



Metaverse: Virtual Gyms and Sports ⓧ

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Source Title: Metaverse Applications for Intelligent Healthcare (</gateway/book/320471>)

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Pages: 69

ISBN13: 9781668498231 ISBN10: 1668498235 EISBN13: 9781668498248

DOI: 10.4018/978-1-6684-9823-1.ch002

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Abstract

In recent years, the concept of the metaverse has garnered substantial attention as an emerging digital realm that combines virtual reality, augmented reality, and various interactive technologies to create immersive and interconnected digital spaces. As traditional fitness routines and sports activities transform due to technological advancements, virtual gyms and sports have emerged as innovative solutions to engage individuals in physical activities within the metaverse. Dive into the dynamic realm of the metaverse with this chapter on virtual gyms and sports. The metaverse's business models, user experience design, and scaling strategies are explored, as are its applications in healthcare, therapy, and sports training. As the curtain falls, the authors delve into virtual fan engagement, community building, and future trends. The dynamic landscape of the metaverse awaits your exploration within these pages. Join the researchers in navigating the boundless possibilities of virtual gyms and sports, unraveling their impact on society, industry, and beyond.

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1. Introduction To The Metaverse

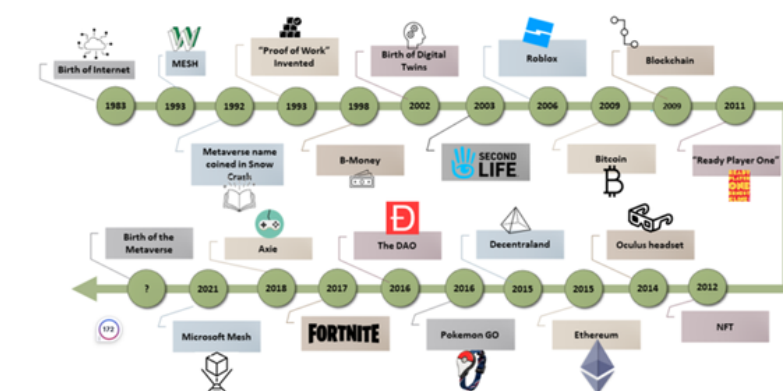
1.1 Definition and Evolution of the Metaverse

The metaverse concept has garnered substantial attention in recent times, owing to technological advancements and the increasing fusion of virtual and VR within our daily routines. The metaverse, characterized as a unified virtual communal realm arising from the intersection of physical and VR, encompasses a range of interconnected digital domains, including AR and VR platforms (Barbera, 2023; Humayun et al., 2020). Neal Stephenson originally coined the term “metaverse” in his 1992 science fiction novel “Snow Crash,” wherein it denoted a VR-oriented successor to the internet. However, this notion has undergone notable evolution since its inception. As technological progress unfolded, the metaverse began crystallizing in the shape of online multiplayer games and virtual realms (Yilmaz et al., 2023; Almusaylim et al., 2018). The 2000s witnessed the emergence of platforms like Second Life, affording users the ability to craft avatars, engage with fellow users, and participate in diverse undertakings. These nascent endeavors to construct a metaverse laid the foundational framework for subsequent advancements.

In recent times, the metaverse's advancement has been fueled by remarkable technological strides. The fusion of VR and VR technologies has emerged as a pivotal force, engendering more captivating and participatory virtual realms. Industry giants such as Facebook (now Meta), Microsoft, and Apple have made substantial investments in the development of AR and VR hardware and software, thereby further obfuscating the demarcation between the tangible and digital domains (Parcu et al., 2023). The widespread proliferation of smartphones and cost-effective VR headsets has democratized access to these encounters (Pizzo, 2023). The maturation of the metaverse carries profound implications across multifarious sectors. In the realm of entertainment, the metaverse has orchestrated a paradigm shift in our interaction with media and content. Virtual concerts, art galleries, and interactive narrative experiences are gaining prevalence (Rejeb et al., 2023; Chatrati et al., 2022). Furthermore, the metaverse possesses the potential to overhaul the landscape of education. Virtual classrooms and immersive pedagogical encounters have the capacity to render education more engrossing and attainable for students across the globe (Soni & Kaur, 2023).

The metaverse's impact extends beyond cultural and social dimensions, encompassing economic prospects as well. A thriving digital economy has taken root within the metaverse, characterized by the trade of virtual commodities and services facilitated by digital currencies such as cryptocurrencies (Şanlısoy & Çiloğlu, 2023). This phenomenon has catalyzed the emergence of the “creator economy,” enabling individuals to monetize their digital innovations and proficiencies. Concurrently, businesses are delving into metaverse-centric marketing approaches, introducing novel methods to connect with consumers (Arya et al., 2023). Figure 1 shows the timeline evolution of metaverse.

Figure 1. Evolution of Metaverse



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References

- Abdusatarov, J. (2023, April 26). *Issues That Need To Be Resolved When Developing The Legal Framework Of International Private Law Relations In Metaverse*. Scholar Express. <https://www.scholarexpress.net/index.php/wbml/article/view/2626>
(<https://www.scholarexpress.net/index.php/wbml/article/view/2626>)
- Follow Reference AbuKhoua E. El-Tahawy M. S. Atif Y. (2023). Envisioning architecture of Metaverse Intensive Learning Experience (MILEX): Career readiness in the 21st century and collective intelligence development scenario.Future Internet, 15(2), 53. 10.3390/fi15020053
- Follow Reference Adrian D. Frances D. Burns A. (2023). An Examination of the Virtual Event Experience of Cyclists Competing on Zwift. Ingenta Connect., 10.3727/152599523X16907613842110
- Follow Reference Afsar M. M. Saqib S. Alarfaj M. Alatiyyah M. H. Alnowaiser K. Aljuaid H. Jalal A. Park J. (2023). Body-Worn sensors for recognizing physical sports activities in exergaming via deep learning model.IEEE Access : Practical Innovations, Open Solutions, 11, 12460–12473. 10.1109/ACCESS.2023.3239692
- Follow Reference Ahuja A. S. Polascik B. W. Doddapaneni D. Byrnes E. S. Sridhar J. (2023). The digital metaverse: Applications in artificial intelligence, medical education, and integrative health.Integrative Medicine Research, 12(1), 100917. 10.1016/j.imr.2022.10091736691642
- Follow Reference Alenizi B. A. Humayun M. Jhanjhi N. Z. (2021). Security and privacy issues in cloud computing.Journal of Physics: Conference Series, 1979(1), 012038. 10.1088/1742-6596/1979/1/012038
- Follow Reference Ali S. Abdullah N. Armand T. P. T. Athar A. Hussain A. Ali M. Muhammad Y. Joo M. Kim H. C. (2023). Metaverse in Healthcare Integrated with Explainable AI and Blockchain: Enabling Immersiveness, Ensuring Trust, and Providing Patient Data Security.Sensors (Basel), 23(2), 565. 10.3390/s2302056536679361
- Follow Reference Almeida L. G. G. (2023). Innovating Industrial Training with Immersive Metaverses: A Method for Developing Cross-Platform Virtual Reality Environments. MDPI., 10.3390/app13158915

