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5 Algorithm

Abstract: This chapter explores the increasingly prominent role of algorithms in policing and criminal justice. Engaging with their inherently non-neutral nature and issues of opaqueness introduced by algorithmic knowledge making, the chapter highlights implications for accountability and democratic control. It concludes by spelling out some of the challenges for research on algorithms in policing and criminal justice contexts.

Keywords: algorithm, data, knowledge, accountability, research

Introduction

An algorithm is nothing spectacular or extraordinary – it is, in fact, simply "a set of rules that must be followed when solving a particular problem" (Oxford Dictionary, 2023). In logical terms, it specifies a computational process that turns an input value into an output value (see Computation by Mazzilli Daechsel). As such, the algorithm forms a core part of computer science and software design; it is "the thing that programs implement, the thing that gets data processing and other computation done" (Hill, 2016: 35). Simple algorithms have been around since the dawn of mathematics, with many believing that the clay tablets of ancient Babylon present the world's first known algorithms (Knuth, 1972). And yet, as a concept and a metaphor, the algorithm has over the past two decades come to be a defining element of the 'information age' where knowledge and power increasingly come into being through digital means—and policing and criminal justice are no exception from this. There are several reasons for the rise of the algorithm.

To begin with, there have been considerable advancements in computer science that have yielded novel, powerful types of algorithms (Cormen et al., 2022). Combined with the widespread availability and accessibility of data, storage capacity, and computing power, algorithms have come to be the key tools to tame enormous information flows. They process large amounts of data in ways that supersede human cognition and thereby scale and accelerate knowledge making and intervention capabilities. Algorithms have also been at the core of the renaissance of machine learning and artificial intelligence after a long research hiatus in the area (Tufail et al., 2023). Sparked by the developments mentioned above, research on AI applications has more recently picked up considerable steam. Rather than traditional algorithms that might be highly complex, yet static in form, machine learning algorithms are in a constant state of flux and have the ability to mutate and adapt to the data that they process—both in control-

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led training set-ups and in the 'wild' (Gillespie, 2014). As a concept, the algorithm thus stands emblematic for forms of knowing and doing that would otherwise not be available. It has, in other words, become shorthand for power in a world that sees digitalization, and with it new waves of machine learning and automation, seemingly unstoppably progress (Beer, 2017; Neyland and Möllers, 2017).

In policing and criminal justice, the power of the algorithm has been harnessed for numerous tasks, including the likes of crime forecasts based on various data sources, advanced forms of video surveillance that include capacities for identification and tracking, intelligence production from open domain data (most importantly social networks and messaging boards), the analysis of large amounts of evidence data (for example video footage that is algorithmically screened for criminal content), or recidivism likelihood estimates (Amicelle, 2022; Brayne and Christin, 2021; Završnik, 2021). While algorithms are in contexts of policing and criminal justice often subjected to limited modes of automation and rigid oversight mechanisms that require human review (Binns, 2022), they do have the power to nudge strategic, tactical, and operational decisions that shape the likes of crime control programs or the deliberations of parole boards (Angwin et al., 2022). This chapter discusses the examples of predictive policing and recidivism estimates and highlights a number of analytical and normative implications of algorithms for policing and criminological justice as well as for criminological research.

Algorithms in policing and criminal justice

A widely debated application of algorithms in policing has been the more recent implementation of 'predictive policing' tools in police departments around the globe (Brayne, 2021; Egbert and Leese, 2021; Kaufmann et al., 2019). Predictive policing rests on the idea that the police, when put in a position where they could turn available data into timely insights about the likelihood of crime, could use available resources for crime prevention in a more targeted and efficient manner (Bratton et al., 2009). In this context, the likelihood of the occurrence of crime can be operationalized in different ways.

