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ENVISIONING LIFE-LONG LEARNING SKILLS REPORT REVIEW on ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING (AI/ML)

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Abstract: Artificial intelligence and machine learning (AI/ML) are running almost all aspects of our daily lives. However, there is little impact of these recent advancements in AI/ML on the education sector. We highlight issues why education is lagging behind while bearing in mind that education is highly structured and process-oriented compared to most of other sectors that are either service or product-oriented. We explore this challenge courtesy of numerous reports such as "The Envisioning Report for Empowering Universities, 2nd edition, April 2018" from two folds: What are the expected benefits? What are the risks and opportunities for public education actors? This desk research recommends natural language processing and/or learning analytics (LA) as a vital technique in fostering individualised visualisation of life-long learning skill.
Keywords: artificial intelligence, machine learning, learning science, learning systems, open education resources.

1.0. Problem Statement

Progress in AI/ML has been impressive, but there is still much work to be done to advance learning science. While some progress is being made to bring AI/ML to the education space as described above, these efforts pale in comparison to advancements in the non-education space. Significant breakthroughs are highlighted in non-education fields for example, Amazon and UPS use drones to deliver packages and other goods to customers; Google purchased DeepMind company and its software recently taught itself how to play 49 retro video games so well that it consistently outperforms human players. Google has also been testing its driverless cars.

The complex nature of new digital technologies further complicates the already difficult task of teaching with technology. In other words, digital technologies are ever-changing, not always predictable, and can take on many forms [1].

2.0. Background

Artificial intelligence (AI) is an area of computer science that emphasizes the creation of intelligent machines or in otherwise a term for simulated intelligence in machines. The machines are programmed to "think" like a human and mimic the way a person act. AI has been used to develop and advance numerous fields and industries, including finance, healthcare, education, transportation, and more. "AI for Good" is a movement in which institutions are employing AI/ML as a key player to tackle some of the world's greatest economic and social crisis management [2].

There are numerous AI/ML techniques that can enhance teaching and learning hence boosting education sector. These include among others: Natural language processing; dialogue systems; inquiry learning system; and learning data analytics. We consider both natural language processing and learning data analytics technique aiming at imparting computing devices to do what comes naturally to humans and animals: learn from experience. Machine learning algorithms use computational methods to "learn" information directly from data without relying on a predetermined equation as a model, thus boosting innovations. According to [3], there is a deliberate continual institutional policies review by most European Universities being brought up by Open Educational Resources (OER) movement, mainly aiming at boosting innovations in higher education teaching and learning practices. One of the key transformative actions proposed is to improve the visibility of quality OER produced in the European Universities by 2020, using investment funds. The challenge is whether repositories of OER take care of specific needs of education context, content scope and other issues such as clarify the understanding about the reuse of OER. In their study [3], highlights that most repositories are mainly created by universities and government bodies and exclusively designed for educational resources, rather than hybrids that also contain research content and that OER production has no place outside of institutional funding since there are few rewards for OER.

In line with [3], we examine their study method based on content analysis consisting of two phases: Exploration of international and specialized sources about OER repositories, and selection of the repository population to be analyzed; Analysis of the OER repository population using a set of indicators, which are directly related to the research questions.

We advocate the use of indicators that are more focused on pedagogy and bottom-up approaches, as these increase the educational usefulness of OER repositories and the reuse of OER. Additional features could be based on users' interaction, meaning communities and personal spaces, kind of information shared, social tagging procedures, etc., and types of OER, defined by whether the material was produced by learners or educators and who it is aimed at (learners, teacher trainers, the OER community, learning innovators). All stakeholders' participation helps to evaluate and license the stored OER, which facilitates reuse and makes it easier to integrate educational needs into the classification and retrieval process. We have reviewed with an intent to demonstrate that AI/ML is realizable in the education sector [4, p. 283]. Challenges have been categorized among others: Educational; Legal; Organizational and Technical challenges as discussed in the next section.

3.1 Educational challenges

Over the years AI/ML in education has proposed and labored to address "grand challenges" including among others: Virtual mentors for every learner which is an omnipresent support that integrates user modeling, social simulation and knowledge representation; Addressing 21st century skills by assisting learners with self-direction, self-assessment, teamwork and more; Interaction data analysis aiming at bringing together the vast amounts of data about individual learning, social contexts, learning contexts and personal interests; Provision global classrooms opportunity intended to increase the interconnectedness and accessibility of classrooms worldwide; and/or offering Lifelong learning technologies with a view of enhancing learning outside of the classroom and into the learner's life outside of school, [5].

