ARTIFICIAL INTELLIGENCE IN PRISONS IN 2030: AN EXPLORATION ON THE FUTURE OF AI IN PRISONS

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Abstract

This article discusses the current and potential future use of Artificial Intelligence (AI) in prisons. In a quickly digitalizing society, prison systems are also being rapidly digitalized, and the latest examples of this development are AI solutions implemented for security technique and offender management. A literature review and a survey to 20 jurisdictions globally are summarized in this article. We will also discuss the possible side effects of AI being implemented and the ethical questions related to its future use in prison context.

Introduction

The term Artificial Intelligence (AI) has been used to describe projects and prototype systems since the second half of the 20th century. In general, we can speak of AI when machines do the kind of things that only people used to be able to do. It refers to *"systems that display intelligent behaviour by analysing their environment and taking action — with some degree of autonomy — to achieve specific goals"* (European Commission, 2018). Where 'artificial' (delivered by machines) is the most straightforward parameter to assess whether a system is AI or not, the word 'intelligent' makes it much more complicated and ambiguous since intelligence is a loaded concept, hinting notions such as consciousness which is part of the uniqueness of a human being. However, the capabilities of AI are still extremely limited relative to human intelligence (Andrew, 2017), and AI is currently not able to do more than the simulation of human intelligence processes like visual perception, speech recognition, decision-making and translation between languages (Tucci, Burns & Laskowski, 2020). The development of AI is more about a revolution in computational statistics than a revolution in intelligence (Fry, 2018).

To distinguish between the different interpretations of the word intelligence, the typology of "AI triad" is made in literature. Based on the 'level of intelligence', we can talk about Artificial Narrow Intelligence (ANI) where machines are capable to execute a specific task or limited set of processes. Artificial General Intelligence (AGI) refers to machines that come closer to simulating or even achieving human level intelligence. Artificial Super Intelligence (ASI) could be used when talking about AI exceeding human intelligence. Where experts disagree about a lot of AI topics, there is a common agreement that current AI is still on the level of ANI. We are currently not even close to AGI and far away from ASI. In this article we will use the term AI in the meaning of ANI.

Machine Learning

It is mainly thanks to four self-reinforcing trends that AI has really taken off: the availability of increasingly large amounts of data, the accessibility of cheap and enormous computational power, the transformation of ever more places into IT-friendly environments (e.g., domotics, and smart cities) and the development of more sophisticated statistical and probabilistic methods (Cath et al., 2018). In this context, investments and interest in AI boomed as it enabled the successful application of the most popular and widespread AI technique to this day, which is known as *machine learning* or supervised learning.

Machine learning is a powerful automated statistical technique that works by identifying patterns in available data (=learning) and then applying this knowledge (algorithms) to new data. The larger a data set is, the better AI can learn and discover even subtle relations in the data. Algorithms improve their performance in a given task when more data becomes available, so they learn by themselves to be more accurate. Besides machine learning, AI's most common applications are natural language processing and understanding, computer vision, speech recognition, planning and scheduling actions, optimization, robotics and expert systems (Pietikäinen & Silvén, 2019). Machine learning itself is broadly used in most of these applications like predicting phenomena, planning, optimization and pattern recognition needed in computer vision, speech recognition and natural language processing, robotics, optimizing the function of large systems (e.g., energy consumption) and improving expert systems.

Artificial Intelligence in Prisons

In a quickly digitalizing society, envisioning prisons in 2030 can hardly be done without the projection of what we know or assume will be available in AI in the future. AI is currently seen as one of the highest forms of human development and a sound outcome of human achievement to date (Dahal, 2019). AI's current implementations have already generated remarkable impact on individual lives as well as our society as a whole. It presents a multitude of challenges and ethical concerns, many of which are being actively considered by organizations, research institutes and governments (Green, 2018). The most fundamental ethical and moral concerns are related to the man-machine relationship, and whether and how far we will go into trusting algorithms and robots in the future.

There are many different underlying techniques that can be categorized under AI, from rather basic programming using logic, if-then rules, over more enhanced, obtuse statistical techniques towards deep learning and the use of neural networks. However, in the context of this article it is more important to have a look at the application of those techniques in practical solutions in prisons. The two main areas where AI in prisons is implemented are: (1) operational technology mainly focused on security and surveillance, and (2) software applications to support information management such as offender management systems, healthcare, finance etc. In this article we will analyse how AI is and could be used in the prison setting, and how its capabilities and challenges are related to its usage in this context[1]. We will also highlight the ethical concerns of AI in prison setting and what is needed to assure that it will support and improve our future correctional practices in line with its purposes.