- Almusaylim, Z. A., Jhanjhi, N. Z., & Jung, L. T. (2018). Proposing A Data Privacy Aware Protocol for Roadside Accident Video Reporting Service Using 5G In *Vehicular Cloud Networks Environment.2018 4th International Conference on Computer and Information Sciences (ICCOINS)*. IEEE. 10.1109/ICCOINS.2018.8510588
- Follow Reference
- Alsem S. C. Van Dijk A. Verhulp E. Dekkers T. J. De Castro B. O. (2023). Treating children's aggressive behavior problems using cognitive behavior therap. with virtual reality: A multicenter randomized controlled trial.Child Development, cdev.13966. Advance online publication. 10.1111/cdev.1396637459452
- Follow Reference
- An, N. (2023, May 2). *Toward learning societies for digital aging*. arXiv.org. <https://arxiv.org/abs/2305.01137> (<https://arxiv.org/abs/2305.01137>)
- Follow Reference
- Anshari M. Syafrudin M. Alfian G. (2023). Metaverse applications for new business models and disruptive innovation. IGI Global. 10.4018/978-1-6684-6097-9
- Follow Reference
- Arpaci I. Bahari M. (2023). Investigating the role of psychological needs in predicting the educational sustainability of Metaverse using a deep learning-based hybrid SEM-ANN technique.Interactive Learning Environments, 1–13. 10.1080/10494820.2022.2164313
- Follow Reference
- Arya V. Sambyal R. Sharma A. Dwivedi Y. K. (2023). Brands are calling your AVATAR in Metaverse–A study to explore XR-based gamification marketing activities & consumer-based brand equity in virtual world.Journal of Consumer Behaviour, cb.2214. 10.1002/cb.2214
- Follow Reference
- Baker, J., Nam, K., & Dutt, C. (2023). *A user experience perspective on heritage tourism in the metaverse: Empirical evidence and design dilemmas for VR*. Springer. <https://link.springer.com/article/10.1007/s40558-023-00256-x> (<https://link.springer.com/article/10.1007/s40558-023-00256-x>)
- Follow Reference
- Bannell D. J. France-Ratcliffe M. Buckley B. J. R. Crozier A. Davies A. Hesketh K. Jones H. Cocks M. Sprung V. S. (2023). Adherence to unsupervised exercise in sedentary individuals: A randomised feasibility trial of two mobile health interventions.Digital Health, 9, 20552076231183552. 10.1177/2055207623118355237426588
- Follow Reference
- Barbera S. (2023). Navigating the Virtual Frontier: The Convergence of Decentralized Finance and the Metaverse. *Preprint.org*.10.20944/preprints202307.1734.v1
- Follow Reference
- Batrakoulis A. Veiga O. L. Franco S. Thomas E. Alexopoulos A. Torrente M. V. Santos-Rocha R. Ramalho F. Di Credico A. Vitucci D. Ramos L. Simões V. Romero-Caballero A. Vieira I. Mancini A. Bianco A. (2023). Health and fitness trends in Southern Europe for 2023: A cross-sectional survey.AIMS Public Health, 10(2), 378–408. 10.3934/publichealth.202302837304589
- Follow Reference
- Bays H. Fitch A. Cuda S. Rickey E. Hablutzel J. Coy R. Censani M. (2023). Artificial intelligence and obesity management: An Obesity Medicine Association (OMA) Clinical Practice Statement (CPS) 2023.Obesity Pillars, 6, 100065. 10.1016/j.obpill.2023.100065
- Follow Reference
- Belt E. S. Lowenthal P. R. (2022). Synchronous video-based communication and online learning: An exploration of instructors' perceptions and experiences.Education and Information Technologies, 28(5), 4941–4964. 10.1007/s10639-022-11360-636320822
- Follow Reference
- Beng, C. O., Gang, C., Shou, Z. M., Tan, K.-L., Tung, A., Xiao, X., James, W. L. Y., Bingxue, Z., & Meihui, Z. (2023). The Metaverse Data Deluge: What Can We Do About It? In *2023 IEEE 39th International Conference on Data Engineering (ICDE)*. IEEE. 10.1109/ICDE55515.2023.00296
- Follow Reference
- Benti B. S. (2023). Sports and eSports: A structural comparison based on the B|Orders in Motion Framework.opus4.kobv.de (<http://opus4.kobv.de>). 10.11584/opus4-1293
- Follow Reference
- Berggren, N. (2023). *Unlocking the Fashion Metaverse: Exploring the impact of external factors on innovation diffusion in the metaverse fashion industry*. DIVA. <https://www.diva-portal.org/smash/record.jsf?pid=diva2%3A1761437&dswid=-6051> (<https://www.diva-portal.org/smash/record.jsf?pid=diva2%3A1761437&dswid=-6051>)
- Follow Reference
- Blowers M. Jaimes N. Williams J. (2023). Benefits and challenges of a military metaverse. SPIE. 10.1117/12.2663772
- Follow Reference
- Brayshaw, M., Gordon, N., Kambili-Mzembe, F., & Jaber, T. A. (2023). Why the Educational Metaverse Is Not All About Virtual Reality Apps. In *Lecture Notes in Computer Science* (pp. 22–32). 10.1007/978-3-031-34550-0_2
- Follow Reference
- Brewer L. C. Abraham H. Kaihoi B. Leth S. Egginton J. S. Slusser J. P. Scott R. J. Penheiter S. G. Alberty M. Squires R. W. Thomas R. J. Scales R. Trejo-Gutiérrez J. F. Kopecky S. L. (2022). A Community-Informed Virtual World-Based cardiac rehabilitation program as an extension of Center-Based cardiac rehabilitation.Journal of Cardiopulmonary Rehabilitation and Prevention, 43(1), 22–30. 10.1097/HCR.000000000000070535881503
- Follow Reference
- Brown, L. (n.d.). *From Coffee Houses to Internet Speech: Civility and Moderation within The Contemporary Public Sphere*. Works. <https://works.swarthmore.edu/theses/323/> (<https://works.swarthmore.edu/theses/323/>)
- Follow Reference
- Buhalis D. Leung D. Lin M. (2023). Metaverse as a disruptive technology revolutionising tourism management and marketing.Tourism Management, 97, 104724. 10.1016/j.tourman.2023.104724
- Follow Reference
- Cameron L. Ride J. (2023). The role of mental health in online gambling decisions: A discrete choice experiment.Social Science & Medicine, 326, 115885. 10.1016/j.socscimed.2023.11588537087972
- Follow Reference
- Carr K. England R. (2023). Simulated And Virtual Realities: Elements Of Perception. CRC Press.
- Follow Reference
- Cennamo C. Dagnino G. B. Zhu F. (2023). Research Handbook on Digital Strategy. Edward Elgar Publishing. 10.4337/9781800378902
- Follow Reference
- Chakraborty D. Patre S. Tiwari D. (2023). Metaverse mingle: Discovering dating intentions in metaverse.Journal of Retailing and Consumer Services, 75, 103509. Advance online publication. 10.1016/j.jretconser.2023.103509
- Follow Reference
- Champion, E. (2022). Mixed histories, augmented pasts. In *Human-computer interaction series* (pp. 163–184). 10.1007/978-3-031-10932-4_7
- Follow Reference
- Chatrati, S. P., Hossain, G., Goyal, A., Bhan, A., Bhattacharya, S., Gaurav, D., & Tiwari, S. (2022). Smart home health monitoring system for predicting type 2 diabetes and hypertension. *Journal of King Saud University - Computer and Information Sciences*, 34(3), 862–870. 10.1016/j.jksuci.2020.01.010



