. 13, pp. 824–842, 3 2022.

[17] C. Chantarungsri, N. Popichit, S. Rugthangam, N. Wattana, J. Chuanchom, and M. Sukmak, "Mapping the landscape of halal tourism: a bibliometric analysis," *Cogent Social Sciences*, vol. 10, no. 1, 2024. [Online]. Available: https://doi.org/10.1080/23311886.2024.2365507

[18] S. A. Suban, K. Madhan, and S. Shagirbasha, "A bibliometric analysis of halal and islamic tourism," *International Hospitality Review*, vol. ahead-of-print, 2021. [Online]. Available: https://www.emerald.com/insight/2516-8142.htm

[19] D. Xiao, N. Wang, J. Yu, C. Zhang, and J. Wu, "A practice of tourism knowledge graph construction based on heterogeneous information," *19th Chinese National Conference on Computational Linguistic, CCL 2020*, pp. 939–949, 2020.

[20] M. Wu and H. Zhao, "Research on entity recognition and alignment methods in knowledge graph construction of multi-source tourism data," *IMCEC 2021 - IEEE 4th Advanced Information Management, Communicates, Electronic and Automation Control Conference*, pp. 862–866, 2021.

[21] Future Market Insights, "Japan halal tourism market size & outlook 2025-2035," Future Market Insights, 2024, market research report. [Online]. Available: https://www.futuremarketinsights.com/reports/japan-halal-tourism-market

[22] U. Dombrowski, A. Reiswich, and C. Imdahl, "Knowledge graphs for an automated information provision in the factory planning," *IEEE International Conference on Industrial Engineering and Engineering Management*, pp. 1074–1078, 12 2019.

[23] A. Berquand and A. Riccardi, "From engineering models to knowledge graph: delivering new insights into models," *9th International Systems & Concurrent Engineering for Space Applications Conference (SECESA) 2020*, 2020.

[24] C. Schlieder *et al.*, "Warsampo knowledge graph: Finland in the second world war as linked open data," *Semantic Web*, vol. 12, pp. 265–278, 2021.

[25] J. Barrasa, A. Hodler, and J. Webber, *Knowledge Graphs*. O'Reilly, 2021.

[26] H. Yun, Y. He, L. Lin, Z. Pan, and X. Zhang, "Construction research and application of poverty alleviation knowledge graph," *Lecture Notes in Computer Science*

UNIVERSITAS
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Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/
(including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics), vol. 11817 LNCS, pp. 430–442, 2019.

[27] B. Yang and Y. ming Liao, "Research on enterprise risk knowledge graph based on multi-source data fusion," *Neural Computing and Applications*, vol. 34, pp. 2569–2582, 2 2022. [Online]. Available: https://link.springer.com/article/10.1007/s00521-021-05985-w

[28] U. Serles, E. Kärle, R. Hunkel, and D. Fensel, "German tourism knowledge graph," in *The Semantic Web: ESWC 2024 Satellite Events*, ser. Lecture Notes in Computer Science, A. M. Peñuela *et al.*, Eds., vol. 15344. Cham: Springer, 2025, pp. –, hersonissos, Crete, Greece, May 26–30, 2024, Proceedings, Part I. [Online]. Available: https://doi.org/10.1007/978-3-031-78952-6_49

[29] S. Pan, L. Luo, Y. Wang, C. Chen, J. Wang, and X. Wu, "Unifying large language models and knowledge graphs: A roadmap," *IEEE Transactions on Knowledge and Data Engineering*, vol. 36, no. 7, pp. 3580–3599, 2024.

[30] J. Z. Pan *et al.*, "Large Language Models and Knowledge Graphs: Opportunities and Challenges," *Transactions on Graph Data and Knowledge*, vol. 1, no. 1, pp. 2:1–2:38, 2023. [Online]. Available: https://drops.dagstuhl.de/entities/document/10.4230/TGDK.1.1.2

[31] A. P. Kirilenko and S. Stepchenkova, "Facilitating topic modeling in tourism research: Comprehensive comparison of new AI technologies," *Tourism Management*, vol. 106, 2025.

[32] E. Soria Leyva, A. Valls, A. Moreno, and A. B. Hernández-Lara, "LLM-enhanced BERTopic vs. traditional topic models in tourism: Performance and temperature effects," in *Artificial Intelligence Research and Development (Proceedings of the 27th International Conference of the Catalan Association for Artificial Intelligence, CCIA 2025)*, ser. Frontiers in Artificial Intelligence and Applications, K. Trejo *et al.*, Eds. IOS Press, 2025, pp. 47–56.

[33] V. Arefeva and R. Egger, "When BERT started traveling: TourBERT—a natural language processing model for the travel industry," *Digital*, vol. 2, no. 4, pp. 546–559, 2022. [Online]. Available: https://www.mdpi.com/2673-6470/2/4/30

[34] Q. Wei, M. Yang, J. Wang, W. Mao, J. Xu, and H. Ning, "CTourLLM: Enhancing LLMs with chinese tourism knowledge," *Cluster Computing*, vol. 28, no. 6, p. 351, 2025.

[35] K. Puh and M. Bagić Babac, "Predicting sentiment and rating of tourist reviews using machine learning," *Journal of Hospitality and Tourism Insights*, vol. 6, no. 3, pp. 1188–1204, 2023.

[36] J. Srinivasan, M. Niranjanee, C. Nandhana, and M. Azhagiri, "A text classification in tourism reviews with the hybrid transformer-attention model in the information management of smart tourism," ser. Lecture Notes in Networks and Systems, vol. 1128 LNNS. Springer Nature Singapore, 2025, pp. 479–488.

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Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

[37] W. Zhang, H. Cao, F. Hao, L. Yang, M. Ahmad, and Y. Li, "The chinese knowledge graph on domain-tourism," *Lecture Notes in Electrical Engineering*, vol. 590, pp. 20–27, 2020. [Online]. Available: https://link.springer.com/chapter/10.1007/978-981-32-9244-4_3

[38] Y. Sui, "Question answering system based on tourism knowledge graph," *Journal of Physics: Conference Series*, vol. 1883, 2021.

[39] P. Yochum, L. Chang, T. Gu, M. Zhu, and W. Zhang, "Tourist attraction recommendation based on knowledge graph," *IFIP Advances in Information and Communication Technology*, vol. 538, pp. 80–85, 2018. [Online]. Available: https://link.springer.com/chapter/10.1007/978-3-030-00828-4_9

[40] M. EK, "The fragmentation and knowledge in tourism fields: An alternative viewpoint," *Journal of Tourism & Hospitality*, vol. 4, no. 159, 2015. [Online]. Available: https://www.longdom.org/abstract/the-fragmentation-and-knowledge-in-tourism-fields-an-alternative-viewpoint-12075.html

[41] Z. Fan and C. Chen, "Cupe-kg: Cultural perspective–based knowledge graph construction of tourism resources via pretrained language models," *Information Processing Management*, vol. 61, no. 3, p. 103646, 2024. [Online]. Available: https://www.sciencedirect.com/science/article/pii/S0306457324000062

[42] W. Tao, Q. Zhou, Y. Zhao, and A. Yu, "A cross-field construction method of chinese tourism knowledge graph based on expasion and adjustment of entities," *Proceedings of 2020 IEEE 5th Information Technology and Mechatronics Engineering Conference, ITOEC 2020*, pp. 211–215, 2020.

[43] X. Wu, J. Wu, X. Fu, J. Li, P. Zhou, and X. Jiang, "Automatic knowledge graph construction: A report on the 2019 icdm/icbk contest," *Proceedings - IEEE International Conference on Data Mining, ICDM*, vol. 2019-November, pp. 1540–1545, 11 2019.