One widely applied way is to mobilize insights from spatial criminology and near-repeat victimization theories to produce intelligence about the spatio-temporal distribution of crime and resulting risks for follow-ups, for example a neighborhood or a street that would arguably be exposed to increased likelihood for burglary and should therefore be patrolled more closely to create potential deterrence effects (Glasner et al., 2018). Another way to operationalize the likelihood of crime would be to model individual risk factors, such as previous convictions, close contacts with criminal networks, or other activities that would be considered as increasing the risk of either becoming an offender or the victim of an offense (Ferguson, 2017). Notwithstanding the theoretical assumptions, the model, or the data behind a particular application, predictive policing algorithms carry out the work of producing actionable predictions that can then

be put into practice and shape the ways in which crime prevention is carried out (see Prediction by Ķīlis, Gundhus, and Galis).

Another pertinent and widely discussed example for the use of algorithms is recidivism likelihood. Recidivism assessments in many countries play a key role in determining the duration of a prison sentence or whether early parole could be granted (see Sentencing and Risk Assessments by Ugwudike)—and there have been multiple controversial attempts to come up with algorithms to assist in these decisions (Dressel and Farid, 2018). Often inspired by psychological theory, models for recidivism likelihood estimation can, for example, include variables such as gender, age, location of residence, or the total number and type of prior arrests and/or convictions (Monahan and Skeem, 2016). Given the magnitude of recidivism assessments and their potential repercussions for individual lives, they have been a focal point of critique about the potential making and/or reproduction of bias by algorithmic means (Hannah-Moffat, 2019).

As should have become clear through these two examples, algorithms have the potential to profoundly reconfigure how society is policed and how criminal justice decisions are made and implemented. Proponents of algorithms argue that the use of technology would serve to eliminate human bias in favor of rationalized and objective forms of knowledge that would eventually lead to improved decision-making and the more efficient use of sparse resources (Brayne and Christin, 2021; Egbert and Leese, 2021). Research has, however, demonstrated that there are a number of caveats attached to the use of algorithms in policing and criminal justice.

First of all, as sociologists and historians of technology have shown, technological neutrality is an illusion (Bijker et al., 1987; Latour, 1987). As is the case with any other basic or applied technology, algorithms are written and implemented in a specific context. This means they need to fulfill particular functions and requirements that correspond with the environment within which they are supposed to be used, for instance regarding established processes, user preferences, or entire organizational cultures. Rather than the impartial tools that they are at times portrayed as, algorithms thus usually feature an entire host of domain-specific assumptions that have been specified before a single line of code was written. Bennett Moses and Chan (2018) have, for example, argued that predictive policing algorithms build on a number of problematic beliefs in order to be able to function smoothly within established frameworks of crime prevention, for instance that crime data in fact are an accurate representation of empirical reality, that patterns from the past extend into the future in a linear fashion, or that the deployment of targeted patrols for deterrence purposes is actually the preferred mode of policing. Algorithms should thus be understood as entangled in the beliefs, theories, and practices that have been at the core of different aspects of policing and criminal justice, and in consequence as potentially leading to the perpetuation of existing problems rather than infusing the domain with neutrality and objectivity (Babuta and Oswald, 2019; Barocas and Selbst, 2016).

A second key complication that emerges from the use of algorithms in policing and criminal justice is opacity (Pasquale, 2015). Opacity refers to the lack of understandability and retraceability of how algorithms transform input into output (Martin,

2019). This can have different reasons. First of all, as algorithms can process large amounts of data in a very short time frame, their calculative capacities by far supersede human cognitive abilities. For simple algorithms, it might be possible for humans to cross-check how an algorithm came to a particular conclusion, but this would require considerable time and resources. In most cases, humans thus need to trust the algorithm and take the output at face value without having the possibility to verify its validity. This situation further complicates when dealing with highly complex algorithms or AI applications that are based on self-learning, dynamic algorithms. In the latter case, sometimes not even programmers might be able to understand and retrace how input was transformed into output (Gillespie, 2014; Leese, 2014).

