Sustainable Education in a Digital Age of rapidly Emerging Technologies

IFIP TC3 Zanzibar Declaration – Outcomes of Webinar 3:
Ethical Issues of Autonomous Systems – Educational Concerns

9 September 2021, 02.00-3.30 p.m. GMT

IF TC3 is taking forward the Zanzibar Declaration (ZD) through a series of four webinars, a summary webinar as part of the IFIP60 Events series, and a follow-up workshop. The third webinar was on the topic "Ethical Issues of Autonomous Systems – Educational Concerns"

Over 170 participants were registered for the webinar, and over 30 took part in the event live. Accompanied by 2 co-moderators, 5 panellists from different countries (Canada, Germany, Nigeria, the USA, and Scotland) discussed the topic from different perspectives and from their respective cultural and working contexts.

Further information on the panellists and the content and discussion of the webinar can be found on the ZD website: https://zanzibardeclaration.cicei.org

The webinar was recorded and the video can be viewed asynchronously: https://vimeo.com/cicei/webinar-zd3

Examples of statements and questions discussed in the webinar were:

- There is no uniform definition of autonomous systems. Autonomous systems differ in the real world primarily in terms of their degree of autonomy and freedom to make decisions independently of humans.
- The software and algorithms of 'autonomous systems' often use machine learning techniques and use deep neural networks, which require vast amounts of data. Therefore, their implementation is associated with severe ethical issues (e.g. if the gathered data is of sufficient quality and does not generate biases).
- If a system fails to evaluate big data correctly, we blame the data, perhaps ignoring our responsibility to gain those data and identify the reliability of their sources. It is necessary to address, rather than avoid, these professional responsibilities.
- Extraordinary care should be taken to identify and mitigate potential risks in machine learning systems. A system for which future risks cannot be reliably predicted requires frequent assessment of risk as the system evolves in use; otherwise, it should not be deployed.
- Ethics should be at the forefront of the development and the deployment of autonomous systems. Even in the development phase of autonomous systems, respecting human rights, protecting individuals' privacy, and empowering people to complete tasks should be essential guidelines ("Every line of code has a moral and ethical implication" according to Grady Booch[1]).
- AI is not independent but is integrated into a socio-technical context of action between humans and machines. This can result in various issues: human interaction confusion, obligations, accountability, transparency and explainability of the system ethics.
- 'Autonomous systems' are mostly not fully autonomous and independent from the human user and are usually embedded in a socio-technical action. The time for decisions by the human actor in time-critical action situations is often limited and essentially determined by the decision alternatives of the AI system specified in its algorithms. Programmed decisions should reflect ethical, cultural and legal values. Therefore, from an ethical perspective, autonomous systems can challenge established assumptions about responsibility and the judgement of guilt.
- The responsibility for the design of algorithms of autonomous systems and the selection of their data for the generation of decisions or proposals for alternative actions should not be left to a single developer but should be the responsibility of a (multidisciplinary) team.
- The relationship between man and machine is not a new problem from a historical perspective. The development of 'new software' has always included the question of responsibility and the underlying ethical issues.
- The primary concern for autonomous systems in education is the proactive application of ethical standards to all aspects of the work of computing professionals, using commonly agreed upon standards. Computer scientists have to emphasise professional responsibility (standards of safety and software development, making software engineering tools, articulating professional responsibility for their work). Therefore, computing professionals should articulate their responsibility and ethical standards and formalise them in codes of ethics. The ACM (1992) code of ethics and professional conduct provides global conciseness of the profession.
- Viewing autonomous systems through the lens of ethics provides too narrow a focus. The real issue is the impact on society.
- Gamification and game-based learning are relevant application examples for AI concepts in education. Game-based mechanics, aesthetics and game thinking is expected to engage people, motivate action, promote learning and solve problems by issuing rewards to foster desired actions and outcomes.
- Game design should keep different ethical considerations in mind:
  – Bias in gamification design (game rules are created by teachers/game designers, not learners).
  – Privacy (game results, play statistics could be visible to others).
  – Voluntary participation (no one game participant should feel left out).
- In game-based learning, the voluntary participation of learners needs a 'safe to fail' environment. Learners need the freedom to fail, recover and learn from the failure and thus will be encouraged to take on challenges they would not have undertaken otherwise.
- AI can be used as a class monitor to support learners and teachers (in the example from Nigeria). AI software provides teachers with essential clues about what is happening in the classroom by