Methods

We conducted a literature review about the use of AI in prisons and ethical questions regarding its use. We used both academic journal resources and other available online sources like news platforms and congress websites. The Finnish Criminal Sanctions Agency's (CSA)[2] submitted in 2020 a survey about the use of AI in correctional services to EuroPris member countries by EuroPris' Knowledge Management System (KMS).[3] CSA submitted their proposal for questions, and EuroPris created the actual digital survey and sent it out to the member countries. Each member country's agency has an appointed KMS focal point, who is responsible for submitting the survey inside the agency to those specialists that are responsible for the specific topic in question. Countries submitted their answers back to EuroPris to collect the results for CSA. Besides the 13 EuroPris member countries, one Australian, two Asian and five North American jurisdictions answered the same survey. The North American responses came from an internal request throughout the Corrections Technology Association[4]. The Asian and Australian jurisdictions were asked and responded directly on the authors' request.

The survey had the following questions:

1. Do you currently use AI in your correctional system? How?
2. Are you planning to use AI? How?
3. Are you planning / discussing the use of AI with your agency's management?

1 *In this article we will not talk about AI's usage in probation or community corrections context.*

2 *Author Pia Puolakka is working as a Project Manager in CSA.*

3 *European Organisation of Prison and Correctional Services: www.europris.org. EuroPris submits several KMS surveys annually reporting their results on their website.*

4 *Author Steven van de Steene is a member of the Corrections Technology Association: www.correctionstech.org*

4. Do you have concerns regarding risks or ethical questions connected to the use of AI?
5. Have there been any new policies or legislation developed to support the current and future use of AI in your organization?

Results: Literature review

Security Techniques

The literature review revealed that the majority of AI applications in the prison context are in the realm of security technique. The most advanced applications are currently seen in Asian countries like China, where a "smart" surveillance system is designed to monitor prisoners at every moment, including while they are in their cells. The network of cameras and sensors are capable to constantly track inmates and feed into an AI system that uses facial identification and movement analysis technologies to monitor each individual inmate, producing a daily report about each one and flagging any unusual behaviour (Yan, 2019).

The same kind of surveillance systems are also used in Hong Kong, where a *"smart"* video surveillance system includes cameras with analytic monitoring functions that can detect unusual behaviour — such as an inmate hurting themselves or collapsing — and alert officials. Another application is related to the use of data coming from a tracking wristband comparable to fitness wristbands on the market. This wearable wristband will keep track of inmates' vital signs and whereabouts – namely biometric data, alerting officials if it notices anything amiss, including signs that the inmate may have injured themselves (Houser, 2019). In South Korea robots are used to monitor violence and suicide risks of inmates to help reduce the workload for human guards (BBC News, 2011). Hong Kong prisons are also using robotic arms that shift through inmates' feces for smuggled items like drugs (Houser, 2019).

Another example of AI in security techniques is the mass-monitoring system of inmate phone calls in US prisons in New York and Alabama (Cassens-Weiss, 2019). This system uses speech-recognition technology, semantic analytics and machine learning software to build growing databases of searchable words that can flag suspicious calls that might include threats like planning crimes, smuggling of drugs into prisons and other incriminating information. Image and pattern recognition technologies are used increasingly in CCTV camera systems in general such as the AI-based video analytics platform currently implemented in some prisons in India (Digit News Desk, 2019) or focused on specific locations: a prison in Liverpool (UK) uses security cameras monitored by AI to stop smuggling of drugs, phones and weapons into prison, and detect other suspicious behaviour (McGoogan, 2016).

Currently AI-driven technologies like these are developed and marketed rapidly and changing the way prisons monitor their inmates. Suspicious human activity recognition from surveillance video is especially an active research area of image processing and computer visioning. Many security technique AI solutions can contribute to staff capacity enhancements, but prison services also mention paying concern to the ethical questions related to these solutions, which we discuss later in the article.

Offender Management[5]*: Risk Analysis and Recidivism*

With the advent of big data analytics and AI, both the assessment of risk and the operation of criminal justice systems are becoming increasingly technologically sophisticated (Zavrsnik, 2020). This is also happening in prisons where the most common applications of AI technology are evident in the context of risk assessment tools (Pereira, 2020), which were the first AI applications in prisons. Most of these models are based on the original and still dominant risk-need-responsivity (RNR) model of risk assessment (Andrews, Bonta, & Hoge, 1990). To support this model the adoption in many jurisdictions of standardized instruments for risk and needs assessment is one of the most important, widespread, and continuing developments of the last 20 years in offender management (Raynor, 2019).