[44] E. Kärle, U. Şimşek, O. Panasiuk, and D. Fensel, "Building an ecosystem for the tyrolean tourism knowledge graph," *Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)*, vol. 11153 LNCS, pp. 260–267, 2018.

[45] R. Alonso-Maturana, E. Alvarado-Cortes, S. López-Sola, M. Martínez-Losa, and P. Hermoso-González, "La rioja turismo: The construction and exploitation of a queryable tourism knowledge graph," *Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)*, vol. 11153 LNCS, pp. 213–220, 2018.

[46] U. Simsek *et al.*, "A knowledge graph perspective on knowledge engineering," *SN Computer Science*, vol. 4, 2023.

[47] H. Hendrik, S. S. Kusumawardani, and A. E. Permanasari, "Exploring the landscape of tourism knowledge graphs: A systematic literature review," in *2024 9th International Conference on Information Technology and Digital Applications (ICITDA)*, 2024, pp. 01–08.

UNIVERSITAS
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Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

[48] Mastercard-CrescentRating, "Global muslim travel index 2019," 2019. [Online]. Available: https://www.crescentrating.com/reports/global-muslim-travel-index-2019.html

[49] D. Samara, I. Magnisalis, and V. Peristeras, "Artificial intelligence and big data in tourism: a systematic literature review," *Journal of Hospitality and Tourism Technology*, vol. 11, pp. 343–367, 9 2020.

[50] A. F. Rahmat, "Halal tourism in social science discipline: A literature review," *Journal of Social Studies (JSS)*, vol. 17, pp. 115–146, 10 2021. [Online]. Available: https://journal.uny.ac.id/index.php/jss/article/view/39287

[51] K. Berhanu and S. Raj, "The trustworthiness of travel and tourism information sources of social media: perspectives of international tourists visiting ethiopia," *Heliyon*, vol. 6, 3 2020.

[52] S. Yasuda, "Managing halal knowledge in japan: Developing knowledge platforms for halal tourism in japan," *Asian Journal of Tourism Research*, vol. 2, pp. 65–83, 2017.

[53] M. Paliwal, "Why knowledge graphs are key to working with data efficiently, powerfully | venture-beat," 2021. [Online]. Available: https://venturebeat.com/2021/06/28/why-knowledge-graphs-are-key-to-working-with-data-efficiently-powerfully/

[54] H. Xu, G. Fan, G. Kuang, and C. Wang, "Exploring the potential of bert-bilstm-crf and the attention mechanism in building a tourism knowledge graph," *Electronics*, vol. 12, p. 1010, 2 2023.

[55] J. Wu, X. Zhu, C. Zhang, and Z. Hu, "Event-centric tourism knowledge graph—a case study of hainan," *Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)*, vol. 12274 LNAI, pp. 3–15, 2020.

[56] J. Gao, P. Peng, F. Lu, S. Wang, X. Xie, and C. Claramunt, "Knowledge-driven spatial competitive intelligence for tourism," *Transactions in GIS*, vol. 28, no. 3, pp. 535–563, 2024. [Online]. Available: https://onlinelibrary.wiley.com/doi/abs/10.1111/tgis.13145

[57] A. Chessa, G. Fenu, E. Motta, F. Osborne, D. R. Recupero, A. Salatino, and L. Secchi, "Data-driven methodology for knowledge graph generation within the tourism domain," *IEEE Access*, vol. 11, pp. 67 567–67 599, 2023.

[58] D. P. Pratama, "The future of the halal tourism market in japan after covid-19: An economic pragmatism perspective," *KnE Social Sciences*, vol. 2022, pp. 21–43–21–43, 3 2022. [Online]. Available: https://knepublishing.com/index.php/KnE-Social/article/view/10512

[59] H. Hendrik, S. S. Kusumawardani, and A. E. Permanasari, "The emerging landscape of halal tourism in the digital era: an it perspective," *Journal of Islamic Marketing*, vol. 15, no. 8, pp. 1995–2015, 06 2024. [Online]. Available: https://doi.org/10.1108/JIMA-04-2023-0130

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Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

[60] H. Oktadiana, P. L. Pearce, and K. Chon, "Muslim travellers' needs: What don't we know?" *Tourism Management Perspectives*, vol. 20, pp. 124–130, 10 2016.

[61] A. Moshin, A. Brochado, and H. Rodrigues, "Halal tourism is traveling fast: Community perceptions and implications," *Journal of Destination Marketing Management*, vol. 18, pp. 2212–571, 2020. [Online]. Available: https://doi.org/10.1016/j.jdmm.2020.100503

[62] A. Jafar, A. Q. Qadri, and A. Husna, "Worldwide research on halal tourism: A bibliometric analysis," *Journal of Business and Economic Analysis*, vol. 6, no. 3, pp. 253–275, 2023.

[63] A. Wibowo, M. Hariadi, M. Sulistyono, M. K. Milad, E. Rhofita, and A. B. Gumelar, "Mapping of tourism destinations by gis-blockchain rpca based on pnpoly algorithm," *Proceedings - 2020 International Seminar on Application for Technology of Information and Communication: IT Challenges for Sustainability, Scalability, and Security in the Age of Digital Disruption, iSemantic 2020*, pp. 412–416, 2020.

[64] S. Afnarius, F. Akbar, and F. Yuliani, "Developing web-based and mobile-based gis for places of worship information to support halal tourism: A case study in bukittinggi, indonesia," *International Journal of Geo-Information*, vol. 9, 2020. [Online]. Available: www.mdpi.com/journal/ijgi

[65] Y. M. Arif, H. Nurhayati, S. Mardi, S. Nugroho, and M. Hariadi, "Destinations ratings based multi-criteria recommender system for indonesian halal tourism game," *International Journal of Intelligent Engineering and Systems*, vol. 15, pp. 282–294, 2022.

[66] H. Wardhana, K. Mustofa, and A. Sari, "Utilization of semantic web rule language for tourism ontology," *Proceedings of the 3rd International Conference on Informatics and Computing, ICIC 2018*, 2018. [Online]. Available: https://ieeexplore.ieee.org/document/8780474

[67] A. Mardison, L. Ramadhanu, R. Navia, S. Enggari, and A. Ramadhanu, "Hybrid dss for recommendations of halal culinary tourism west sumatra," *IAES International Journal of Artificial Intelligence (IJ-AI)*, vol. 10, pp. 273–283, 2021.

[68] M. Battour *et al.*, "Artificial intelligence applications in halal tourism to assist muslim tourist journey," vol. 322, 2022, pp. 861–872.

[69] H. Husain, M. Zarlis, H. Mawengkang, and S. Efendi, "Causal loop diagram (cld) model in planning a sustainable smart sharia tourism," *Journal of Physics: Conference Series*, vol. 1641, p. 12099, 2020.

[70] A. P. Marlinda, B. Cipto, F. Al-Fadhat, and H. Jubba, "The influence of artificial intelligence to support halal tourism policy in south korea the influence of artificial intelligence to support halal tourism policy in south korea," *IOP Conference Series: Earth and Environmental Science*, vol. 717, 2021.

[71] T. Nahdliyah, A. Nabila, D. Sensuse, R. Suryono, and K. Kautsarina, "Redesigning user interface on halal tourism application with user-centered design approach," *2021 International Conference on Computer Science, Information Technology, and Electrical Engineering, ICOMITEE 2021*, pp. 118–124, 2021.