3.2 Legal challenges

Rapid technological advancements have led to non-educational institutions and organisations accumulate lots of data about almost everyone which is problematic and possess a big ethical challenge. Social platforms can for instance be used to spread 'fake news' and facilitate the online sexual grooming of children and much other abuse.

As distance and online educators use more new technology it becomes vital that we also develop methods of testing our ethical use of those technologies. Now the new field of learning analytics (LA) has brought the need to examine the ethics of online and distance education into even more urgent focus.

3.3 Organisational challenges

In order to enhance continual professional development, life-long learning skills are considered to be key aspects to realise it and to stimulate learning between different communities of practice. According to [6], OER and courses ought to be curated and purposely presented to meet the needs of defined communities of practitioners. More so, practitioners often times prefer to use different styles or types of resources to suit their circumstances and thus it is vital to maintain and continually revive the quantity of such resources and courses over time. The challenge is to create learning systems that blend open and closed resources bearing in mind that for-instance with 'closed' learning systems thinking, resources and course materials can only be accessed upon learner registration and payment of fees.

3.4 Technical challenges

The challenge is to change from mere commitment to taking action towards realisation of an all-inclusive and equitable quality education. These include among others: examining solutions to meet the challenges of mainstreaming OER content and practices into education systems worldwide; showcase the world's best practices in OER policies, initiatives and experts, and; identifying recommendations that are demonstrably best practices for the mainstreaming of OER.

In the next section, we clarify each of the challenges discussed in the previous section.

4.0. Clarification

4.1 Educational clarification

The democratisation of knowledge and the expansion of access to higher education (HE) require universities to constantly review their pedagogical practices to ensure that they remain up to date with developments [7] [8] [2]. We advocate for an application to learning where AI/ML can help organize and synthesize content to support content delivery. This form of technology is known as deep learning systems, which can read, write and emulate human behaviour. For instance, according to Neil Sahota from IBM in [9] discussed "IBM Watson" as an application that can be used to see the learning capability of each student, move at their pace and help them develop confidence to master subjects. Watson can recommend things the student might like or be interested in learning, based on their specific personality traits. Watson can adjust the way it interacts with the student based on their age, competency level, vocabulary and emotional state.

Some of the suggested strategies highlighted in the education session [9] included: using AI in education to first serve the underserved – not something that actually came out as a big priority for education in the panel, but basic literacy should be a priority. Before thinking about scaling with AI, we first have to redefine what great education and learning experiences actually are; and learning has to be self-directed for meaning.

4.2 Legal clarification

There is a need for clear institutional ODL ethical guidelines agreed upon throughout a given institution [10]. For this is to be realised depends on the institutional structures and probably an 'Ethics Committee' with learner representatives. In order to adhere to the guidelines, there must be regular reviews of how learning analytics and other data-based systems are employed. With such guidelines in place, each learner individually could easily get access to their data but this possess an ethical challenge of the unknown consequences. [10] Commends uptake of principles required to deal with ethical issues raised by the use of learning analytics (LA) in online education as suggested by [11]. These principles are highlighted below:

Principle 1: LA as moral practice. LA should be employed in not only what is effective, but also in what is morally necessary.

Principle 2: Learners as agents. LA must involve Learners as collaborators.

Principle 3: Learner identity and performance are dynamic constructs. LA only provides a 'snapshot' of a learner at one time. So 'data collected through learning analytics should have an agreed-upon lifespan and expiry date, as well as mechanisms for learners to request data deletion'.

Principle 4: Learner success is a complex phenomenon. It will be important to recognise that learner success depends on many more things than institutional actions.

Principle 5: Transparency. Institutions need to be clear as what data is collected and used and who has access to it.

Principle 6: Higher education must use LA given that it can be so important in fulfilling in improving outcomes for learners.

4.3 Organisational clarification

Educators have an excellent insight into what their learners need in order to succeed. But they have little or no influence in the development of these technologies. Most technologies are built around past educational paradigms and thus are inherited. It is time for teachers or educators to influence the development of technology for their own needs, rather than just wait for the next development then to jump on that bandwagon. According to [12, p. 30] [13], organisations can boost their professional growth by means of informal learning through conventional and commissioned education teaching programs such as child rights, classroom and school management. It's incumbent for educational settings to individually support their learners throughout each learner's educational journey. This vital significance has a real meaning especially for open distance learning (ODL). ODL can only be achieved by independent learning and independent learning can only be achieved by the learner autonomy while taking care of the extent of autonomy.