- Follow Reference Chen G. Peachey J. W. Stodolska M. (2023). Sense of community among virtual race participants: The case of the Illinois Marathon. *Managing Sport and Leisure*, 1–23. 10.1080/23750472.2023.2239246
- Follow Reference Chen X. Zou D. Xie H. Wang F. L. (2023). Metaverse in Education: Contributors, cooperations, and research themes. *IEEE Transactions on Learning Technologies*, 1–18. 10.1109/TLT.2023.3277952
- Follow Reference Chengoden R. Victor N. Huynh-The T. Yenduri G. Jhaveri R. H. Alazab M. Bhattacharya S. Hegde P. Maddikunta P. K. R. Gadekallu T. R. (2023). Metaverse for Healthcare: A survey on potential applications, challenges and future directions. *IEEE Access : Practical Innovations, Open Solutions*, 11, 12765–12795. 10.1109/ACCESS.2023.3241628
- Follow Reference Cho Y. Park M. Kim J. (2023). XAVE: Cross-platform based Asymmetric Virtual Environment for Immersive Content. *IEEE Access : Practical Innovations, Open Solutions*, 1, 71890–71904. 10.1109/ACCESS.2023.3294390
- Crew, E. (2023, April 20). How can virtual reality sports training help athletes? *4Experience*. <https://4experience.co/how-virtual-reality-sports-training-helps-athletes/> (<https://4experience.co/how-virtual-reality-sports-training-helps-athletes/>)
- Follow Reference Czegledy P. K. (2023). Crystal Ball Gazing: The future of sports betting. *Gaming Law Review*, 27(2), 65–70. 10.1089/qlr.2022.0046
- Follow Reference Da Silva Schlickmann D. Molz P. Uebel G. C. Santos C. D. Brand C. Colombelli R. W. Da Silva T. G. Steffens J. P. Da Silva Limberger Castilhos E. Benito P. J. Rieger A. Franke S. I. R. (2023). The moderating role of macronutrient intake in relation to body composition and genotoxicity: A study with gym users. *Mutation Research*, 503660, 503660. 10.1016/j.mrgentox.2023.50366037567647
- Follow Reference Deng J. Tajuddin R. B. M. Chen Z. Ren B. Shariff S. M. (2023). The impact of virtual presence on the behavior of live E-Commerce consumers. Atlantis Press. 10.2991/978-94-6463-210-1_47
- Follow Reference Desbordes, M. (2023). Analysis of the sport ecosystem and its value chain, What lessons in an uncertain world? In *Sports economics, management and policy* (pp. 109–142). 10.1007/978-981-19-7010-8_6
- Follow Reference Dhiman B. (2023). Ethical Issues and Challenges in social Media: A current scenario. *Social Science Research Network*. 10.2139/ssrn.4406610
- Dhiman, D. B. (2023, March 10). *Key issues and New Challenges in New Media Technology in 2023: A Critical review*. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4387353
- Follow Reference Dias S. B. Jelinek H. F. Hadjileontiadis L. (2023). Wearable Neurofeedback Acceptance Model: An Investigation within Academic Settings to Explore a Multimodal Framework for Student Stress and Anxiety Management. SSRN. 10.2139/ssrn.4485826
- Dogheim, G. M. (2023, June 5). *Patient Care through AI-driven Remote Monitoring: Analyzing the Role of Predictive Models and Intelligent Alerts in Preventive Medicine*. DL Press. <https://publications.dlpress.org/index.php/jcha/article/view/20>
- Follow Reference Dogra V. Verma S. Kavita K. Jhanjhi N. Z. Ghosh U. Le D. (2022). A comparative analysis of machine learning models for banking news extraction by multiclass classification with imbalanced datasets of financial news: Challenges and solutions. *International Journal of Interactive Multimedia and Artificial Intelligence*, 7(3), 35. 10.9781/ijimai.2022.02.002
- Follow Reference Doskarayev B. Omarov N. Omarov B. Ismagulova Z. Kozhamkulova Z. Nurlybaeva E. Kasimova G. (2023). Development of computer vision-enabled augmented reality games to increase motivation for sports. *International Journal of Advanced Computer Science and Applications*, 14(4). 10.14569/IJACSA.2023.0140428
- Follow Reference Dwivedi Y. K. Kshetri N. Hughes L. Rana N. P. Baabdullah A. M. Kar A. K. Koohang A. Ribeiro-Navarrete S. Belei N. Balakrishnan J. Basu S. Behl A. Davies G. H. Dutot V. Dwivedi R. Evans L. Felix R. Foster-Fletcher R. Giannakis M. Yan M. (2023). Exploring the Darkverse: A Multi-Perspective Analysis of the negative societal impacts of the Metaverse. *Information Systems Frontiers*, 25(5), 2071–2114. 10.1007/s10796-023-10400-x37361890
- Follow Reference Ezawa I. D. Hollon S. D. Robinson N. J. (2023). Examining Predictors of Depression and Anxiety Symptom change in Cognitive Behavioral Immersion: Observational study. *JMIR Mental Health*, 10, e42377. 10.2196/4237737450322
- Follow Reference Ferraro C. Hemsley A. Sands S. (2022). Embracing diversity, equity, and inclusion (DEI): Considerations and opportunities for brand managers. *Business Horizons*. 10.1016/j.bushor.2022.09.005
- Follow Reference Ferreira M. S. L. Antão J. Pereira R. Bianchi I. S. Tovma N. Shurenov N. (2023). Improving real estate CRM user experience and satisfaction: A user-centered design approach. *Journal of Open Innovation*, 9(2), 100076. 10.1016/j.joitmc.2023.100076
- Fiske, J. (2023, June 1). *Identity Assurance in an era of Digital Disruption: Planning a Controlled transition*. Harvard Press. <https://dash.harvard.edu/handle/1/37376453>
- Follow Reference Gill S. H. Razaq M. A. Ahmad M. Almansour F. M. Haq I. U. Jhanjhi N. Z. Alam M. Z. Masud M. (2022). Security and privacy aspects of cloud Computing: A Smart Campus case study. *Intelligent Automation and Soft Computing*, 31(1), 117–128. 10.32604/iasc.2022.016597
- Glen, S. (2023). History of the metaverse in one picture. *Data Science Central*. <https://www.datasciencecentral.com/history-of-the-metaverse-in-one-picture/> (<https://www.datasciencecentral.com/history-of-the-metaverse-in-one-picture/>)
- Follow Reference Goel R. Baral S. K. Mishra T. Jain V. (2023). Augmented and Virtual Reality in Industry 5.0. Walter de Gruyter GmbH & Co KG. 10.1515/9783110790146
- Follow Reference Grech A. Mehnen J. Wodehouse A. (2023). An extended AI-Experience: Industry 5.0 in Creative Product innovation. *Sensors (Basel)*, 23(6), 3009. 10.3390/s2306300936991718
- Follow Reference Greenhalgh G. P. Goebert C. (2023). From Gearshifts to Gigabytes: An analysis of how NASCAR used iRacing to engage fans during the COVID-19 shutdown. *International Journal of Sport Communication*, 1–15. 10.1123/ijsc.2023-0145



Follow Reference Gupta N. S. Kumar P. (2023). Perspective of artificial intelligence in healthcare data management: A journey towards precision medicine. *Computers in Biology and Medicine*, 162, 107051. 10.1016/j.combiomed.2023.10705137271113

Follow Reference Hadi R. Melumad S. Park E. S. (2023). The Metaverse: A new digital frontier for consumer behavior. *Journal of Consumer Psychology*, jcpy.1356. 10.1002/jcpy.1356

Follow Reference Hamid, B., Jhanjhi, N. Z., Humayun, M., Khan, A. F., & Alsayat, A. (2019). Cyber Security Issues and Challenges for Smart Cities: A survey. In *2019 13th International Conference on Mathematics, Actuarial Science, Computer Science and Statistics (MACS)*. ACM. 10.1109/MACS48846.2019.9024768

Follow Reference Hang Y. (2023). Research on the problems and countermeasures in the In-Person Fitness industry in the post-pandemic era. *Highlights in Business, Economics and Management*, 13, 29–38. 10.54097/hbem.v13i.8618

