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*Published in:*  
Technology in Society

*DOI:*  
[10.1016/j.techsoc.2022.102147](https://doi.org/10.1016/j.techsoc.2022.102147)

Published: 01/02/2023

*Document Version*  
Publisher's final version

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*Please cite the original version:*

Fox, S., & Griffy-Brown, C. (2023). Machine learning in society: Technology in Society Briefing. *Technology in Society*, 72, [102147]. <https://doi.org/10.1016/j.techsoc.2022.102147>



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## Machine learning in society: Technology in Society Briefing

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### 1. Topic summary

Since 2020, machine learning has been a topic of increasing interest in the Technology in Society discourse. Some papers concerned with machine learning have addressed fundamental issues, while other papers have addressed particular applications of machine learning. Papers concerned with fundamental issues have considered machine learning as a continuation of human outsourcing of cognitive activities; the potential for combining human learning with machine learning; and governance challenges in human interactions with machine learning. Papers concerned with particular applications of machine learning have focused on automated trading; credit score modeling; customer segmentation; healthcare; and security systems. Together, these papers illuminate the importance of considering machine learning from broader biosocial-technical and strategic management perspectives.

### 2. List of papers

#### • Fundamentals

- o G. De Luca, The development of machine intelligence in a computational universe, *Technology in Society* 65 (2021) 101553.10.1016/j.techsoc.2021.101553
- o E. Engström, P. Strimling, Deep learning diffusion by infusion into preexisting technologies—Implications for users and society at large, *Technology in Society* 63 (2020) 101396.10.1016/j.techsoc.2020.101396
- o J. Ostheimer, S. Chowdhury, S. Iqbal, An alliance of humans and machines for machine learning: Hybrid intelligent systems and their design principles, *Technology in Society* 66 (2021) 101647.10.1016/j.techsoc.2021.101647
- o E.S. Kim, Eun-Sung, Deep learning and principal–agent problems of algorithmic governance: The new materialism perspective, *Technology in Society* 63 (2020) 101378.10.1016/j.techsoc.2020.101378

#### • Applications

- o C. Borch, Machine learning, knowledge risk, and principal-agent problems in automated trading, *Technology in Society* 68 (2022) 101852.10.1016/j.techsoc.2021.101852
- o S.K. Trivedi, A study on credit scoring modeling with different feature selection and machine learning approaches, *Technology in Society* 63 (2020) 101413.10.1016/j.techsoc.2020.101413
- o M. Coccia, Deep learning technology for improving cancer care in society: New directions in cancer imaging driven by artificial intelligence, *Technology in Society* 60 (2020) 101198.10.1016/j.techsoc.2019.101198
- o E. Yadegaridehkordi, M. Nilashi, M.H.N.B.M. Nasir, S. Momtazi, S. Samad, E. Supriyanto, F. Ghabban, Customers segmentation in eco-friendly hotels using multi-criteria and machine learning techniques, *Technology in Society* 65 (2021) 101528. 10.1016/j.techsoc.2021.101528
- o M. Nilashi, R.A. Abumalloh, S. Samad, M. Alrizq, S. Alyami, H. Abosaq, A. Alghamdi, N.A.M. Akib, Factors impacting customer purchase intention of smart home security systems: Social data analysis using machine learning techniques, *Technology in Society* (2022) 102118. 10.1016/j.techsoc.2022.102118

### 3. Future research directions

Future submissions concerned with machine learning should be directed towards current gaps in the Technology in Society discourse. For example, submissions could address to what extent, if any, constructs such as social class and social sustainability are affected by widespread applications of machine learning. In addition, submissions are welcome that relate human learning at the societal level to machine learning. Such submissions should consider non-reinforced learning and reinforcement learning in different types of societies in different geographical regions. From the biosocial-technical systems perspective, submissions could consider how the different environments in which

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human societies learn can affect applications of machine learning that has been developed in other environments. Also, wider consideration is needed of ethical issues arising from machine learning. These can be analysed at the level of different societies that have different beliefs about relationships between biological intelligence and machine intelligence.

#### 4. Practice recommendations

Practitioners in all sectors can find examples of opportunities and related challenges from machine learning in the titles and abstracts of Technology in Society papers concerned with machine learning, deep

learning, and reinforcement learning. Overall, practitioners can structure their implementations of machine learning in terms of automational, informational, and transformational effects. Automational effects can be derived from human labour being substituted. Informational effects involve machine learning providing information to support human decision-making. Transformational effects refer to the potential for machine learning to support radical change of processes. Typically, standard automational effects can be achieved through implementing common machine learning applications. By contrast, more human imagination is required to ideate transformational effects from applying machine learning in unique ways to support innovative processes and positive social change.