

# Introduction

## Education for digital citizenship: Algorithms, automation and communication

Guest-edited special issue:

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Algorithms have a growing influence on all areas of citizens' life, with decision-making increasingly linked to mathematical models and big data. Although we are only aware of their presence when we receive personalised messages by email or on social networks, their presence in our lives is very relevant because every interaction with electronic devices collects information about our behaviour. This situation led to relevant changes in the profession, research and media education of journalism, communication, education and, therefore, the public sphere and democratic life. This Special Issue aims to provide an account of, and shed light on, an opaque subject that could determine our social, political, economic and cultural future.

From a multidisciplinary perspective, we start from the idea of research as a relevant step for citizenship education in the fourth wave of digital communication. It is essential for education and in raising citizens' awareness of the relevance of this new social actor.

In its five articles, this Special Issue analyses the influence of algorithms on society, the technological, educational and journalistic implications and the ethical challenges that societies will face in the coming years. These articles allow, always through the dual perspective of research and education, an overview of the main issue of the monograph: the automatization in data collection, fear and phenomena as polarization, social inclusion and ethics. This Special Issue begins with an article entitled 'Algorithms and communication: A systematized literature review', which offers an overview of the academic research, as well as the possible effects the algorithms have on the democratic system. The three authors, Berta García-Orosa, Joao Canavilhas and Jorge Vázquez-Herrero, carry out a systematized review of recent literature from quantitative and qualitative approaches. The results highlight that it is a fluid reality, but with a growing interest in scientific literature, especially in English. In recent years, the main focus of that interest has been on journalism and democracy, with less involvement of ethics and education. The authors highlight a great interest in the effects of the use of algorithms overall in journalism and democracy, but the answers are still uncertain and developments over the coming years will be important.

The collaboration between Spanish and German universities gives rise to the second contribution included in the Special Issue. In 'How to automate the extraction and analysis of information for educational purposes', Miriam Calvera-Isabal, Patricia Santos, H-Ulrich Hoppe and Cleo Schulten, highlight the importance of Citizen Sciences (CS) in education and analyze its use in websites, the use of web scraping methods and anonymization techniques to collect online information, and propose its educational use in a formal context.

As in all innovations, ethics is one of the key, and sometimes less-studied, pillars. In the third article of the monograph, 'Reflections on the ethics, potential, and challenges of artificial intelligence in the framework of Quality Education (SDG4)', Jesús-Miguel Flores-Vivar and Francisco-José García-Peñalvo address, from an educational perspective,

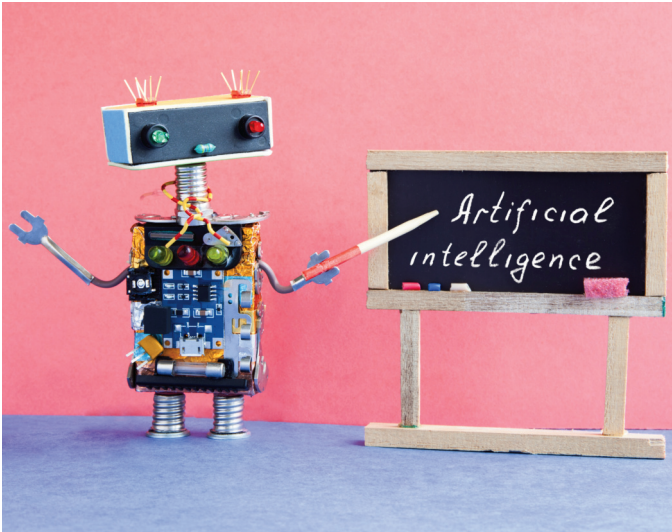
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the ethical aspects of the implementation of Artificial Intelligence. Through a bibliographical and documentary review, they analyze the opportunities for its use in the classroom and the challenges and difficulties it could face in the coming years.

The fourth article, by Carlos Barroso-Moreno, Laura Rayon-Rumayor, Antonio Bautista García-Vera, is entitled 'Big Data and Business Intelligence in Twitter and Instagram for digital inclusion». This work is based on a two-fold conception of social media as a vehicle for phenomena against democratic values such as polarisation, but, at the same time, as an interesting tool for education and the search for an inclusive society. The authors present 'web scraping' and 'text analytics' as tools



that define teachers' digital competence and they analyze which posts on Twitter and Instagram are most viral in relation to education, disability and inclusion. The results show that political and economic influence groups are the most viral in relation to third-sector entities.

The last chapter of the Special Issue analyzes the YouTube recommendation system. In '(Un)founded fear towards the algorithm: YouTube recommendations and polarization', the authors, from the perspectives of reverse engineering and semantic mining, make progress on a subject that is complicated due to its opacity. The results show that the issues do not tend to be extreme, and the authors also point out that the factors shaping the recommendation system are very varied and diverse and offer a further step in the complex analysis of the algorithms that produce personalized recommendations for each individual citizen.

All these perspectives provide an overview of the status of the use of algorithms in the field of education and communication, as well as new challenges for teaching and research.