Follow Reference Hasson H. Rundgren E. H. Schwarz U. V. T. (2023). The adaptation and fidelity tool to support social service practitioners in balancing fidelity and adaptations: Longitudinal, mixed-method evaluation study. *SIRC*. 10.1177/26334895231189198

Follow Reference Hawajri, O., Lindberg, J., & Suominen, S. (2023). Virtual Reality Exposure Therapy as a Treatment Method Against Anxiety Disorders and Depression-A Structured Literature Review. *Issues in Mental Health Nursing*, 1–25. 10.1080/01612840.2023.2190051

Follow Reference Høeg E. R. Andersen N. B. Malmkjær N. Vaaben A. H. Uth J. (2023). Hospitalized older adults' experiences of virtual reality-based group exercise therapy with cycle ergometers: An early feasibility study. *Computers in Human Behavior Reports*, 11, 100301. 10.1016/j.chbr.2023.100301

Follow Reference Höner O. Dugandzic D. Hauser T. Stügelmaier M. Willig N. Schultz F. (2023). Do you have a good all-around view? Evaluation of a decision-making skills diagnostic tool using 360° videos and head-mounted displays in elite youth soccer. *Frontiers in Sports and Active Living*, 5, 1171262. 10.3389/fspor.2023.117126237342613

Follow Reference Hughes J. Martin T. Gladwell T. D. Akiyode O. Purnell M. C. Shahid M. Moultry A. M. Rapp K. I. Unonu J. (2023). Lessons from a cross-institutional online professional development pilot. *Currents in Pharmacy Teaching & Learning*, 15(5), 534–540. 10.1016/j.cptl.2023.05.00437202331

Follow Reference Humayun M. Jhanjhi N. Z. Alruwaili M. Amalathas S. S. Balasubramanian V. Selvaraj B. (2020). Privacy protection and energy optimization for 5G-Aided industrial internet of things. *IEEE Access : Practical Innovations, Open Solutions*, 8, 183665–183677. 10.1109/ACCESS.2020.3028764

Follow Reference Humayun M. Niazi M. Jhanjhi N. Z. Alshayeb M. Mahmood S. (2020b). Cyber Security Threats and Vulnerabilities: A Systematic Mapping study. *Arabian Journal for Science and Engineering*, 45(4), 3171–3189. 10.1007/s13369-019-04319-2

Hutson, J. (n.d.). *Life, death, and AI: Exploring digital necromancy in popular culture—Ethical considerations, technological limitations, and the pet cemetery conundrum*. Digital Commons@Lindenwood University. <https://digitalcommons.lindenwood.edu/faculty-research-papers/478/> (<https://digitalcommons.lindenwood.edu/faculty-research-papers/478/>)

Follow Reference Huynh-The T. Pham Q. Pham X. Nguyen T. Han Z. Kim D. (2023). Artificial intelligence for the metaverse: A survey. *Engineering Applications of Artificial Intelligence*, 117, 105581. 10.1016/j.engappai.2022.105581

Follow Reference Inwood H. (2022). Towards Sinophone Game Studies. *Apollo (London. 1925)*, 12(2), 1–10. 10.51661/bjoes.v12i2.219

Follow Reference Jamshidi M. (2023). The Meta-Metaverse: Ideation and future Directions. *MDPI*, 10.3390/fi15080252

Follow Reference Javed, N., Ahmed, T., Faisal, M., Sadia, H., & Sidaine-Daumiller, E. Z. J. (2023). Workplace cyberbullying in the Remote-Work era. In *Advances in human and social aspects of technology book series* (pp. 166–177). 10.4018/978-1-6684-8133-2.ch009

Follow Reference Jerath R. Syam M. Ahmed S. Z. (2023). *The Future of Stress Management: Integration Smartwatches and HRV Technology*. 10.20944/preprints202307.1283.v2

Follow Reference Jiang X. Deng N. Zheng S. (2023). Understanding the core technological features of virtual and augmented reality in tourism: A qualitative and quantitative review. *Current Issues in Tourism*, 1–21. 10.1080/13683500.2023.2198118

Follow Reference Jo, H., Seidel, L., Pahud, M., Sinclair, M., & Bianchi, A. (2023). *FlowAR: How Different Augmented Reality Visualizations of Online Fitness Videos Support Flow for At-Home Yoga Exercises*. ACM. 10.1145/3544548.3580897

Follow Reference Jonathan N. T. Bachri M. R. Wijaya E. Ramdhan D. Chowanda A. (2023). The efficacy of virtual reality exposure therapy (VRET) with extra intervention for treating PTSD symptoms. *Procedia Computer Science*, 216, 252–259. 10.1016/j.procs.2022.12.134

Follow Reference Jones L. Lee M. Gomes R. S. M. (2023). Remote rehabilitation (telerehabilitation) in the sight loss sector: Reflections on challenges and opportunities from service providers in the United Kingdom. *British Journal of Visual Impairment*, 02646196231188634. 10.1177/02646196231188634

Follow Reference Kaddoura S. Husseiny F. A. (2023). The rising trend of Metaverse in education: Challenges, opportunities, and ethical considerations. *PeerJ*, 9, e1252. 10.7717/peerj-cs.125237346578

Kaihua, N. (2023, June 1). *Disruptive Innovation in Finnish hospitality: An analysis and mapping of incumbent perceptions*. Osuva. <https://osuva.uwasa.fi/handle/10024/15987> (<https://osuva.uwasa.fi/handle/10024/15987>)

Follow Reference Kamaruddin I. K. Ma'rof A. M. Nazan A. I. N. M. Jalil H. A. (2023). A systematic review and meta-analysis of interventions to decrease cyberbullying perpetration and victimization: An in-depth analysis within the Asia Pacific region. *Frontiers in Psychiatry*, 14, 1014258. 10.3389/fpsy.2023.101425836778634

Follow Reference Kato N. (2023). Comparison of Smoothness, Movement Speed and Trajectory during Reaching Movements in Real and Virtual Spaces Using a Head-Mounted Display. *MDPI*. 10.3390/life13081618

Follow Reference Kępińska A. Wiśniewski R. (2023). Metaverse and its creative potential for visual arts. *Acta Universitatis Lodzianensis*, 85(85), 57–75. 10.18778/0208-600X.85.04

Kesavan, D., & N, M. A. (2023). *Emerging insights on the relationship between cryptocurrencies and decentralized economic models*. IGI Global.