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Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

[72] J. Xie *et al.*, "Construction of multimodal chinese tourism knowledge graph," *Communications in Computer and Information Science*, vol. 1452 CCIS, pp. 16–29, 2021.

[73] A. Cimmino, N. Mihindukulasooriya, F. Priyatna, and M. Rico, "Linked-fiestas: A knowledge graph to promote cultural tourism in spain," *Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)*, vol. 11153 LNCS, pp. 202–205, 2018. [Online]. Available: https://link.springer.com/chapter/10.1007/978-3-030-03056-8_18

[74] J. Li, Z. Luo, H. Huang, and Z. Ding, "Towards knowledge-based tourism chinese question answering system," *Mathematics*, vol. 10, 2022.

[75] X. Su, J. He, J. Ren, and J. Peng, "Personalized chinese tourism recommendation algorithm based on knowledge graph," *Applied Sciences (Switzerland)*, vol. 12, 2022.

[76] X. Liang, H. Cao, and W. Zhang, "Knowledge extraction experiment based on tourism knowledge graph qa data set," *Proceedings of 2020 IEEE International Conference on Power, Intelligent Computing and Systems, ICPICS 2020*, pp. 828–832, 2020.

[77] Q. Jiang, "A personalized attractions recommendation model based on tourism knowledge graph," *Proceedings of SPIE - The International Society for Optical Engineering*, vol. 12129, 2021.

[78] L. Feng, "Design of tourism intelligent recommendation model of mount tai scenic area based on knowledge graph," *Proceedings - 2020 International Conference on E-Commerce and Internet Technology, ECIT 2020*, pp. 241–244, 2020.

[79] P. Do, T. H. V. Phan, and B. B. Gupta, "Developing a vietnamese tourism question answering system using knowledge graph and deep learning," *Transactions on Asian and Low-Resource Language Information Processing*, vol. 20, pp. 1–18, 6 2021. [Online]. Available: https://dl.acm.org/doi/10.1145/3453651

[80] L. Yang, H. Cao, F. Hao, W. Zhang, and M. Ahmad, "Research on tourism question answering system based on xi'an tourism knowledge graph," *Journal of Physics: Conference Series*, vol. 1616, 2020.

[81] F. Zeng and Y. Zheng, "Tourism recommendation system based on knowledge graph feature learning," *Proceedings of the 4th International Conference on Computing Methodologies and Communication, ICCMC 2020*, pp. 110–114, 3 2020.

[82] P. Calleja, F. Priyatna, N. Mihindukulasooriya, and M. Rico, "Dbtravel: A tourism-oriented semantic graph," *Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)*, vol. 11153 LNCS, pp. 206–212, 2018. [Online]. Available: https://link.springer.com/chapter/10.1007/978-3-030-03056-8_19

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Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

[83] A. B. Bastidas-Manzano, J. Sánchez-Fernández, and L. A. Casado-Aranda, "The past, present, and future of smart tourism destinations: A bibliometric analysis," *Journal of Hospitality and Tourism Research*, vol. 45, pp. 529–552, 3 2021. [Online]. Available: https://journals.sagepub.com/doi/10.1177/1096348020967062

[84] D. Buhalis and R. Law, "Progress in information technology and tourism management: 20 years on and 10 years after the internet—the state of etourism research," *Tourism Management*, vol. 29, pp. 609–623, 8 2008.

[85] I. Erol, I. O. Neuhofer, T. Dogru, A. Oztel, C. Searcy, and A. C. Yorulmaz, "Improving sustainability in the tourism industry through blockchain technology: Challenges and opportunities," *Tourism Management*, vol. 93, p. 104628, 12 2022.

[86] T. Gajdošík, V. Maráková, and J. Kučerová, "From mass tourists to smart tourists: a perspective article," *Tourism Review*, vol. 76, pp. 47–50, 2 2021.

[87] S. Gössling, "Tourism, information technologies and sustainability: an exploratory review," *Journal of Sustainable Tourism*, vol. 25, pp. 1024–1041, 7 2016. [Online]. Available: https://www.tandfonline.com/doi/abs/10.1080/09669582.2015.1122017

[88] R. Law, D. Buhalis, and C. Cobanoglu, "Progress on information and communication technologies in hospitality and tourism," *International Journal of Contemporary Hospitality Management*, vol. 26, pp. 727–750, 7 2014.

[89] C.-C. Lee, M.-P. Chen, W. Wu, and W. Xing, "The impacts of icts on tourism development: International evidence based on a panel quantile approach," *Information Technology & Tourism*, vol. 23, pp. 509–547, 2021. [Online]. Available: https://doi.org/10.1007/s40558-021-00215-4

[90] T. Pencarelli, "The digital revolution in the travel and tourism industry," *Information Technology Tourism*, vol. 22, pp. 455–476, 2020. [Online]. Available: https://doi.org/10.1007/s40558-019-00160-3

[91] J. Qian, R. Law, and J. Wei, "Knowledge mapping in travel website studies: a scientometric review," *Scandinavian Journal of Hospitality and Tourism*, vol. 19, pp. 192–209, 3 2018. [Online]. Available: https://www.tandfonline.com/doi/abs/10.1080/15022250.2018.1526113

[92] M. Wang, "Applying internet information technology combined with deep learning to tourism collaborative recommendation system," *Plos One*, vol. 15, 2020. [Online]. Available: https://doi.org/10.1371/journal.pone.0240656.g001

[93] P. Yin, X. Zheng, L. Duan, X. Xu, and M. He, "A study of the contribution of information technology on the growth of tourism economy using cross-sectional data," *Journal of Global Information Management (JGIM)*, vol. 27, pp. 39–58, 4 2019. [Online]. Available: https://dl.acm.org/doi/10.4018/JGIM.2019040103

[94] J. Frizzo-Barker, P. A. Chow-White, P. R. Adams, J. Mentanko, D. Ha, and S. Green, "Blockchain as a disruptive technology for business: A systematic review," *International Journal of Information Management*, vol. 51, p. 102029, 4 2020.

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Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

[95] N. S. Muhamad, S. Sulaiman, K. A. Adham, and M. F. Said, "Halal tourism: literature synthesis and direction for future research," *Pertanika Journal of Social Sciences and Humanities*, vol. 27, pp. 729–745, 2019. [Online]. Available: http://www.pertanika.upm.edu.my/Pertanika%20PAPERS/JSSH%20Vol.%2027%20(1)%20Mar.%202019/48%20JSSH-2753-2017.pdf

[96] F. Khan and M. Callanan, "The "halalification" of tourism," *Journal of Islamic Marketing*, vol. 8, pp. 558–577, 2017.

[97] M. A. Fauzi and M. Battour, "Halal and islamic tourism: science mapping of present and future trends," *Tourism Review*, 2024. [Online]. Available: https://api.semanticscholar.org/CorpusID:267443378

[98] M. Battour, K. Mady, M. Salaheldeen, M. Elsotouhy, I. Elbendary, and E. Boğan, "Ai-enabled technologies to assist muslim tourists in halal-friendly tourism," *Journal of Islamic Marketing*, vol. ahead-of-print, 2022.

[99] S. Yousaf and F. Xiucheng, "Halal culinary and tourism marketing strategies on government websites: A preliminary analysis," *Tourism Management*, vol. 68, pp. 423–443, 10 2018.

[100] S. Razzaq, C. M. Hall, and G. Prayag, "The capacity of new zealand to accommodate the halal tourism market - or not," *Tourism Management Perspectives*, vol. 18, pp. 92–97, 4 2016.

