

On Artificial Intelligence - A European approach to excellence and trust

Comments on how autistic people can benefit from Artificial Intelligence

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it has been brought to my attention that the disability dimension is lacking in the White Paper, just issued by the European commission: https://ec.europa.eu/info/publications/white-paper-artificial-intelligence-european-approach-excellence-and-trust_en - there is just mention of disability in relation to antidiscrimination. It would be great to submit comments to the European commission regarding the potential added value of AI in relation to assistive technology, for people with disability and notably autistic people.

1 Introduction

The white paper entitled “a European approach to excellence and trust” describes how the European Union can not only benefit from the innovations stemming from the development of the Artificial Intelligence but also how to tackle the challenges brought by this technology.

In this report, many actions are proposed to deal with the negative aspects of Artificial Intelligence such as privacy issues or the opacity causing a lack of understanding in the decisions made which can lead to bias, discriminations, limitation of freedom, etc. Unfortunately, the report does not consider how useful Artificial Intelligence can be in the life of people with disability and especially autistic people. We propose in the following section to give a definition of Artificial Intelligence and then, to explore in the literature what solutions have been proposed to support autistic people.

2 Artificial Intelligence: what are we talking about?

The word Artificial Intelligence was proposed by John McCarty [1] and was defined in 1956 by Marvin Lee Minsky as “*the building of computer programs which perform tasks which are, for the moment, performed in a more satisfactory way by humans because they require high level mental processes such as: perception learning, memory organization and critical reasoning*”.

Many solutions have been proposed [2] and many are still used today. For instance, Bayesian Networks, or “probabilistic directed acyclic graphical model”, is a probabilistic graphical model (a type of statistical model) that represents a set of variables and their conditional dependencies via a Directed Acyclic Graph (DAG). Bayesian networks are ideal for taking an event that occurred and predicting the likelihood that any one of several possible known causes was the contributing factor.

Another set of approaches is composed of the Artificial Neural Networks (ANN). It consists in computing systems that are inspired by the biological neural networks constituting animal brains. Such systems “learn” to perform tasks by considering examples, generally without being programmed with task-specific rules. Many variants of Artificial Neural Networks exist. For instance, Support Vector Machines (SVM) are used for classification while convolutional neural network are more adapted to image analysis.

We use the term “machine learning” as a synonym of “artificial intelligence”.

3 Assessment

One of the most obvious uses of artificial intelligence is to help the medical profession to make assessments and to diagnose autistic people. In 2016, Bone *et al.* [3] proposed to create a Support Vector Machine (SVM) that

helps to predict if a person is autistic or not. The SVM is trained on the answers given to tests such as Autism Diagnostic Interview-Revised (ADI-R) or Social Responsiveness Scale (SRS).

Duda *et al.* [4] and Wall *et al.* [5] have proposed to use a machine learning algorithm to reduce the length of the ADOS testing. Based on previous answers, only the relevant questions are asked. They showed that it does not reduce the accuracy of the diagnosis.

Some works, such as those of Crippa *et al.* [6] or Liu *et al.* [7, 8] try to detect autistic people from their movement signature or more specifically from their face or eyes movements.

The goal of this research is to reduce the long time it takes to diagnose people today. In some countries, the waiting lists are huge and too few professionals are trained to establish a diagnosis. Transferring this research into the community could reduce the waiting lists and can enable more professionals to efficiently assess these persons. The result would be for people to access help and support more quickly.

In fundamental research, Artificial Intelligence can be used to find the genetic characteristics of autism [9].

4 Artificial Intelligence for autism-friendly environments

Artificial Intelligence can help professionals to establish autism diagnoses but more importantly, it has a role to play to support autistic people and to create a predictable and sensory acceptable environment which is the first step for the inclusion of autistic people.

4.1 Teaching social skills

Autistic people often struggle with communication and unpredictability.

For instance, recognising emotions is something many autistic people struggle to do. Many works rely on Artificial Intelligence and machine learning to teach social codes or emotion recognition to autistic people [10]. For example, Ricks *et al.* [11] shows that using a robot can extra help autistic persons to learn social abilities and to recognise emotions.

Although these approaches can be great in a teaching environment, help can still be useful in the unknown world.

One project relies on Artificial Intelligence and the virtual reality provided by Google glasses in order to help the autistic person to understand the emotions displayed by the persons they meet [12].

Nevertheless the previous approaches show that the improvements do not last in the long term. There is also a difference between learning in a controlled environment and generalising in daily activities. The university of Stanford is working on a project involving Google glasses and Artificial Intelligence to deliver social cues whenever needed¹.

4.2 Removing unknown and unpredictability

Communication and social interaction are only one part of the challenges autistic people face. A large amount of stress and anxiety in the life of autistic people is tied to the unknown and the uncertainty of the environment.

An ambitious and practical project consists in creating a life coach for autistic people [13]. The life coach uses sensors to evaluate how the person is feeling (to identify their emotions and their mental state like stress for instance). Then, an artificial intelligence system is used to give some advice to the person. It can be a help in understanding the people with whom the person is interacting with, what they said or the emotion but it also can be a help to remove the uncertainty in the situation.