Follow Reference	Khan S. Kannapiran T. Muthiah A. Shetty S. (2023). Exergaming intervention for children, adolescents, and elderly people. IGI Global. 10.4018/978-1-6684-6320-8
Follow Reference	Kim E. J. Kim J. (2023). The Metaverse for Healthcare: Trends, applications, and future directions of digital therapeutics for Urology. <i>International Neurour Journal</i> , 27(Suppl 1), S3–S12. 10.5213/inj.2346108.05437280754
Follow Reference	Kim K. B. Baek H. J. (2023). Photoplethysmography in Wearable Devices: A comprehensive review of technological advances, current challenges, and future directions. <i>Electronics (Basel)</i> , 12(13), 2923. 10.3390/electronics12132923
Follow Reference	Knoll, T., Liaqat, A., & Monroy-Hernández, A. (2023). <i>ARctic Escape: Promoting Social Connection, Teamwork, and Collaboration Using a Co-Located Augmented Reality Escape Room</i> . ACM Digital Library. 10.1145/3544549.3585841
Follow Reference	Koohang A. Nord J. H. Ooi K. Tan G. W. Al-Emran M. Aw E. C. Baabdullah A. M. Buhalis D. Cham T. Dennis C. Dutot V. Dwivedi Y. K. Hughes L. Mogaji E. Pandey N. Phau I. Raman R. Sharma A. Sigala M. Wong L. (2023). Shaping the Metaverse into Reality: A Holistic Multidisciplinary Understanding of Opportunities, Challenges, and Avenues for Future Investigation. <i>Journal of Computer Information Systems</i> , 63(3), 735–765. 10.1080/08874417.2023.2165197
Follow Reference	Kumar P. T. Mohamed J. S. Padmaja R. (2023). <i>Contrasting virtual reality and augmented reality in the health care system - Briefing</i> . Zenodo. 10.5281/zenodo.8068117
Follow Reference	Kwon S. Park J. K. Koh Y. H. (2023). A systematic review and meta-analysis on the effect of virtual reality-based rehabilitation for people with Parkinson's disease. <i>Journal of Neuroengineering and Rehabilitation</i> , 20(1), 94. 10.1186/s12984-023-01219-337475014
Follow Reference	Labbaïf, S., Abbasian, M., Azimi, I., Dutt, N., & Rahmani, A. M. (2023). <i>ZotCare: a flexible, personalizable, and affordable MHealth service provider</i> . https://doi.org/10.2307.0190510.48550
Follow Reference	Lee J. C. Lin R. (2023). The continuous usage of artificial intelligence (AI)-powered mobile fitness applications: The goal-setting theory perspective. <i>Industrial Management & Data Systems</i> , 123(6), 1840–1860. 10.1108/IMDS-10-2022-0602
Follow Reference	Lee S. (2023). Sustainable Vocational Preparation for Adults with Disabilities: A Metaverse-Based Approach. MDPI. 10.3390/su151512000
Follow Reference	Letafati M. Otoum S. (2023). On the privacy and security for e-health services in the metaverse: An overview. <i>ScienceDirect</i> . 10.1016/j.adhoc.2023.103262
Follow Reference	Li B. Naraine M. L. Liang Z. Li C. (2021). A magic “Bullet”: Exploring sport fan usage of On-Screen, ephemeral posts during live stream sessions. <i>Communication & Sport</i> , 11(2), 334–355. 10.1177/21674795211038949
Follow Reference	Li H.-H. Lian J.-J. Liao Y.-H. (2023). Design an Adaptive Virtual Reality Game to Promote Elderly Health. <i>IEEE Explore</i> . 10.1109/CITS58301.2023.10188784
Follow Reference	Li N. (2023). Application of motion tracking technology in movies, television production and photography using big data. <i>Soft Computing</i> , 27(17), 12787–12806. 10.1007/s00500-023-08963-7
Follow Reference	Li X. Huang J. Kong Z. Sun F. Sit C. H. P. Li C. (2023). Effects of Virtual Reality-Based Exercise on Physical Fitness in People with Intellectual Disability: A Systematic Review of Randomized Controlled Trials. <i>Games for Health Journal</i> , 12(2), 89–99. 10.1089/g4h.2022.016836716183
Follow Reference	Li, Y., Ma, Z., & Zhang, L. L. (2023). Research on interaction design based on artificial intelligence technology in a metaverse environment. In <i>Lecture Notes in Computer Science</i> (pp. 193–209). 10.1007/978-3-031-35699-5_15
Follow Reference	Lister, P. (2023). Opening up smart learning cities - building knowledge, interactions and communities for lifelong learning and urban belonging. In <i>Lecture Notes in Computer Science</i> (pp. 67–85). 10.1007/978-3-031-34609-5_5
	Lopes, F. (2023). <i>Exploring the features and benefits of Mixed Reality Toolkit 2 for developing immersive games : a reflective study</i> . Theseus. https://www.theseus.fi/handle/10024/803207 (https://www.theseus.fi/handle/10024/803207)
	Mabary, J. (2023). <i>Analyzing compositional strategies in video game music</i> . MoSpace. https://mospace.umsystem.edu/xmlui/handle/10355/96145
Follow Reference	Marabelli M. Newell S. (2023). Responsibly strategizing with the metaverse: Business implications and DEI opportunities and challenges. <i>The Journal of Strategic Information Systems</i> , 32(2), 101774. 10.1016/j.jsis.2023.101774
Follow Reference	Maskeliūnas R. Damaševičius R. Blažauskas T. Canbulut C. Adomavičienė A. Griškevičius J. (2023). BioMacVR: A virtual Reality-Based system for precise human posture and motion analysis in rehabilitation exercises using depth sensors. <i>Electronics (Basel)</i> , 12(2), 339. 10.3390/electronics12020339
Follow Reference	Meena S. D. Mithesh G. S. S. Panyam R. Chowdary M. S. Sadhu V. S. Sheela J. (2023). Advancing Education through Metaverse: Components, Applications, Challenges, Case Studies and Open Issues. <i>IEEE Explore</i> . 10.1109/ICSCSS57650.2023.10169535
Follow Reference	Mejtoft T. Lindahl H. Norberg O. Andersson M. Söderström U. (2023). Enhancing Digital Social Interaction Using Augmented Reality in Mobile Fitness Applications. ACM. 10.1145/3591156.3591170
Follow Reference	Menhas R. Luo Q. Saqib Z. A. Younas M. (2023). The association between COVID-19 preventive strategies, virtual reality exercise, use of fitness apps, physical, and psychological health: Testing a structural equation moderation model. <i>Frontiers in Public Health</i> , 11, 1170645. 10.3389/fpubh.2023.117064537483921
Follow Reference	Mezei K. Szentgáli-Tóth B. (2023). Some comments on the legal regulation on misinformation and cyber attacks conducted through online platforms. <i>Lexonomica</i> , 15(1), 33–52. 10.18690/lexonomica.15.1.33-52.2023
Follow Reference	Miljković I. Shlyakhetko O. Fedushko S. (2023). Real estate app development based on AI/VR technologies. <i>Electronics (Basel)</i> , 12(3), 707. 10.3390/electronics12030707