[101] S. Ainin, A. Feizollah, N. B. Anuar, and N. A. Abdullah, "Sentiment analyses of multilingual tweets on halal tourism," *Tourism Management Perspectives*, vol. 34, 4 2020.

[102] A. Feizollah, S. Ainin, N. B. Anuar, N. A. B. Abdullah, and M. Hazim, "Halal products on twitter: Data extraction and sentiment analysis using stack of deep learning algorithms," *IEEE Access*, vol. 7, pp. 83 354–83 362, 2019.

[103] A. Feizollah, M. M. Mostafa, A. Sulaiman, Z. Zakaria, and A. Firdaus, "Exploring halal tourism tweets on social media," *Journal of Big Data*, vol. 8, 2021, done. [Online]. Available: https://doi.org/10.1186/s40537-021-00463-5

[104] H.-K. Lu, P.-C. Lin, C.-H. Lo, and M.-Y. Wu, "A review of information system evaluation methods," 2012. [Online]. Available: https://www.researchgate.net/publication/241686080

[105] S. Samsi, H. Jamaluddin, A. Noor, S. Mohd, and S. Abdullah, "Information quality, usefulness and information satisfaction in islamic e-tourism websites," *Journal of Theoretical and Applied Information Technology*, vol. 89, pp. 450–460, 2016.

[106] D. Suhartanto, T. Andrianto, N. Wibisono, and R. Sutrisno, "Virtual reality in halal tourism: The role of system quality and content quality," *Proceedings - 2021 IEEE International Conference on Industry 4.0, Artificial Intelligence, and Communications Technology, IAICT 2021*, pp. 138–142, 2021.

[107] N. S. Lestari, T. L. Anita, and R. D. Wiastuti, "The effect of web quality on visit intention for muslim visitor: Study case at grand indonesia shopping mall jakarta,"

UNIVERSITAS
GADJAH MADA
**Constructing a Knowledge Graph to Resolve Knowledge Fragmentation in Halal Tourism: an AI-enhanced
Methodology with Integrated Quality Control**
Hendrik, Ir. Adhistya Erna Permanasari, S.T., M.T., Ph.D. ; Silmi Fauziati, Dr.Eng., S.T., M.T.
Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

2020 International Conference on Information Management and Tehcnology, pp. 46–49, 2020. [Online]. Available: https://ieeexplore.ieee.org/stamp/stamp.jsp?arnumber=9211128&tag=1

[108] P. Do, T. Phan, H. Le, and B. Gupta, "Building a knowledge graph by using cross-lingual transfer method and distributed minie algorithm on apache spark," *Neural Computing and Applications*, vol. 34, pp. 8393–8409, 2022.

[109] M. Battour, M. N. Ismail, and M. Battor, "Toward a halal tourism market," *Tourism Analysis*, vol. 15, pp. 461–470, 2010.

[110] J. C. Henderson, "Islamic tourism reviewed," *Tourism Recreation Research*, vol. 32, pp. 207–211, 2009. [Online]. Available: https://www.tandfonline.com/action/journalInformation?journalCode=rtrr20

[111] I. M. C. R. T. P. Hamza, "Islamic tourism : exploring perceptions possibilities in egypt," *African Journal of Business and Economic Research*, 2012.

[112] Mastercard-CrescentRating, "Global muslim travel index 2022," 2022. [Online]. Available: https://www.crescentrating.com/reports/global-muslim-travel-index-2022.html

[113] ——, "Global muslim travel index 2018," 2018. [Online]. Available: https://www.crescentrating.com/reports/mastercard-crescentrating-global-muslim-travel-index-gmti-2018.html

[114] R. Qureshi, Z. Dada, W. Bhat, and M. Soudager, "Modelling halal tourism as a reflective–reflective second-order construct: linking attributes to tourist outcomes using structural model analysis," *Journal of Islamic Marketing*, 2025. [Online]. Available: https://www.scopus.com/record/display.uri?eid=2-s2.0-105000222548&origin=scopusAI

[115] A. Al-Ansi and H. Han, "Role of halal-friendly destination performances, value, satisfaction, and trust in generating destination image and loyalty," *Journal of Destination Marketing and Management*, 2019. [Online]. Available: https://www.scopus.com/record/display.uri?eid=2-s2.0-85066146141&origin=scopusAI

[116] Y. Lestari, F. Saidah, and A. Aliya Putri, "Effect of destination competitiveness attributes on tourists' intention to visit halal tourism destination in indonesia," *Journal of Islamic Marketing*, 2023. [Online]. Available: https://www.scopus.com/record/display.uri?eid=2-s2.0-85124365291&origin=scopusAI

[117] M. Šuligoj and H. Maruško, "Hotels and halal-oriented products: What do hotel managers in slovenia think?" *Organizacija*, 2017. [Online]. Available: https://www.scopus.com/record/display.uri?eid=2-s2.0-85039154786&origin=scopusAI

[118] Sochimin, Alfalisyado, H. Muflihin, and I. Fatchan, "Halal value chain model in halal ecosystem of malaysia," *Journal of Distribution Science*, 2025. [Online]. Available: https://www.scopus.com/record/display.uri?eid=2-s2.0-105008789244&origin=scopusAI

UNIVERSITAS
GADJAH MADA
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Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

[119] N. Bamiro, A. Oshoba, I. Yahya, and Q. Li, "Transforming halal coastal tourism for financial inclusion and economic growth: Threat, challenges and opportunities," in *Green and Blue Economy Frameworks for Halal Industry Sustainability*, 2025. [Online]. Available: https://www.scopus.com/record/display.uri?eid=2-s2.0-105005053450&origin=scopusAI

[120] A. Rachmiatie, E. Setiawan, K. Zakiah, and F. Martian, "Halal tourism ecosystem: networks, institutions and implementations in indonesia," *Journal of Islamic Marketing*, 2024. [Online]. Available: https://www.scopus.com/record/display.uri?eid=2-s2.0-85194944825&origin=scopusAI

[121] Hulwati, A. Fadhlan, M. Zein, and C. Wulandari, "Navigating halal certification standards: A comparative analysis of the food industry in indonesia and malaysia," *Journal of Fatwa Management and Research*, 2025. [Online]. Available: https://www.scopus.com/record/display.uri?eid=2-s2.0-105005973823&origin=scopusAI

[122] N. Ramlan, N. Sahari, N. Shafie, and S. Izham, "Assessing consumer confidence in halal authorities: A comparative study between malaysia and brunei," *Indonesian Journal of Halal Research*, 2025. [Online]. Available: https://www.scopus.com/record/display.uri?eid=2-s2.0-105008947803&origin=scopusAI

[123] M. Latif, "Halal international standards and certification," in *The Halal Food Handbook*, 2020. [Online]. Available: https://www.scopus.com/record/display.uri?eid=2-s2.0-85112787969&origin=scopusAI

[124] N. Amin, N. Ramli, and M. Zawawi, "Shariah-compliant medical tourism: An evaluation of the legal impediments of its implementation in malaysia," *IIUM Law Journal*, 2024. [Online]. Available: https://www.scopus.com/record/display.uri?eid=2-s2.0-105008915718&origin=scopusAI

[125] J. Chavez and M. Vicente, "Halal compliance behaviors of food and accommodation businesses in the zamboanga peninsula, philippines," *Multidisciplinary Science Journal*, 2025. [Online]. Available: https://www.scopus.com/record/display.uri?eid=2-s2.0-85219497804&origin=scopusAI