[1] https://twitter.com/grady_booch/status/962758799772626944?lang=de

collecting and evaluating a wide range of data gathered from pedagogical interactions in the classroom. In the process, cameras and other input and recording media capture and assess the following data: classroom interaction, scanning faces, face recognition, classification and storing of data (students' behaviour, facial emotions by applying deep learning methods with neuronal networks). Reporting and analysing the data by human action detection algorithms suggests to teachers necessary intervention for the classroom and daily notification to parents via an App. The AI class monitor enables students to utilise individually adapted learning opportunities for adaptive self-regulated learning (adaptive quizzes).

- The varying acceptance of such systems in education in different countries highlights the importance of the cultural, social and legal contexts when evaluating AI and autonomous systems from an ethical perspective.
- The importance of the cultural and social context in which data are collected and analysed with AI methods also becomes evident in the case of image processing. Ethical biases can be produced during data training (as they may be likely to fail to recognise certain ethnical groups as humans because of their skin colour and clothing).
- To enable students to understand the fundamental functioning of autonomous systems and their impact on society, informatics education is necessary for all. Informatics should be a compulsory part of education and should be treated as important as mathematics, the sciences and languages. Informatics should also be integrated into the teaching of all disciplines.

- What are the main ethical issues to be considered during the design, development and application of autonomous systems?
- How have ethical standards of autonomous systems at the international level been influenced by research, application experience, and advocacy of ACM's Codes of Ethics?
- How can the societal impact of autonomous systems and the related ethical problems be taught in informatics education?
- What kind of autonomous systems and AI concepts were used in teacher training and in secondary schools in Nigeria?
- What are possible ethical issues when applying AI in an educational context?
- How can autonomous systems and AI support the ecological transformations of society in developing countries, and what kind of ethical issues arise in this context, particularly with regards to education?
- Are games and game-based learning a vital application area of AI and autonomous systems?
- What kinds of ethical problems arise in connection with the use of AI and autonomous systems in gaming in educational contexts?
- What are the implications of games as autonomous systems from an educational perspective?
- What is a definition of autonomous systems, and which AI concepts do they include?
- How can system developers consider the variety of users' needs, digital equity, priorities and expectations according to their location, culture and perspectives?
- How should informatics education be designed, so that future developers and users understand the ethical issues of autonomous systems?
- What are the main challenges of risk analysis, security and privacy protection with autonomous systems?
- Are there specific risks and ethical issues in using autonomous systems in mobile computing and personal security assistants and services?
- Should ethical issues of autonomous systems be the sole concern of informatics education, or is a broader multidisciplinary approach needed?

The following word clouds were created based on the notes of the two moderators and on transcript excerpts of the Webinar and the discussion contributions in the chats. The first shows an unfiltered version, the second a filtered version applying AI methods.

Event organisers of Webinar 3
Co-moderator: Prof. Dr. Cathy Lewin
Co-moderator: Prof. Dr. Johannes Magenheim
Technical organisation: Prof. Javier Osorio
Organisational planning: Dr. Christophe Reffay
Organisational support: Prof. Dr. Don Passey

Panellists
Prof. Dr. Andrew McGettrick (Scotland)
Prof. Dr. Don Gotterbarn (USA)
Olalekan Akinsande (Nigeria)
Dr. Lin Zhang (Canada)
Prof. Dr. Kai Rannenberg (Germany)

The next webinar
Webinar 4 will focus on 'Power of AI-Methods and Algorithms for Decision-Making - Educational Issues', and will be held on 5 October 2021, 08.00-09.30 a.m. GMT.

For further details and registration please visit the Website:
https://zanzibardeclaration.cicei.org/mod/page/view.php?id=19

Please contribute to the Zanzibar Declaration
To contribute to the Zanzibar Declaration and to the discussion on the impact of ICT on education and society, please enter short contributions in the ZD-grid: https://jsilab.ch/zdApp/