The ambition of using AI in the context of offender management lies in the desire to improve decision making related to finding the best trajectory for the offenders regarding their needs and minimizing their risks. For example, the Hong Kong Prison department states they are actively developing AI technologies for persons in custody self-management in order to enhance the efficiency of penal operations and even the effectiveness of rehabilitation programmes (Houser, 2019). A recent project in the Finnish Criminal Sanctions Agency is developing an AI application for offender management. RISE[6] AI will be a 'recommender' system that recommends rehabilitative services to offenders during their sentences based on the available offender background information, like various criminogenic risk factors. This application will complement the risk and needs assessment tools currently in use, thereby improving the accuracy of service recommendations made to offenders. Here 'accuracy' is referring to meeting offenders needs and reducing their risk for re-offending (Puolakka, 2020).

AI-driven analysis of risk factors and estimates of reoffending are based on statistical algorithms that become more accurate by machine learning that analyses large amounts of data of individual risk factors and their relationship to reoffending. However, at the same time these analyses are being criticized. One study finds that statistical algorithms are no more accurate than laypeople's estimates of recidivism (Dressel & Farid, 2018). This study was replicated and extended with nearly identical results, with humans and algorithms performing comparably (Lin et al., 2020). However, the same study noted increased performance gaps between humans and algorithms when the information provided for predictions includes a more complex set of parameters (an enriched set of risk factors) suggesting that algorithms can outperform human predictions of recidivism in "ecologically valid settings" (Lin et al., 2020.). However, the challenge remains to define what is the meaning of this 'ecologically valid' setting, and how far those algorithms can be trusted in decision making processes that potentially have a huge and pervasive impact on an individual's life like the length and conditions of a prison sentence or a release.

The proponents of algorithms claim that AI-driven analysis and decision making can correct the biases that are present in human decision making without allowing heuristics, stereotypes, emotions and other irrelevant but "human" factors interfere with objective analysis, arguing that *algorithms can overcome the harmful effects of cognitive biases* (Sunstein, 2018). However, evidence shows that algorithms can also easily be biased and start to repeat the same mistakes humans are prone to

5 *Offender Management is a term that is used in this context to describe the information management of the individual offenders. This includes information related to all aspects of their life during their journey: from initial intake, assessment & classification towards surveillance, planning & programming and supporting care and rehabilitation.*

6 *RISE is short for Rikosseuraamuslaitos, which is the Finnish name of the agency.*

make. This shouldn't be surprising considering that AI is only using the data and weightings defined by humans and can't do much more than simulating human (statistical) decision making. Studies also show many problems with the data itself like lack of enough clean, accurate or well documented data (Dhasarathy et al., 2020). AI-relevant data is often not accessible by systems across organizations, and aging infrastructure with a multitude of different systems makes it difficult to implement AI solutions (ibid). Therefore, designing an algorithm for use in the prison context requires thinking deliberately about what it is that we exactly want to achieve and a solid understanding of the human failings they're supposed to be replacing (Fry, 2018).

AI in Rehabilitation - Better than Human?

While decision making algorithms are already hotly debated, the use of robotic systems is really the crossing of a fundamental barrier for many people. Today, robots are already used for specific tasks besides security tasks in different prisons in China and Hong Kong. Some are discussing the possibility of using AI to address the solitary confinement crisis in the US by employing smart assistants, similar to Amazon's Alexa, as a form of 'confinement companions' for prisoners. Even if these 'companions' could alleviate some of the psychological stress for some prisoners, the focus on the 'surface' of the problem of solitary confinement conceals the debate about the aggravating harm of such confinement, since these companions might actually contribute to the legitimization of solitary confinement penal policy instead of questioning it (Zavr□nik, 2020).

Considering that AI chatbots and virtual assistants are already used to some extent in civil health care, it is a relevant question to ask if and how these solutions could be used in a meaningful and rehabilitative way in the prison setting. A good virtual companion is perhaps a better solution than a bad physical one: one of the risks in high-risk offender units where rehabilitative practices are competing with a negative prison culture amongst prisoners.