[126] S. Cuevas, C. Franco, R. Capistrano, and J. Guia, "Exploring the potential of halal tourism through institutional analysis of halal certifiers in the philippines," *International Journal of Religious Tourism and Pilgrimage*, 2022. [Online]. Available: https://www.scopus.com/record/display.uri?eid=2-s2.0-85134182334&origin=scopusAI

[127] A. H. Nu'man, H. Mulyaningsih, N. Saraswati, and U. Saripudin, "Global halal industry outlook: Current issues and development," in *Technologies and Trends in the Halal Industry*, 2023. [Online]. Available: https://www.scopus.com/record/display.uri?eid=2-s2.0-85176830474&origin=scopusAI

[128] M. Almunawar, M. Almunawar, M. Almunawar, and A. Thoha, *Implementing halal principles and regulations in business governance*, 2025. [Online]. Available: https://www.scopus.com/record/display.uri?eid=2-s2.0-105006593297&origin=scopusAI

UNIVERSITAS
GADJAH MADA
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Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

[129] A. Papastathopoulos, K. Kaminakis, and C. Mertzanis, "What services do muslim tourists want? uncovering nonlinear relationships and unobserved heterogeneity," *Tourism Management Perspectives*, vol. 35, 2020. [Online]. Available: https://doi.org/10.1016/j.tmp.2020.100720

[130] Z. Spalević, B. Milosavljević, and S. Marković, "Legal basis of educational processes of artificial intelligence algorithms in e-tourism," *International Journal of Cognitive Research in Science, Engineering and Education*, 2024. [Online]. Available: https://www.scopus.com/record/display.uri?eid=2-s2.0-85192351314&origin=scopusAI

[131] A. Mukherjee, S. Rajendran, and S. Wahab, "Technology strategy in boosting halal tourism activities," in *Technology Application in Aviation, Tourism and Hospitality: Recent Developments and Emerging Issues*, 2022. [Online]. Available: https://www.scopus.com/record/display.uri?eid=2-s2.0-85172111908&origin=scopusAI

[132] I. Berakon, M. Wibowo, A. Nurdany, and H. Aji, "An expansion of the technology acceptance model applied to the halal tourism sector," *Journal of Islamic Marketing*, 2023. [Online]. Available: https://www.scopus.com/record/display.uri?eid=2-s2.0-85116225949&origin=scopusAI

[133] A. Hogan *et al.*, "Knowledge graphs," *ACM Computing Surveys*, vol. 54, pp. 1–37, 2021. [Online]. Available: https://doi.org/10.1145/3447772

[134] X. Hao *et al.*, "Construction and application of a knowledge graph," *Remote Sensing 2021, Vol. 13, Page 2511*, vol. 13, p. 2511, 6 2021. [Online]. Available: https://www.mdpi.com/2072-4292/13/13/2511/

[135] C. Ji, B. Yu, and X. Du, "A design for constructing non-public economic knowledge graph," *Proceedings of 2021 International Conference on Green Communication, Network, and Internet of Things*, p. 21, 12 2021.

[136] B. Abu-Salih, "Domain-specific knowledge graphs: A survey," *Journal of Network and Computer Applications*, vol. 185, 7 2021.

[137] C. Gutierrez and J. F. Sequeda, "Knowledge graphs," *Communications of the ACM*, vol. 64, pp. 96–104, 3 2021.

[138] L. Yu, "A developer's guide to the semantic web," *A Developer's Guide to the Semantic Web*, 2014.

[139] S. Faralli, A. Lenzi, and P. Velardi, "A benchmark study on knowledge graphs enrichment and pruning methods in the presence of noisy relationships," *Journal of Artificial Intelligence Research*, vol. 78, pp. 37–68, 2023.

[140] R. Xia, H. Liu, A. Li, X. Liu, Y. Zhang, C. Zhang, and B. Yang, "Incomplete graph learning: A comprehensive survey," *Neural Networks*, vol. 190, p. 107682, 2025.

[141] C. Zhang and Y. Lu, "Study on artificial intelligence: The state of the art and future prospects," *Journal of Industrial Information Integration*, vol. 23, p. 100224, 2021. [Online]. Available: https://www.sciencedirect.com/science/article/pii/S2452414X21000248

UNIVERSITAS
GADJAH MADA
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Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

[142] H. W. Marar, "Advancements in software engineering using ai," *Computer Software and Media Applications*, vol. 6, p. 3906, 2024.

[143] N. Kriegeskorte, "Deep neural networks: a new framework for modelling biological vision and brain information processing," *Annual Review of Vision Science*, vol. 1, 2015.

[144] D. Lenat and G. Marcus, "Getting from generative ai to trustworthy ai: What llms might learn from cyc," 2023. [Online]. Available: https://arxiv.org/abs/2308.04445

[145] M. A. K. Raiaan *et al.*, "A review on large language models: Architectures, applications, taxonomies, open issues and challenges," *IEEE Access*, vol. 12, pp. 26 839–26 874, 2024. [Online]. Available: https://api.semanticscholar.org/CorpusID:267675587

[146] M. Cascella, F. Semeraro, J. Montomoli, V. Bellini, O. Piazza, and E. Bignami, "The breakthrough of large language models release for medical applications: 1-year timeline and perspectives," *Journal of Medical Systems*, vol. 48, 2024.

[147] T. B. Brown *et al.*, "Language models are few-shot learners," in *Proceedings of the 34th International Conference on Neural Information Processing Systems*, ser. NIPS '20. Red Hook, NY, USA: Curran Associates Inc., 2020.

[148] OpenAI, "Gpt-4 technical report," 2024.

[149] J. Devlin, M.-W. Chang, K. Lee, and K. Toutanova, "Bert: Pre-training of deep bidirectional transformers for language understanding," 2019.

[150] A. Chowdhery *et al.*, "Palm: scaling language modeling with pathways," *J. Mach. Learn. Res.*, vol. 24, no. 1, mar 2022.

[151] R. Thoppilan, D. D. Freitas, J. Hall, N. Shazeer, A. Kulshreshtha, H.-T. Cheng *et al.*, "Lamda: Language models for dialog applications," 2022.

[152] H. Touvron *et al.*, "Llama 2: Open foundation and fine-tuned chat models," 2023.

[153] A. Q. Jiang *et al.*, "Mistral 7b," 2023.

[154] P. P. Ray, "Chatgpt: A comprehensive review on background, applications, key challenges, bias, ethics, limitations and future scope," *Internet of Things and Cyber-Physical Systems*, vol. 3, pp. 121–154, 2023.

[155] B. J. Jansen, S. gyo Jung, and J. Salminen, "Employing large language models in survey research," *Natural Language Processing Journal*, vol. 4, p. 100020, 9 2023.

[156] S. Y. Park, B. Lee, Y. kyung Lee, E. H. Ham, and S. Lee, "Exploring the possibility of science-inquiry competence assessment by chatgpt-4: Comparisons with human evaluators," *Korean Educational Research Association*, vol. 61, pp. 299–332, 6 2023.

[157] A. Khademi, "Can ChatGPT and bard generate aligned assessment items? a reliability analysis against human performance," *Journal of Applied Learning Teaching*, vol. 6, no. 1, may 2023.

UNIVERSITAS
GADJAH MADA
**Constructing a Knowledge Graph to Resolve Knowledge Fragmentation in Halal Tourism: an AI-enhanced
Methodology with Integrated Quality Control**
Hendrik, Ir. Adhistya Erna Permanasari, S.T., M.T., Ph.D. ; Silmi Fauziati, Dr.Eng., S.T., M.T.
Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

[158] J. Sreemathy, K. Naveen Durai, E. Lakshmi Priya, R. Deebika, K. Suganthi, and P. Aisshwarya, "Data integration and etl: A theoretical perspective," in *2021 7th International Conference on Advanced Computing and Communication Systems (ICACCS)*, vol. 1, 2021, pp. 1655–1660.