Another good aspect of such a solution is to use the interests of the person and to automatically integrate this knowledge in the given advice [14]. Relying on what the person is interested in is always a good way to engage autistic people.

Similar projects such as Bimbrahw *et al.* [15] or Arnold *et al.* [16] are more focused in helping autistic people to develop their autonomy and to support them in living independently.

Finally, an autistic person even proposed to develop an app for smartphones in order to provide help in understanding situations [17].

Such research is today leaving the laboratory and reaching the society. For instance, even if many improvements are still needed, autistic people can today rely on personal assistants such as Amazon Alexa or Apple Siri².

¹<http://autismglass.stanford.edu/>

²<https://www.nytimes.com/2014/10/19/fashion/how-apples-siri-became-one-autistic-boys-bff.html>

4.3 Creating a sensory-friendly environment

Even if we have not find any research work on this aspect, we can imagine Artificial Intelligence to be used to continuously monitor the environment in order to help the companies or the public spaces to determine which elements of the environment autistic people may struggle with.

5 Artificial Intelligence for better professional practices

In this section, we present how artificial intelligence can be used to put an end to discrimination, and the accessibility barriers autistic people face in their day-to-day lives. These barriers autistic people face are not part of the autism diagnosis but are related to the way society sees and considers autistic people. Removing them, is essential to enable these persons to participate and to contribute to society.

5.1 Employment

Around 80% of autistic people are currently unemployed, despite their competencies. Some authors focused on the autistic person and proposed to use Artificial Intelligence to determine the risk factors related to employment [18]. Contrary to this approach, an original proposition by Hyde *et al.* [19] is to use a Bayesian Network to compute the probability of an employer hiring an autistic employee. The proposed solution can also help to find the reasons and the obstacles the employer face to recruit autistic people. Such research can easily benefit the community and will lead to put in place specific strategies to help the employers in recruiting autistic people.

5.2 Healthcare

Over 70% of autistic people have difficulty accessing healthcare and they have a shorter life expectancy than non-autistic people³. Among the barriers, research showed that autistic people expressed pain in a different way than non autistic people [20]. Several projects used Artificial Intelligence to identify pain through body characteristics or facial expressions [21]. Therefore, we can imagine the same techniques could be used to help professionals to identify pain in autistic people and to increase the life expectancy of this population.

In mental healthcare, Artificial Intelligence has a huge role to play. For instance it can help the persons to identify their mental state [22, 23] or to help the professionals to make decisions [24].

5.3 Evolution of professional practices

Many research papers are published each year on how to support and help autistic people. Professionals may struggle to modify their practice to take into account these results.

Artificial Intelligence can be used to help researchers to peer-review the articles [25] but it can also help the professionals to understand the research papers and to transfer this knowledge into their daily practices.

This can reduce the time taken by solutions to migrate from the research field to the practices, leading to better support the people.

6 Co-occurring conditions

Autistic people often have other conditions such as dyslexia, dysgraphia or even ADHD.

Drigas *et al.* [26] published a survey in which they describe how Artificial Intelligence can be used to detect issues like learning how to read but also how Artificial Intelligence can be helpful in the learning process by providing a feedback to the reader/writer.

7 Discussion

Artificial Intelligence is a great opportunity to provide help and support to autistic people but also to professionals by helping them to improve their practices. Nevertheless, as mentioned in the white paper, Artificial Intelligence also has negative aspects which raise many fundamental questions.

For instance, a device that displays the name and the profession of the person you are talking to is something that could help autistic people because autistic people often struggle to recognise the faces or do not always

³<https://asiam.ie/research-opportunity-barriers-experienced-accessing-healthcare/>

remember this kind of information. But creating an AI with these pieces of information is also a great danger for privacy and for personal data protection.

Finally, my last point is that something we need to pay attention to is the fact that many people see disability as something that needs to be “fixed” or cured. and Artificial Intelligence can also be used for that. For instance, in 2019, Mr. Elon Musk, the CEO of Telsa said that the company Neuralink is developing an AI-enabled chip that could be implanted in a person’s brain to record brain activity and to potentially stimulate it. He added that “Neuralink will solve a lot of brain-related diseases that could be anything from, like, autism, schizophrenia or memory loss”⁴.

The thing is that autism is not a disease and many autistic people do not want to be fixed or cured. They consider autism as a part of who they are and a fix would be considered as a modification of their personality⁵. I think, we need to highlight that Artificial Intelligence is not developed against the interests of the people it is supposed to help.

8 Conclusion

In this document we explored how Artificial Intelligence can help and support autistic people. We presented some research works that have been done in an academic context but also the projects that have reached the society in general. We finally discussed the particular aspects we need to be careful of, in the deployment and the adoption of the Artificial Intelligence.

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⁴<https://www.businessinsider.fr/us/elon-musk-said-neuralink-could-solve-autism-and-schizophrenia-2019-11>

⁵<https://themighty.com/2019/11/neuralink-solve-autism-elon-musk/>

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