Courtesy of rapidly advancing technologies, there are numerous innovative learner support tools that boost learning autonomy and independent learning in online learning environments. According to [14], the prominence of these technologies is semantic web, labelling technologies, sensitive search, meta-data supported frequently asked question systems and learning analytics.

4.4 Technical clarification

In order to meaningfully contribute directly to an individual business and /or professional career, a range of activities ought to be taken advantage of such as proper use of OERs, tools and spaces within two main learning environments: the virtual and the physical. Blended learning elements are crucial for the systematic acquisition and development of knowledge, understanding, skills and attributes of learners working and researching in a range of contexts and professional settings. A blended approach that integrates online, face-to-face and independent learning not only motivates learners by means of facilitating activities for knowledge acquisition but also boosts life-long learning skills.

According to [15], the process of becoming a life-long learner requires appropriate learner mind-set and qualities adequately utilized to develop a set of relevant skills and subject knowledge. A main quality indicator for universities is that learners are able to research and learn about research in a supportive environment.

The supportive environment should embrace the triple-helix model see figure 1 below as discussed by [16], to help in comprehending the change produced by the inclusion of economic development as a new mission for universities. Since the university is considered as a knowledge producing and disseminating institution it could play a more significant role in economic innovation.

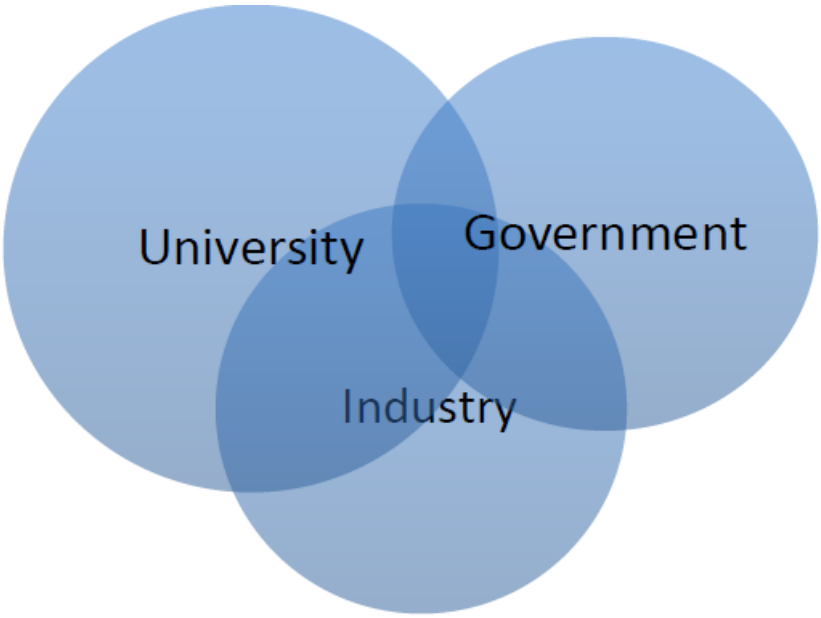

Figure 1 Tripple-helix model

Technically, we also applaud the K-nearest neighbour or k-NN as one of the simple supervised machine learning algorithms to recognize the pattern in a given data set without explicitly learning a model. It is a non-parametric method to predict the output value based on k closest training examples or datasets.

We also endorse Machine learning as a complex discipline which provides the basic building blocks to design, train, and deploy machine learning models. It can be used for several machine learning algorithms. Mostly it is famous for building deep neural networks such as image recognition, speech recognition and translation, image style transfer and many others. But implementing machine learning models is far less daunting and difficult than it used to be, thanks to machine learning frameworks such as Google's TensorFlow that ease the process of acquiring data, training models, serving predictions, and refining future results.

5.0. Conclusion

We envisage that AI/ML could play a contextual role especially in the growing field of learning analytics, evaluating the quality of curricular materials, and in seamless learning. More specifically, AI/ML is highly considered in overcoming hindrances in attaining all-inclusive and equitable quality education as highlighted in "The second world OER congress Ljubljana OER action plan 2017".

However, AI/ML has the potential to become more intelligent than any human and with no definite way of predicting its behaviour, pose significant challenges. For instance, AI/ML can be programmed to do devastating stuff and/or instead of doing beneficial things it develops a destructive method for achieving its own goal. The best example of what we could face may be

our own evolution. "Human beings are now controlling the planet, not because we are the strongest, fastest or biggest, but because we are the smartest". We envision loss of control of the planet when we are rendered no longer the smartest.

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