[159] M. Lenzerini, "Data integration: a theoretical perspective," in *Proceedings of the Twenty-First ACM SIGMOD-SIGACT-SIGART Symposium on Principles of Database Systems*, ser. PODS '02. New York, NY, USA: Association for Computing Machinery, 2002, p. 233–246. [Online]. Available: https://doi.org/10.1145/543613.543644

[160] M. Masmoudi, S. B. A. B. Lamine, H. B. Zghal, B. Archimede, and M. H. Karray, "Knowledge hypergraph-based approach for data integration and querying: Application to earth observation," *Future Generation Computer Systems*, vol. 115, p. 720–740, Feb. 2021. [Online]. Available: http://dx.doi.org/10.1016/j.future.2020.09.029

[161] R. Salais, S. Botos, and J. Felföldi, "Application of smart visualisation in the analysis of hungarian agriculture ict," *Journal of Agricultural Informatics*, vol. 13, 2023.

[162] Z. Gu *et al.*, "A systematic overview of data federation systems," *Semantic Web*, vol. 15, pp. 107–165, 2022.

[163] H. Dibowski and F. Massa Gray, *Applying Knowledge Graphs as Integrated Semantic Information Model for the Computerized Engineering of Building Automation Systems*. Springer International Publishing, 2020, p. 616–631. [Online]. Available: http://dx.doi.org/10.1007/978-3-030-49461-2_36

[164] G. Fusco and L. Aversano, "An approach for semantic integration of heterogeneous data sources," *PeerJ Computer Science*, vol. 6, p. e254, Mar. 2020. [Online]. Available: http://dx.doi.org/10.7717/peerj-cs.254

[165] S. Auer, *Semantic Integration and Interoperability*. Springer International Publishing, 2022, p. 195–210. [Online]. Available: http://dx.doi.org/10.1007/978-3-030-93975-5_12

[166] I. Grangel-Gonzalez, F. Losch, and A. ul Mehdi, "Knowledge graphs for efficient integration and access of manufacturing data," in *2020 25th IEEE International Conference on Emerging Technologies and Factory Automation (ETFA)*. IEEE, Sep. 2020. [Online]. Available: http://dx.doi.org/10.1109/ETFA46521.2020.9212156

[167] M. Masoud, B. Pereira, J. Mccrae, and P. Buitelaar, "Automatic construction of knowledge graphs from text and structured data: A preliminary literature review," 2021.

[168] D. Collarana, M. Galkin, I. Traverso-Ribon, C. Lange, M.-E. Vidal, and S. Auer, "Semantic data integration for knowledge graph construction at query time," in *2017 IEEE 11th International Conference on Semantic Computing (ICSC)*. IEEE, 2017. [Online]. Available: http://dx.doi.org/10.1109/ICSC.2017.85

UNIVERSITAS
GADJAH MADA
**Constructing a Knowledge Graph to Resolve Knowledge Fragmentation in Halal Tourism: an AI-enhanced
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Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

[169] M. Sjarov and J. Franke, *Towards Knowledge Graphs for Industrial End-To-End Data Integration: Technologies, Architectures and Potentials*. Springer International Publishing, Sep. 2021, p. 545–553. [Online]. Available: http://dx.doi.org/10.1007/978-3-030-78424-9_60

[170] D. R. Karger, "Unify everything: It's all the same to me," in *Personal Information Management*, W. Jones and J. Teevan, Eds. University of Washington Press, 2007, pp. 127–152.

[171] Y. Liu, F. Gu, Y. Wu, X. Gu, and J. Guo, "A metrics-based meta-learning model with meta-pretraining for industrial knowledge graph construction," *Computers in Industry*, vol. 143, 2022, publisher: Elsevier B.V.

[172] G. Kumar, S. Basri, A. A. Imam, S. A. Khowaja, L. F. Capretz, and A. O. Balogun, "Data harmonization for heterogeneous datasets: A systematic literature review," *Applied Sciences (Switzerland)*, vol. 11, no. 17, 2021, publisher: MDPI.

[173] N. A. Rakhmawati, M. Karnstedt, M. Hausenblas, and S. Decker, "On metrics for measuring fragmentation of federation over SPARQL endpoints," in *WEBIST - Proc. Int. Conf. Web Inf. Syst. Technol.*, vol. 2. SciTePress, 2014, pp. 99–106, journal Abbreviation: WEBIST - Proc. Int. Conf. Web Inf. Syst. Technol.

[174] S.-A. Zhou, "Multi-source data fusion analysis model for intelligent operation of stadiums," in *Proc. Int. Conf. Sports Technol. Perform. Anal., ICSTPA*. Association for Computing Machinery, Inc, 2025, pp. 346–352, journal Abbreviation: Proc. Int. Conf. Sports Technol. Perform. Anal., ICSTPA.

[175] S. Issa, O. Adekunle, F. Hamdi, S. S.-S. Cherfi, M. Dumontier, and A. Zaveri, "Knowledge Graph Completeness: A Systematic Literature Review," *IEEE Access*, vol. 9, pp. 31 322–31 339, 2021, publisher: Institute of Electrical and Electronics Engineers Inc.

[176] Y. Zhang and G. Xiao, "How to implement a knowledge graph completeness assessment with the guidance of user requirements," *Journal of Systems Engineering and Electronics*, vol. 35, no. 3, pp. 666–678, 2024, publisher: Beijing Institute of Aerospace Information.

[177] H. Hendrik, A. E. Permanasari, S. Fauziati, and S. S. Kusumawardani, "Judging knowledge by its cover: Leveraging large language models in establishing criteria for knowledge graph sources selection," in *2023 8th International Conference on Information Technology and Digital Applications (ICITDA)*, 2023.

[178] N. Heist, S. Hertling, and H. Paulheim, "KGrEaT: A Framework to Evaluate Knowledge Graphs via Downstream Tasks," in *Int Conf Inf Knowledge Manage*. Association for Computing Machinery, 2023, pp. 3938–3942, journal Abbreviation: Int Conf Inf Knowledge Manage.

[179] G. Tuozzo, "Quality Without Borders: A Modular Approach to Unified Knowledge Graph Assessment," in *CEUR Workshop Proc.*, vol. 4085. CEUR-WS, 2025, journal Abbreviation: CEUR Workshop Proc.

UNIVERSITAS
GADJAH MADA
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Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

[180] S. Zhang, N. Benis, and R. Cornet, "Automated approach for quality assessment of rdf resources," *BMC Medical Informatics and Decision Making*, vol. 23, no. Suppl 1, p. 90, 2023. [Online]. Available: https://bmcmedinformdecismak.biomedcentral.com/articles/10.1186/s12911-023-02182-8

[181] H. Thakkar, K. M. Endris, J. M. Gimenez-Garcia, J. Debattista, C. Lange, and S. Auer, "Are linked datasets fit for open-domain question answering? A quality assessment," in *ACM Int. Conf. Proc. Ser.*, vol. 13-15-June-2016. Association for Computing Machinery, 2016, journal Abbreviation: ACM Int. Conf. Proc. Ser.

[182] J. Debattista, S. Londoño, C. Lange, and S. Auer, "Quality assessment of linked datasets using probabilistic approximation," in *Lect. Notes Comput. Sci.*, vol. 9088. Springer Verlag, 2015, pp. 221–236, journal Abbreviation: Lect. Notes Comput. Sci.