Follow Reference	Miyoung R. Choi Y. Park H. (2023). Analysis of Issues in Fitness Centers through News Articles before and after the COVID-19 Pandemic in South Korea: Applying Big Data Analysis.Sustainability (Basel), 15(3), 2660. 10.3390/su15032660
Follow Reference	Mogavi R. H. Hoffman J. Deng C. Yihang D. Haq E. Hui P. (2023). Envisioning an Inclusive Metaverse: Student Perspectives on Accessible and Empowering Metaverse-Enabled Learning. 10.1145/3573051.3596185
Follow Reference	Monge J. Ribeiro G. Raimundo A. Postolache O. Santos J. F. D. (2023). AI-Based Smart Sensing and AR for GAIT Rehabilitation Assessment.Information (Basel), 14(7), 355. 10.3390/info14070355
Follow Reference	Morrison A. M. Buhalis D. (2023). Routledge Handbook of Trends and Issues in Global Tourism Supply and Demand. Routledge. 10.4324/9781003260790
Follow Reference	Mousazadeh H. Ghorbani A. Azadi H. Almani F. A. Ali Z. Zhu K. Dávid L. D. (2023). Developing sustainable behaviors for underground heritage tourism management: The case of Persian Qanats, a UNESCO World Heritage property.Land (Basel), 12(4), 808. 10.3390/land12040808
Follow Reference	Mozumder M. I. Armand T. P. T. Uddin S. M. I. Athar A. Sumon R. I. Hussain A. Kim H. C. (2023). Metaverse for Digital Anti-Aging Healthcare: An overview of potential use cases based on artificial intelligence, blockchain, IoT technologies, its challenges, and future directions.Applied Sciences (Basel, Switzerland), 13(8), 5127. 10.3390/app13085127
Follow Reference	Murakawa D. (2023). Decision making under virtual environment triggers more aggressive tactical solutions. 2023 株式会社産経デジタル. 10.51015/jdl.2023.3.9
	Muslihati, M. (2023). <i>How to prevent student mental health problems in metaverse era?</i> Muslihati Jurnal Kajian Bimbingan Dan Konseling. http://journal2.um.ac.id/index.php/jkbk/article/view/37598 (http://journal2.um.ac.id/index.php/jkbk/article/view/37598)
Follow Reference	Muthmainnah Y. Al Yakin A. Ibna Seraj P. M. (2023). Impact of metaverse technology on student engagement and academic performance: The Mediating role of learning motivation. <i>International Journal of Computations</i> . Information and Manufacturing, 3(1), 10–18. 10.54489/ijcim.v3i1.234
	Nagarajan, G. (2023, July 15). <i>The Role Of The Metaverse In Digital Marketing</i> . Universidad De Granada. https://digibug.ugr.es/handle/10481/84077 (https://digibug.ugr.es/handle/10481/84077)
Follow Reference	Nath D. Singh N. Saini M. Banduni O. Kumar N. Srivastava M. V. P. Mehndiratta A. (2023). Clinical potential and neuroplastic effect of targeted virtual reality based intervention for distal upper limb in post-stroke rehabilitation: A pilot observational study.Disability and Rehabilitation, 1–10. 10.1080/09638288.2023.222869037383015
Follow Reference	Ning H. Wang H. Lin Y. Wang W. Dhelim S. Farha F. Ding J. Daneshmand M. (2023). A survey on the metaverse: The State-of-the-Art, technologies, applications, and challenges.IEEE Internet of Things Journal, 1(16), 14671–14688. 10.1109/IJOT.2023.3278329
Follow Reference	Norman K. French A. Lake A. Tchuisseu Y. P. Repka S. Vasudeva K. Dong C. Whitaker R. Bettger J. P. (2023). Describing Perspectives of Telehealth and the Impact on Equity in Access to Health Care from Community and Provider Perspectives: A Multimethod Analysis.Telemedicine Journal and e-Health, tmj.2023.0036. 10.1089/tmj.2023.003637410525
Follow Reference	Ose S. O. Thaulow K. Færevik H. Hoffmann P. L. Lestander H. Stiles T. C. Lindgren M. (2023). Development of a social skills training programme to target social isolation using virtual reality technology in primary mental health care.Journal of Rehabilitation and Assistive Technologies Engineering, 10. 10.1177/2055668323118754537456950
Follow Reference	Ozacar K. Ortakci Y. Küçükara M. Y. (2023). VRArchEducation: Redesigning building survey process in architectural education using collaborative virtual reality.Computers & Graphics, 113, 1–9. 10.1016/j.cag.2023.04.008
Follow Reference	Papamichael I. Pappas G. Siegel J. E. Inglezakis V. J. Demetriou G. Zorpas A. A. Hadjisavvas C. (2023). Metaverse and circular economy.Waste Management & Research, 41(9), 1393–1398. 10.1177/0734242X23118040637313976
Follow Reference	Parcu P. L. Rossi M. A. Innocenti N. Carrozza C. (2023). How real will the metaverse be? Exploring the spatial impact of virtual worlds.European Planning Studies, 31(7), 1466–1488. 10.1080/09654313.2023.2221323
Follow Reference	Parry J. Giesbrecht J. (2023). Esports, real sports and the Olympic Virtual Series.Journal of the Philosophy of Sport, 50(2), 1–21. 10.1080/00948705.2023.2216883
Follow Reference	Pastel S. Petri K. Chen C. H. Cáceres A. M. W. Stirnatis M. Nübel C. Schlotter L. Witte K. (2022). Training in virtual reality enables learning of a complex sports movement.Virtual Reality (Waltham Cross), 27(2), 523–540. 10.1007/s10055-022-00679-7
Follow Reference	Pizzo A. D. (2023). Hypercasual and Hybrid-Casual Video Gaming: A Digital Leisure perspective.Leisure Sciences, 1–20. 10.1080/01490400.2023.2211056
Follow Reference	Placidi G. Di Matteo A. Lozzi D. Polsinelli M. Theodoridou E. (2023). Patient–Therapist Cooperative Hand Telerehabilitation through a Novel Framework Involving the Virtual Glove System.Sensors (Basel), 23(7), 3463. 10.3390/s2307346337050523
	Pontin, S. (2023). <i>AI-Based Race Strategy Assistant and Car data Monitor</i> . DIVA. https://www.diva-portal.org/smash/record.jsf?pid=diva2%3A1756880&dswid=-6708 (https://www.diva-portal.org/smash/record.jsf?pid=diva2%3A1756880&dswid=-6708)
	Purcarea, I. M. (2023). <i>E-Commerce Business Under Pressure To Grow</i> . https://ideas.repec.org/a/hmm/journal/v13y2023i2p24-30.html (https://ideas.repec.org/a/hmm/journal/v13y2023i2p24-30.html)
Follow Reference	Purdy G. M. Sobierajski F. Onazi M. M. A. Effa C. Venner C. P. Tandon P. McNeely M. L. (2023). Exploring participant perceptions of a virtually supported home exercise program for people with multiple myeloma using a novel eHealth application: A qualitative study.Supportive Care in Cancer, 31(5), 298. 10.1007/s00520-023-07762-y37097319



Follow Reference Qi J. Ma L. Cui Z. Yu Y. (2023). Computer vision-based hand gesture recognition for human-robot interaction: A review. *Complex & Intelligent Systems*. 10.1007/s40747-023-01173-6

Follow Reference Rachmadtullah R. Setiawan B. Setiawan B. Wicaksono J. W. (2022). Elementary school teachers' perceptions of the potential of metaverse technology as a transformation of interactive learning media in Indonesia. *International Journal of Innovative Research and Scientific Studies*, 6(1), 128–136. 10.53894/ijirss.v6i1.1119

Follow Reference Radanliev D. P. (2023, August1). *Accessibility and inclusiveness of new information and communication technologies for disabled users and content creators in the metaverse*. <https://arxiv.org/abs/2308.01925> (<https://arxiv.org/abs/2308.01925>)

Follow Reference Radanliev P. (2023). *Accessibility and inclusiveness of new information and communication technologies for disabled users and content creators in the metaverse*. 10.2139/ssrn.4528363

Follow Reference Rejeb A. Rejeb K. Treiblmaier H. (2023). Mapping Metaverse research: Identifying future research areas based on bibliometric and topic modeling techniques. *Information (Basel)*, 14(7), 356. 10.3390/info14070356

Saha, B. (n.d.). *Analysis of the adherence of MHealth applications to HIPAA Technical Safeguards*. DigitalCommons@Kennesaw State University. https://digitalcommons.kennesaw.edu/msit_etd/14/ (https://digitalcommons.kennesaw.edu/msit_etd/14/)

Salem, S. F., Lawry, C. A., Alanadoly, A., & Li, J. (2023). Branded experiences in the immersive spectrum: How will fashion consumers react to the Metaverse? *ResearchGate*. https://www.researchgate.net/publication/372782798_Branded_experiences_in_the_immersive_spectrum_How_will_fashion_consumers_react_to_the_Metaverse (https://www.researchgate.net/publication/372782798_Branded_experiences_in_the_immersive_spectrum_How_will_fashion_consumers_react_to_the_Metaverse)

Follow Reference Şanlısoy S. Çiloğlu T. (2023). A View of the Future of the Metaverse Economy on the Basis of The Global Financial System: New Opportunities and Risks. *Journal of Corporate Governance, Insurance and Risk Management*, 10(1), 28–41. 10.56578/jcgirm100104