Generally speaking, opacity presents a major issue in policing and criminal justice. In democratic societies, public authorities are expected to be able to be transparent to a certain degree, such that they can be held accountable through mechanisms such as audits or hearings (Bovens, 2005). This is particularly relevant in case decisions or actions carried out by state actors have caused unjustified harm at either the individual or collective level. The police must, in other words, be able to detail how they came to the conclusion to distribute resources for crime prevention, and a judge or a board must be able to present the reasoning behind a conviction or a denied parole application (Jones, 2008; Walker and Archbold, 2020). Traditionally, while there might be certain trade-offs involved concerning operational needs for secrecy and the public interest for transparency, police and criminal justice institutions are capable of producing such an account. After all, knowledge and decision-making processes were traditionally carried out by humans who could explicate their motives and rationales. This constellation changes with the insertion of algorithms. When humans are no longer fully capable of understanding how knowledge has come into being, this fundamentally undermines the principle of accountability for interventions based on such knowledge (Bennett Moses and Chan, 2018; Leese, 2014).

Being faced with the outlined challenges, police and criminal justice institutions find themselves in a difficult situation. On the one hand, they do not want to miss out on technological advancements and new analytical capacities that have shown promise in the private sector. On the other hand, they do need to find ways to implement algorithmic tools in ways that fit into the wider societal norms and expectations regarding policing, crime control, and social and criminal justice (Binns, 2022; Leese, 2023a). In concrete terms, this means that there is a need for internal policy as well as proper oversight mechanisms that allow public authorities to remain in control of the technologies that they use (Leese, 2023b). Empirical research on the implementation of predictive policing software has, for instance, shown how police departments devise several strategies to incorporate algorithmic crime risk forecasts into collective deliberation and decision-making processes, as well as ensuring that human analysts and patrol officers can override algorithmically computed recommendations for optimized crime prevention (Egbert and Leese, 2021; Leese and Pollozek, 2023).

Finally, for research from criminology and related fields, algorithms in policing and criminal justice do present a methodological challenge (Zarsky, 2016). Understand-

ing them often requires a substantial level of literacy in computer science and software design. Criminologists are usually trained in legal and/or social scientific theories and methods and do not necessarily possess much technical skill and expertise. And even in cases where the relevant know-how is available, the complexity and dynamic nature of advanced algorithms might make it impossible to properly reverse engineer them and to understand all aspects of the input-output transformation. A common way to deal with such issues is to instead engage with those who are involved in the development and implementation of algorithms, for example programmers and software designers, but also technical personnel or analysts in police and criminal justice institutions (Brayne, 2021; Egbert and Leese, 2021; Kaufmann, 2019). While such an approach offers a viable workaround and can give valuable insights into the practices that emerge around the use of algorithms, it might still be hampered by a reluctance to disclose trade secrets and proprietary code (Brayne and Christin, 2021)—and thus not be able to speak directly to the work of the algorithm itself.

Conclusions

In conclusion, algorithms have come to be key aspects in contemporary policing and criminal justice matters. While their use in many cases remains disputed, they are most likely here to stay and even expand their significance (Egbert and Krasmann, 2020). With this development comes a host of challenges and transformations, both for public authorities internally and in regard to their relations with the general public, that are not limited to the social sciences but extend to many other academic disciplines such as law, ethics, public policy, computer science, or design studies. As this chapter has outlined, while algorithms can be powerful tools for knowledge making and ordering in environments where digital data are produced and available at scale, they are never the impartial or objective tools that they are sometimes framed as. Moreover, they do present some fundamental issues in regard to established forms of individual and institutional decision-making and accountability. Subsequently, they require careful ways of sensitive implementation and institutional design to surround them. Only then will police and criminal justice institutions be able to put them to use in a way that not only speaks to internal effectiveness and efficiency requirements, but more importantly to the societal mandate of social ordering in a responsible fashion.

The main arguments put forward here can be summarized as follows:

– Algorithms have come to be a key component of policing and criminal justice, promising to scale, accelerate, and rationalize many tasks.
– They can, however, never be neutral. Rather, they are written for specific use cases and incorporate many of the assumptions and beliefs that already coin these use cases. As a result, there is a risk that algorithms reproduce bias and other problematic issues.

– Algorithms tend to be opaque, meaning that the transformation of input into output might be impossible to understand for human users. This creates major challenges for the principle of accountability.
– For researchers, the study of algorithms might be difficult due to the level of technical skill required to understand them. Alternative routes include the study of those who are involved in their making, implementation, and use.

Suggested reading

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