This brings us to one of the biggest concerns as it comes to the implementation of AI and robotics in society: occupations will disappear while AI is taking over the job humans used to do in a faster and more accurate way. A counter argument states that AI is also bringing new occupations. One such example is shown in a pilot in Finnish prisons, where prisoners were training in use of AI algorithms (Newcomb, 2019), which also shows the possibility to provide prisoners with new job-related and digital skills to help them successfully re-enter into the modern society and labour market.

Ethical Questions

The literature review revealed that the ethical questions regarding AI are being extensively discussed, and it is necessary to evaluate each implementation of new technology in depth in the prison setting as well. Nellis (2019) refers to this by expressing the need to apply an 'ethics of technology' to avoid emerging technologies such as AI reinforcing the development of even more punitive penal interventions. An increased use of AI in monitoring technologies has the potential to enhance its capabilities and transform its role as a security technique making monitoring even more extensive and constant than currently. Without proper analysis on what its effect would be on the entire prison environment and culture, the risk is that AI simply generates more monitoring, control and even other negative side effects. Constant surveillance can increase a person's stress and anxiety levels and decrease their trust in others (Houser, 2019). Prison agencies have to make decisions not only based on the quantity of monitoring, but also on the intrusive character of the monitoring sensors:

where they are placed (in cell, on the body, in community areas), when they are used, what they are measuring (location, movements, heartbeat, breathing), how this is measured (signal type like sound, picture, video, specific digital monitor signal) and how long the data are kept (real-life monitoring with immediate deletion, anonymization or kept for longer periods for future analysis and evidence gathering). Additional effects of the new digital monitoring and their possible ethical issues will be revealed in time.

Regarding use of AI in offender management, as we are today very far from having correctional systems that can prevent re-offending, we should be careful in trusting systems that are trained based on data generated from our current prison environments. If there are cognitive biases in the way we analyse offenders' risks and needs, these biases can be easily repeated in algorithms and in the worst-case scenario even further justified in this process. At this stage, we would suggest AI should play a more modest role and to use machine learning techniques to help us improve our understanding about what works, learn from our mistakes, and play only an advisory role in decision making processes.

The use of AI and robotics in rehabilitative practices in prison has the potential to replace humans in some tasks. However, we don't yet know how replacing existing tasks or jobs by machines is affecting culture and environment in general or the quality of the interventions in prisons. Face-to-face contact and human-centred rehabilitation are part of the core values of the modern prison concept.

The development of a set of guiding AI design principles supporting the prison's vision and strategy, including rehabilitation objectives, would help in shaping AI as trustworthy for the prison context (Knight & Van De Steene, 2020). To gain this trust, the technology should be predictable, responsible, verifiable, respect fundamental rights, and follow ethical rules. The development of such principles and policies can only be done in the broader national and international context where prison authorities are operating. Public authorities and international organisations have only recently started reflecting on these fundamental rights and challenges (European Union Agency for Fundamental Rights, 2020). The European Ethical Charter on the use of AI in judicial systems and their environment (European Commission, 2018) contains the following five principles:

- *Principle of respect for fundamental rights: ensure that the design and implementation of AI tools and services are compatible with fundamental rights.*
- *Principle of non-discrimination: Specifically prevent the development or intensification of any discrimination between individuals or groups of individuals.*
- *Principle of quality and security: With regard to the processing of judicial decisions and data, use certified sources and tangible data with models conceived in a multi-disciplinary manner, in a secure technological environment*
- *Principle of transparency, impartiality and fairness: Make data processing methods accessible and understandable, authorise external audits.*
- *Principle "under user control": Preclude a prescriptive approach and ensure that users are informed actors and in control of their choices.*

Though comprehensive, these principles do not yet describe how it can be assured that AI technologies contribute to the broader safety, offender management and rehabilitation objectives

in prisons. As argued elsewhere, the construction of an additional ethical model for the prison environment would be needed to guide the implementation of AI-driven technologies. This would need a shift from a retro-active assessment towards a more pro-active assessment of how these technologies could improve interventions in prisons.

AI in Prisons Survey

The majority of the correctional services that answered the questionnaire indicated they were not using AI currently (question no. 1). The only European exception was UK, where natural language processing on case notes and free text is used to identify national and local themes and issues and some actuarial risk scores as part of their risk management processes. However not yet in use, the role of AI in supporting offender management and decision making related to assessments and sentence planning processes is an area that currently sits on the radar of a majority of the respondents. In the UK, machine learning is also used to estimate the rate of violent incidents in prisons, which brings us closer to an area where AI is currently already is use in jurisdictions like Singapore and Hong Kong. The majority of the respondents indicated having plans to investigate the use of AI in the prison operational context as a correctional security technique.