Follow Reference Schneider M. Woodworth A. Arumalla S. Gowder C. Hernandez J. Kim A. Moorthy B. (2023). Development of a tool for quantifying need-supportive coaching in technology-mediated exercise classes. *Psychology of Sport and Exercise*, 64, 102321. 10.1016/j.psychsport.2022.10232137665807

Follow Reference Settimo C. De Cola M. C. Pironti E. Muratore R. Giambò F. M. Alito A. Tresoldi M. La Fauci M. De Domenico C. Tripodi E. Impallomeni C. Quartarone A. Cucinotta F. (2023). Virtual Reality Technology to Enhance Conventional Rehabilitation Program: Results of a Single-Blind, Randomized, Controlled Pilot Study in Patients with Global Developmental Delay. *Journal of Clinical Medicine*, 12(15), 4962. 10.3390/jcm1215496237568364

Follow Reference Shafiq D. A. Jhanjhi N. Z. Abdullah A. (2021). Machine Learning Approaches for Load Balancing in Cloud Computing Services. 2021 National Computing Colleges Conference (NCCC). 10.1109/NCCC49330.2021.9428825

Follow Reference Shen J. Wang J. Zhang J. (2023). The Development of Digital Technology Efficiency in the Communication of Large-Scale Events. *European Union Digital Library*. 10.4108/eai.6-1-2023.2330328

Follow Reference Shuai, Q., Li, Z., & Zhang, Y. (2023). E-Commerce Channels and Platforms. In *Springer Link* (pp. 283–318). Springer. 10.1007/978-981-99-0043-5_8

Follow Reference Singh M. Kumar A. (2023). A Critical Political Economy Perspective on Indian Television: STAR, Hotstar, and Live Sports Streaming. *TripleC*, 21(1), 18–32. 10.31269/triplec.v21i1.1395

Follow Reference Singhal V. Jain S. P. Anand D. Singh A. Verma S. Kavita Rodrigues J. J. P. C. Jhanjhi N. Z. Ghosh U. Jo O. Iwendi C. (2020). Artificial Intelligence Enabled Road Vehicle-Train Collision Risk Assessment Framework for Unmanned railway level crossings. *IEEE Access : Practical Innovations, Open Solutions*, 8, 113790–113806. 10.1109/ACCESS.2020.3002416

Follow Reference Siricharoen N. (2023). Creative Brain Training Apps and Games Can Help Improve Memory, Cognitive Abilities, and Promote Good Mental Health for The Elderly. *EAI Endorsed Transactions on Context-aware Systems and Applications*, 9(1). 10.4108/eetcasa.v9i1.3524

Follow Reference Smith M. J. Mark R. Nette H. Rhodes R. E. (2023). Correlates and participation in community-based exercise programming for cancer patients before and during COVID-19. *Supportive Care in Cancer*, 31(6), 319. 10.1007/s00520-023-07725-337148447

Follow Reference Soilemezi D. Roberts H. Navarta-Sánchez M. V. Kunkel D. Ewings S. Reidy C. Portillo M. C. (2022). Managing Parkinson's during the COVID-19 pandemic: Perspectives from people living with Parkinson's and health professionals. *Journal of Clinical Nursing*, 32(7–8), 1421–1432. 10.1111/jocn.1636735581711

Follow Reference Solas-Martínez, J. L., Suárez-Manzano, S., De La Torre-Cruz, M. J., & Ruiz-Ariza, A. (2023). Artificial Intelligence and Augmented Reality in Physical Activity: A Review of Systems and Devices. In *Springer Link* (pp. 245–270). 10.1007/978-3-031-27166-3_14

Follow Reference Soni L. Kaur A. (2023). Strategies for Implementing Metaverse in Education. *IEEE Explore*. 10.1109/ICDT57929.2023.10150886

Follow Reference Ştefan S. C. Popa I. Mircioiu C. (2023). Lessons Learned from Online Teaching and Their Implications for Students' Future Careers: Combined PLS-SEM and IPA Approach. *Electronics (Basel)*, 12(9), 2005. 10.3390/electronics12092005

Follow Reference Stocker, V., Whalley, J., & Lehr, W. (2023). Beyond the pandemic: towards a digitally enabled society and economy. In *Emerald Publishing Limited eBooks* (pp. 245–265). 10.1108/978-1-80262-049-820231012

Follow Reference Suh I. H. McKinney T. Siu K. (2023). Current Perspective of Metaverse Application in Medical Education, Research and Patient Care. *MDPI*, 2(2), 115–128. 10.3390/virtualworlds2020007

Follow Reference Sun P. (2023). A Guidebook for 5GTOB and 6G Vision for Deep Convergence. Springer Nature. 10.1007/978-981-99-4024-0

Follow Reference Sun T. Jin T. Huang Y. Meng L. Yun W. Jiang Z. Fu X. (2023). Restoring Dunhuang Murals: Crafting Cultural Heritage Preservation Knowledge into Immersive Virtual Reality Experience Design. *International Journal of Human-Computer Interaction*, 1–22. 10.1080/10447318.2023.2232976