[183] J. Debattista, C. Lange, and S. Auer, "Luzzu - A framework for linked data quality assessment," in *CEUR Workshop Proc.*, vol. 1486. CEUR-WS, 2015, journal Abbreviation: CEUR Workshop Proc.

[184] C. Negru, F. Pop, M. Mocanu, and V. Cristea, "A unified approach to data modeling and management in big data era," in *Data Science and Big Data Computing: Frameworks and Methodologies*, Z. Mahmood, Ed. Springer International Publishing, 2016, pp. 95–116.

[185] M. Pincheira, F. Antonelli, and M. Vecchio, "AGRICLIMA: Towards a Federated Platform for Spatiotemporal Risk Analysis in Agriculture," *Agriculture (Switzerland)*, vol. 15, no. 23, 2025, publisher: Multidisciplinary Digital Publishing Institute (MDPI).

[186] R. Liao, "Graph neural networks: Graph generation," in *Graph Neural Networks: Foundations, Frontiers, and Applications*, L. Wu, P. Cui, J. Pei, and L. Zhao, Eds. Singapore: Springer Singapore, 2022, pp. 225–250.

[187] I. Chami, S. Abu-El-Haija, B. Perozzi, C. Ré, and K. Murphy, "Machine learning on graphs: a model and comprehensive taxonomy," *J. Mach. Learn. Res.*, vol. 23, no. 1, Jan. 2022.

[188] H. Zeng, H. Zhou, A. Srivastava, R. Kannan, and V. Prasanna, "Accurate, efficient and scalable training of graph neural networks," *Journal of Parallel and Distributed Computing*, vol. 147, pp. 166–183, 2021. [Online]. Available: https://www.sciencedirect.com/science/article/pii/S0743731520303579

[189] Y.-C. Lin and V. Prasanna, " HyScale-GNN: A Scalable Hybrid GNN Training System on Single-Node Heterogeneous Architecture ," in *2023 IEEE International Parallel and Distributed Processing Symposium (IPDPS)*. Los Alamitos, CA, USA: IEEE Computer Society, May 2023, pp. 557–567. [Online]. Available: https://doi.ieeecomputersociety.org/10.1109/IPDPS54959.2023.00062

[190] J. Dibie-Barthélemy, O. Haemmerlé, and E. Salvat, "A semantic validation of conceptual graphs," *Knowledge-Based Systems*, vol. 19, no. 7, pp. 498–510, 2006, creative Systems. [Online]. Available: https://www.sciencedirect.com/science/article/pii/S0950705106000748

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Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

[191] D. Purohit, Y. Chudasama, M. Torrente, and M.-E. Vidal, "VISE: Validated and invalidated symbolic explanations for knowledge graph integrity," in *Proceedings of the First Workshop on Explainable Artificial Intelligence in Medicine (EXPLIMED 2024), co-located with the 27th European Conference on Artificial Intelligence (ECAI 2024)*, ser. CEUR Workshop Proceedings, vol. 3831. CEUR-WS.org, 2024, p. Paper 5. [Online]. Available: https://ceur-ws.org/Vol-3831/paper5.pdf

[192] Y. Chen, T. Wu, Y. Liu, Y. Wang, and G. Qi, "Uncertain knowledge graph completion with rule mining," in *Web Information Systems and Applications*, ser. Lecture Notes in Computer Science, C. Jin, S. Yang, X. Shang, H. Wang, and Y. Zhang, Eds., vol. 14883. Singapore: Springer, 2024, pp. 100–112.

[193] T. Zhao, J. Kang, and L. Cheng, "Conformalized link prediction on graph neural networks," in *Proceedings of the 30th ACM SIGKDD Conference on Knowledge Discovery and Data Mining*, ser. KDD '24. New York, NY, USA: Association for Computing Machinery, 2024, p. 4490–4499. [Online]. Available: https://doi.org/10.1145/3637528.3672061

[194] S. Tsaneva, D. Dessì, F. Osborne, and M. Sabou, "Knowledge graph validation by integrating LLMs and human-in-the-loop," *Information Processing & Management*, vol. 62, no. 5, p. 104145, 2025.

[195] ——, "Enhancing scientific knowledge graph generation pipelines with LLMs and human-in-the-loop," in *Proceedings of the 4th International Workshop on Scientific Knowledge: Representation, Discovery, and Assessment (Sci-K 2024), co-located with the 23rd International Semantic Web Conference (ISWC 2024)*, ser. CEUR Workshop Proceedings, vol. 3780. Aachen: CEUR-WS.org, 2024, pp. 1–10. [Online]. Available: https://ceur-ws.org/Vol-3780/paper1.pdf

[196] S. Guan, H. Ma, and Y. Wu, "RoboGNN: Robustifying node classification under link perturbation," in *Proceedings of the Thirty-First International Joint Conference on Artificial Intelligence (IJCAI-22)*, L. D. Raedt, Ed. International Joint Conferences on Artificial Intelligence Organization, 7 2022, pp. 3029–3035. [Online]. Available: https://doi.org/10.24963/ijcai.2022/420

[197] R. Wickramarachchi, C. Henson, and A. Sheth, "A benchmark knowledge graph of driving scenes for knowledge completion tasks," in *Proceedings of the Posters, Demos, and Industry Tracks at ISWC 2024, co-located with the 23rd International Semantic Web Conference (ISWC 2024)*, ser. CEUR Workshop Proceedings, vol. 3828. Aachen: CEUR-WS.org, 2024, p. Paper 47. [Online]. Available: https://ceur-ws.org/Vol-3828/paper47.pdf

[198] M. M. Rahman, "Halal industry 4.0 and knowledge management: Technological integration and sustainability," in *Innovative Ventures and Strategies in Islamic Business*, A. Rafiki and A. Sarea, Eds. IGI Global Scientific Publishing, 2025, pp. 221–246. [Online]. Available: https://doi.org/10.4018/979-8-3693-3980-0.ch010

[199] M. Kejriwal, *Knowledge Graphs: Constructing, Completing, and Effectively Applying Knowledge Graphs in Tourism*. Cham: Springer International Publishing, 2022, pp. 423–449. [Online]. Available: https://doi.org/10.1007/978-3-030-88389-8_20

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GADJAH MADA
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Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

[200] S. K. Joshi, C. Manral, N. Chauhan, A. Deogaonkar, Charu, and N. Varshney, "Knowledge graphs and data models for knowledge representation using the bi-lstm model," in *2024 Second International Conference on Intelligent Cyber Physical Systems and Internet of Things (ICoICI)*, 2024, pp. 1028–1033.

[201] J. Zhou, " The Research and Construction of the AI-Based Knowledge Graph in Multi-Dimensional Data ," in *2023 International Conference on Computer Engineering and Distance Learning (CEDL)*. Los Alamitos, CA, USA: IEEE Computer Society, Jul. 2023, pp. 1–6. [Online]. Available: https://doi.ieeecomputersociety.org/10.1109/CEDL60560.2023.00008

[202] S. Chen, H. Wang, J. Liu, and J. Wu, "Dash: An agile knowledge graph system disentangling demands, algorithms, data resources, and humans," in *Proceedings of the 31st ACM International Conference on Information & Knowledge Management*, ser. CIKM '22. New York, NY, USA: Association for Computing Machinery, 2022, p. 4838–4842. [Online]. Available: https://doi.org/10.1145/3511808.3557189

[203] H. L. Nguyen, D. T. Vu, and J. J. Jung, "Knowledge graph fusion for smart systems: A survey," *Information Fusion*, vol. 61, pp. 56–70, 2020. [Online]. Available: https://www.sciencedirect.com/science/article/pii/S1566253519307729

[204] A. R. Hevner, S. T. March, J. Park, and S. Ram, "Design science in information systems research," *MIS Q.*, vol. 28, no. 1, p. 75–105, Mar. 2004.