With the exception of Hong Kong and Singapore, besides the still vague plans to use AI and some initial ideas, most of the countries do not give any real planned examples of possible projects (question no. 2). However, the need for and interest in AI solutions in the future was acknowledged by all respondents. Those results are also reflected in the responses on the interest from the management level (question no. 3). Respondents mentioned the presence of some discussions on the management level where AI is seen as an opportunity that might come into application in the future, once the digitization of prisons proceeds. The possible benefits of AI to workflows, offender management, security and value of discovering hidden patterns in large data-sets to help decision making and analysis was acknowledged. The jurisdictions who have the most concrete plans and implementations (Hong Kong and Singapore) also mention a formal and strategic vision on the use of technology like AI, which is driven from broader national digital strategies on data-driven government (Singapore) or Smart Cities (Hong Kong).

The ethical concerns mentioned (question no. 4) include biased data-sets leading to wrong or inaccurate decisions, fairness, transparency, privacy, and GDPR questions. Ethical guidance for the development and delivery of AI solutions is seen as very important. Regarding the translation into new policies and legislations (question no. 5) from the European and North American respondents, only the UK mention that ethical guidance was built upon the Office of AI and Government Digital Service which was under development. We also see here that the respondents with the largest experience in AI (Hong Kong and Singapore) have developed and implemented formal policies and regulations as well as evaluation methods and principles to govern the use of this technology.

Discussion

Based on the literature review we can say that the evidence related to the implementation of AI in prisons is almost completely absent. Furthermore, based on the results of a survey in 20 jurisdictions globally, it would seem the use of AI is not much further developed than some basic trials and pilots. Although the use of AI in the prison setting is still rather limited, it is to some extent used in both correctional security and offender management. AI is mostly used in prison security technique, but in

the upcoming years, prisons will undoubtedly move towards using AI more for other tasks as well.

AI can contribute to corrections in many different ways if used in an ethical and human-centered manner to improve safety, security and the well-being of individuals in the prison. AI could be used to improve the quality of information and enhance the insight in correctional professionals' decision making. It could be used to rationalise and support more efficient and economic workflows, surveillance and risk mitigation. It could help in saving human resources by allowing them to do more meaningful work while AI is doing the more routine work tasks. Using AI for surveillance might free the time of prison staff for more face-to-face contact and rehabilitative practices. However, we should consider carefully what are the tasks that we can and will trust to the machines. This is a complex exercise in which we need to analyse the use of technology outside its pure instrumental value, in the broader context and culture of prisons and offender management.

Polarized man or machine discourses will not facilitate the nuanced analysis of this technology and its implementation in the prison environment. Different kinds of combinations are to be seen in the future where AI assists human workflows and tasks without replacing them. Human interaction is of fundamental value in a prison where the offenders should not merely be treated as an object, but as an individual and a citizen with rights and responsibilities. Recent policies are helping us to assess and assure that the implementation of digital technologies, including AI, will not violate those rights and keep humans in the driving seat. For this exploration, we have chosen to limit the scope of our discussion to the prisons setting. Where we expect some similar results would come out from an analysis how AI is being adopted in probation and community corrections, we also expect some important differences. As we see how the use of technology and in particular electronic monitoring has played an important role in the way we manage offenders in the community, analysing how AI is used in this particular context merits a dedicated research project.

Between now and 2030, AI will further develop both inside and outside the prison. AI could enhance human agency and intelligence and augment level of performance in many ways that are still unexplored (Cath et al., 2018). We can expect to see better information retrieval and recommendation systems, natural language interfaces starting to work better (chatbots) and better functioning robots like drones and cars (Roos, 2020). Maybe we will see AI entering in the field of prison education – both for staff as for offenders: humans training AI and AI training humans. We will probably see more smart-automatization, hopefully benefiting both staff and offenders in prisons as well (Cath et al., 2018).

The impact of AI will depend on how we will or will not use its power and even more on which direction we want our correctional systems to evolve. We have argued that policies and ethical frameworks – currently under development – are needed to assure emerging technologies like AI are helping us to achieve our objectives. However, this will not happen without active engagement, pro-active analysis and anticipating potential side-effects. It is up to the human to engage and make sure that technology will make good things better instead of making bad things worse.

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