- Follow Reference Synnott C. K. (2023). Gambling companies' contracts in higher education raise concerns. *Social Science Research Network*.10.2139/ssrn.4394642
- Follow Reference Tan, M. C. C., Chye, S., & Min, T. J. (2023). Teaching Social-Emotional Learning with Immersive Virtual Technology: Exploratory Considerations. In *Springer Link* (pp. 169–195). 10.1007/978-981-99-2107-2_10
- Follow Reference Tayyab M. Marjani M. Jhanjhi N. Z. Hashem I. T. Usmani R. S. A. Qamar F. (2023). A comprehensive review on deep learning algorithms: Security and privacy issues.Computers & Security, 131, 103297. 10.1016/j.cose.2023.103297
- Follow Reference Thamrongrat, P., Khundam, C., Pakdeebun, P., & Nizam, D. M. (2023). Desktop vs. Headset: A Comparative Study of User Experience and Engagement for Flexibility Exercise in. *ResearchGate*. 10.28991/ESJ-2023-07-04-03
- Follow Reference Torky, M., Darwish, A., & Hassanien, A. E. (2023). Blockchain technology in metaverse: opportunities, applications, and open problems. In *Springer eBooks* (pp. 225–246). 10.1007/978-3-031-29132-6_13
- Follow Reference Torrance J. O'Hanrahan M. Carroll J. Newall P. (2022). The structural characteristics of online sports betting: a scoping review of current product features and utility patents as indicators of potential future developments. Taylor Francis Online. 10.1080/16066359.2023.2241350
- Follow Reference Turoń-Skrzypińska A. Tomska N. Mosiejczuk H. Rył A. Szylińska A. Marchelek-Myśliwiec M. Ciechanowski K. Nagay R. Rotter I. (2023). Impact of virtual reality exercises on anxiety and depression in hemodialysis.Nature, 13(1), 12435. 10.1038/s41598-023-39709-y37528161
- Follow Reference Ullah H. Manickam S. Obaidat M. Laghari S. A. Uddin M. (2023). Exploring the potential of metaverse technology in healthcare: Applications, challenges, and future directions.IEEE Access : Practical Innovations, Open Solutions, 11, 69686–69707. 10.1109/ACCESS.2023.3286696
- Follow Reference Ullah M. Hamayun S. Wahab A. Khan S. U. Qayum M. Ullah A. Rehman M. U. Mehreen A. Awan U. A. Naeem M. (2023). Smart Technologies used as Smart Tools in the Management of Cardiovascular Disease and their Future Perspective.Current Problems in Cardiology, 101922(11), 101922. 10.1016/j.cpcardiol.2023.10192237437703
- Follow Reference Vaccaro A. Koerner J. D. Kim D. H. (2016). Recent advances in spinal surgery. JP Medical Ltd.
- Follow Reference Van Biemen T. Müller D. Mann D. L. (2023). Virtual reality as a representative training environment for football referees.Human Movement Science, 89, 103091. 10.1016/j.humov.2023.10309137084551
- Follow Reference Van Rijmenam M. (2022). Step into the Metaverse: How the Immersive Internet Will Unlock a Trillion-Dollar Social Economy. John Wiley & Sons.
- Follow Reference Van Wegen M. Herder J. L. Adelsberger R. Pastore-Wapp M. Van Wegen E. E. H. Bohlhalter S. Nef T. Krack P. Vanbellingen T. (2023). An overview of wearable haptic technologies and their performance in virtual object exploration.Sensors (Basel), 23(3), 1563. 10.3390/s2303156336772603
- Follow Reference Villa-García L. Davey V. Pérez L. M. Soto-Bagaria L. Risco E. Díaz P. Kuluski K. Giné-Garriga M. Castellano-Tejedor C. Inzitari M. (2023). Co-designing implementation strategies to promote remote physical activity programs in frail older community-dwellers.Frontiers in Public Health, 11, 1062843. 10.3389/fpubh.2023.106284336960372
- Follow Reference Villalonga-Gómez C. Ortega-Fernández E. Borau-Boira E. (2023). Fifteen years of metaverse in Higher Education: A systematic literature review.IEEE Transactions on Learning Technologies, 1–14. 10.1109/TLT.2023.3302382
- Follow Reference Waitt G. R. Gordon R. Harada T. Gurrieri L. Reith G. Ciorciari J. (2023). Towards relational geographies of gambling harm: Orientation, affective atmosphere, and intimacy.Progress in Human Geography, (5), 627–644. 10.1177/03091325231177278
- Follow Reference Wang D. Yang Z. Zhang P. Wang R. Yang B. Ma X. (2023). Virtual-Reality Inter-Promotion Technology for Metaverse: A survey.IEEE Internet of Things Journal, 1(18), 15788–15809. 10.1109/IJOT.2023.3265848
- Follow Reference Wang N. Wen-Guang C. (2023). The effect of playing e-sports games on young people's desire to engage in physical activity: Mediating effects of social presence perception and virtual sports experience.PLoS One, 18(7), e0288608. 10.1371/journal.pone.028860837498937
- Wang, T. (2023, January 3). *Augmented Reality in Sports Event Videos: A Qualitative Study on Viewer experience*. Scholar Space. <https://scholarspace.manoa.hawaii.edu/items/00382afd-df6e-4ece-8b84-21e7922dad76>
- Follow Reference Wedig I. J. Phillips J. J. Kamm K. Elmer S. J. (2023). Promoting Physical Activity in Rural Communities During COVID-19 with Exercise is Medicine® on Campus.ACSM's Health & Fitness Journal, 27(2), 33–40. 10.1249/FIT.0000000000000849
- Follow Reference Wieland M. Sedlmair M. Machulla T. (2023). VR, Gaze, and Visual Impairment: An Exploratory Study of the Perception of Eye Contact across different Sensory Modalities for People with Visual Impairments in Virtual Reality. ACM. 10.1145/3544549.3585726
- Follow Reference Wongkitrungrueng A. Suprawan L. (2023). Metaverse Meets Branding: Examining consumer responses to immersive brand experiences.International Journal of Human-Computer Interaction, 1–20. 10.1080/10447318.2023.2175162
- Follow Reference Xu Y. (2023). The evolving eSports landscape: Technology empowerment, intelligent embodiment, and digital ethics.Sport, Ethics and Philosophy, 17(3), 356–368. 10.1080/17511321.2023.2168039
- Follow Reference Yaqoob I. Salah K. Jayaraman R. Omar M. (2023). Metaverse applications in smart cities: Enabling technologies, opportunities, challenges, and future directions.Internet of Things, 100884, 100884. 10.1016/j.iot.2023.100884
- Follow Reference Yilmaz M. O'Farrell E. Clarke P. M. (2023). Examining the training and education potential of the metaverse: Results from an empirical study of next generation SAFe training.Journal of Software (Malden, MA), 35(9), e2531. 10.1002/smr.2531
- Follow Reference Yoo K. Welden R. Hewett K. Haenlein M. (2023). The merchants of meta: A research agenda to understand the future of retailing in the metaverse.Journal of Retailing, 99(2), 173–192. 10.1016/j.jretai.2023.02.002



Follow Reference

Yun S. J. Hyun S. E. Oh B. M. Seo H. G. (2023). Fully immersive virtual reality exergames with dual-task components for patients with Parkinson’s disease: A feasibility study.Journal of Neuroengineering and Rehabilitation, 20(1), 92. 10.1186/s12984-023-01215-737464349

Follow Reference

Zalan T. Barbesino P. (2023). Making the metaverse real.Digital Business, 3(2), 100059. 10.1016/j.digbus.2023.100059

Follow Reference

Zaman N. Gaur L. Humayun M. (2022). Approaches and applications of deep learning in virtual medical care. IGI Global. 10.4018/978-1-7998-8929-8

Zhang, J. (2023, June 1). *Gamification in marketing to increase customer retention*. MIT. <https://dspace.mit.edu/handle/1721.1/151418>

Follow Reference

Zhang L. He W. Cao Z. Wang S. Bai H. Billingham M. (2022). HapticProxy: Providing positional vibrotactile feedback on a physical proxy for Virtual-Real interaction in augmented reality.International Journal of Human-Computer Interaction, 1–15. 10.1080/10447318.2022.2041895

Follow Reference

Zhang Q. (2023). Secure preschool education using machine learning and metaverse technologies.Applied Artificial Intelligence, 37(1), 2222496. 10.1080/08839514.2023.2222496

Follow Reference

Zhao R. Zhang Y. Zhu Y. Lan R. Hua Z. (2023). Metaverse: Security and Privacy Concerns.Dergi Park, 3(2), 93–99. 10.57019/jmv.1286526

Follow Reference

Zhu Q. Zhang X. Dai S. Satake N. Wang H. (2023). ZoomBaTogether: a video conference add-on for generating interactive visual feedback for online group exercise through On-The-Fly pose tracking.Designing Interactive Systems Conference. 10.1145/3563703.3596653

Follow Reference

Zikas P. Protopsaltis A. Lydatakis N. Kentros M. Geronikolakis S. Kateros S. Kamarianakis M. Evangelou G. Filippidis A. Grigoriou E. Angelis D. Tamiolakis M. Dodis M. Kokiadis G. Petropoulos J. Pateraki M. Papagiannakis G. (2023). MAGES 4.0: Accelerating the world’s transition to VR training and democratizing the authoring of the medical metaverse.IEEE Computer Graphics and Applications, 43(2), 43–56. 10.1109/MCG.2023.3242686

Follow Reference

Zikas P. Protopsaltis A. Lydatakis N. Kentros M. Geronikolakis S. Kateros S. Kamarianakis M. Evangelou G. Filippidis A. Grigoriou E. Angelis D. Tamiolakis M. Dodis M. Kokiadis G. Petropoulos J. Pateraki M. Papagiannakis G. (2023). MAGES 4.0: Accelerating the world’s transition to VR training and democratizing the authoring of the medical metaverse.IEEE Computer Graphics and Applications, 43(2), 43–56. 10.1109/MCG.2023.3242686

Zoe, V. R. (2023, July 17). *Development of a therapy game proof of concept using the Virtual Reality technology*. Repostori. <https://repositori.uji.es/xmlui/handle/10234/203631> (<https://repositori.uji.es/xmlui/handle/10234/203631>)

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