[205] J. Park, K. Sung, and S. Moon, "Developing graduation screen ontology based on the methontology approach," in *Proceedings of the 2008 Fourth International Conference on Networked Computing and Advanced Information Management - Volume 02*, ser. NCM '08. USA: IEEE Computer Society, 2008, p. 375–380. [Online]. Available: https://doi.org/10.1109/NCM.2008.215

[206] Y. Alfaifi, "Ontology development methodology: A systematic review and case study," in *2022 2nd International Conference on Computing and Information Technology (ICCIT)*, 2022, pp. 446–450.

[207] Elicit, "Elicit: The ai research assistant," 2024. [Online]. Available: https://elicit.com

[208] M. A. Musen, "The protégé project: A look back and a look forward," *AI Matters*, vol. 1, no. 4, jun 2015.

[209] A. Reiz and K. Sandkuhl, "Harmonizing the oquare quality framework," in *2022 24th International Conference on Enterprise Information Systems*, 2022. [Online]. Available: https://api.semanticscholar.org/CorpusID:248715847

[210] ——, "Neontometrics - a public endpoint for calculating ontology metrics," *Transactions on Graph Data and Knowledge*, vol. 2, pp. 2:1–2:22, 2024. [Online]. Available: https://drops.dagstuhl.de/entities/document/10.4230/TGDK.2.2.2

[211] M. Riabacke, M. Danielson, and L. Ekenberg, "State-of-the-art prescriptive criteria weight elicitation," *Advances in Decision Sciences*, vol. 2012, pp. 1–24, 12 2012.

UNIVERSITAS
GADJAH MADA
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Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

[212] B. Ezell, C. Lynch, and P. Hester, "Methods for weighting decisions to assist modelers and decision analysts: A review of ratio assignment and approximate techniques," *Applied Sciences*, vol. 11, p. 10397, 11 2021.

[213] C.-H. Chiang and H.-y. Lee, "Can large language models be an alternative to human evaluations?" in *Proceedings of the 61st Annual Meeting of the Association for Computational Linguistics (Volume 1: Long Papers)*, A. Rogers, J. Boyd-Graber, and N. Okazaki, Eds. Toronto, Canada: Association for Computational Linguistics, Jul. 2023, pp. 15 607–15 631. [Online]. Available: https://aclanthology.org/2023.acl-long.870

[214] C. Gissane, "Is the data normally distributed," *Physiotherapy Practice and Research*, vol. 37, pp. 57–60, 2015.

[215] F. Habibzadeh, "Data distribution: Normal or abnormal?" *Journal of Korean Medical Science*, vol. 39, 2024.

[216] R. B. D'Agostino, "Tests for the normal distribution," 2017.

[217] N. A. Ahad, S. Y. Teh, A. R. Othman, and C. R. Yaakob, "Sensitivity of normality tests to non-normal data," 2011. [Online]. Available: https://api.semanticscholar.org/CorpusID:15965087

[218] P. Schober, C. Boer, and L. A. Schwarte, "Correlation coefficients: Appropriate use and interpretation," *Anesthesia & Analgesia*, vol. 126, p. 1763–1768, 2018.

[219] G. Cumming, "The new statistics," *Psychological Science*, vol. 25, pp. 7–29, 2013.

[220] S. W. Scheff, *Fundamental Statistical Principles for the Neurobiologist: A Survival Guide*. Elsevier, 2016, pp. 157–182.

[221] A. Majdara and S. Nooshabadi, "Nonparametric density estimation using copula transform, bayesian sequential partitioning, and diffusion-based kernel estimator," *IEEE Transactions on Knowledge and Data Engineering*, vol. 32, pp. 821–826, 4 2020.

[222] T. W. MacFarland and J. M. Yates, *Introduction to Nonparametric Statistics for the Biological Sciences Using R*. Springer International Publishing, 2016, pp. 103–132.

[223] N. R. Smalheiser, *Data Literacy: How to Make your Experiments Robust and Reproducible*. Elsevier, 2017, pp. 157–167.

[224] UncleCode, "Crawl4ai: Open-source llm friendly web crawler scraper," https://github.com/unclecode/crawl4ai, 2024.

[225] Z. Wahyono and R. Embong, "The concept of safar (travelling) from the qura'nic worldview," *International Journal of Academic Research in Progressive Education and Development*, vol. 12, no. 2, pp. 1613–1622, 2023.

[226] X. Wang *et al.*, "Knowledge graph quality control: A survey," *Fundamental Research*, vol. 1, pp. 607–626, 9 2021.

UNIVERSITAS
GADJAH MADA
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Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

[227] J. Lovett, C. Gordon, S. Patton, and C. X. Chen, "Online information on dysmenorrhoea: An evaluation of readability, credibility, quality and usability," *Journal of Clinical Nursing*, vol. 28, pp. 3590–3598, 10 2019.

[228] F. Tuzahra, "Reading online: Evaluation of online sources credibility," *Journal of Research on Language Education*, vol. 2, p. 32, 1 2021.

[229] Y. Kammerer and S. Brand-Gruwel, *Trainings and Tools to Foster Source Credibility Evaluation During Web Search*, 2020, pp. 213–243.

[230] Y. Zhang, "Beyond quality and accessibility: Source selection in consumer health information searching," *Journal of the Association for Information Science and Technology*, vol. 65, pp. 911–927, 5 2014.

[231] C.-X. Wan, S. Deng, X.-P. Liu, G.-Q. Liao, D.-X. Liu, and T.-J. Jiang, "Web data source selection technologies," *Journal of Software*, vol. 24, pp. 781–797, 1 2014.

[232] M. Asgari-Bidhendi, A. Hadian, and B. Minaei-Bidgoli, "Farsbase: The persian knowledge graph," *Semantic Web*, vol. 10, pp. 1169–1196, 1 2019.

[233] T. Rekatsinas, X. L. Dong, and D. Srivastava, "Characterizing and selecting fresh data sources." ACM, 6 2014, pp. 919–930.

[234] S. Issa, O. Adekunle, F. Hamdi, S. S.-S. Cherfi, M. Dumontier, and A. Zaveri, "Knowledge graph completeness: A systematic literature review," *IEEE Access*, vol. 9, pp. 31 322–31 339, 2021.

[235] D. Duong and B. D. Solomon, "Analysis of large-language model versus human performance for genetics questions," *European Journal of Human Genetics*, 5 2023.

[236] H. Hendrik, S. Fauziati, and A. E. Permanasari, "Enhancing knowledge graph construction with automated source evaluation using large language models," *JUCS - Journal of Universal Computer Science*, vol. 31, no. 5, pp. 519–549, 2025. [Online]. Available: https://doi.org/10.3897/jucs.137103

[237] M. Wang, L. Qiu, and X. Wang, "A survey on knowledge graph embeddings for link prediction," *Symmetry*, vol. 13, no. 3, 2021. [Online]. Available: https://www.mdpi.com/2073-8994/13/3/485

[238] H. Gul, F. Al-Obeidat, A. Amin, M. Wasim, and F. Moreira, "Dualrep: Knowledge graph completion by utilizing dual representation of relational paths and tail node density insights," *IEEE Access*, vol. 12, pp. 179 566–179 578, 2024.