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ATCS: Neural Networks P2

30 April 2024

Cracking Crime with Code: The Applications of AI in Law Enforcement

Crime does not wait for anyone, but what if the solution could anticipate it? The role of neural networks in our everyday lives has grown exponentially since the first computational models of neurons were made in the 1940s. From phones to cars to finances and medical care, Artificial Intelligence shifts the way we live. In recent years, with more interest and advancement in Generative AI, more people have been using large-scale neural networks for daily tasks, such as for learning about topics or for planning schedules. However, on a greater scale than just being an assistant for normal citizens, AI has the potential to revolutionize law enforcement processes and justice proceedings. Through generating sketches, deepfake video detection, noise distinction detection, data analysis advancements, and voice cloning, there can be huge benefits for crime control from AI. However, even with these advantages and advancements, there can be bias in algorithms, and we need to consider ethical considerations of using AI for crime-solving.

The potential for generative AI is greatly evident in its utility in crime investigations, specifically in police sketches. Traditional police sketches may take up to hours and are an inefficient process that requires human-to-human understanding and connection between the witness and the artist (Conger). With OpenAI's launch of ChatGPT in 2022 which was credited with beginning the AI boom, people discovered the chance to use generative AI for creating art ("Chatgpt."). This could easily be translated into a solution for faster, and possibly, more accurate, police sketches, where a witness simply inputs the features of the suspect, and the algorithm creates an image matching the description (Technexus). Based on the efficiency of the algorithm, this can be nearly instantaneous, much faster than traditional methods. Another use of similar algorithms is to determine a criminal's identity "through facial recognition system by converting forensic sketch into a real photo using Deep Convolutional Generative Adversarial Network (DCGAN)" (Bushra and Maheswari 1). DCGANs use a deep convolutional neural network architecture that is specialized for managing image data and creating realistic images (GeeksforGeeks). For an effective transition from traditional police sketching to artificially generated images, it can be important to consider that the models may not be consistent, thus feedback from the witness can be useful for improving the neural network's accuracy (Taylor).

Shifting from the realm of images, generative AI can enable voice cloning, where voices can either be imitated and replicated to say certain words, or voices can be manipulated to sound differently. Voice cloning can have both beneficial and harmful effects on the justice system. To begin, Machine Learning voice generators can be used to allow witnesses to testify using an artificially generated voice, protecting their anonymity in court proceedings (Bulakh). Similarly, if someone under federal witness protection needs to communicate with another person, changing someone's voice live, through AI filters, can allow them to stay safe. Unfortunately, voice cloning can be used for scams and other malintent. To promote a safer society, the federal government is encouraging the development of voice cloning detection algorithms by creating healthy competition in the field (FTC).

Along with generative AI for images and audio comes the capability to artificially create fake videos, called deepfakes. Deepfake technology poses a significant threat to everyone, exposing both celebrities and ordinary citizens to the risk of cyberbullying. Additionally, the use of videos as evidence in court becomes more difficult to certify. A recent data analysis found that in 80% of crimes, videos are used as evidence (BJA). The advancement in technology is a huge threat to the validity of videos used in court, and "it becomes clear the erosion of trust in video has significant implications for law enforcement" (Dauer). One example scenario depicts how if there is DNA evidence in a location of a crime for a certain suspect, but the defendant submits video evidence of being in a different location at the time of the crime, it is contradictory to the evidence given by the prosecution ("Increasing Threat of Deepfake Identities"). This video can be a deepfake and can render DNA evidence to be circumstantial, depending on the situation ("Increasing Threat of Deepfake Identities"). Thankfully, with the advancement of dangerous technology comes solutions to offset these issues, and many organizations work on algorithms to identify artificially generated videos ("Malicious Actors Almost Certainly Will Leverage Synthetic"). However, as deepfake videos become more seamless and technologies become more advanced, it will continue to be more difficult to tell real from fake.

Detection algorithms have a pivotal role not only in identifying deepfakes but also in fast response times in emergencies. This efficiency can be enhanced by leveraging gunshot detection algorithms, which are essential in critical situations (PNW). Algorithms for determining the source of a sound mainly rely on large amounts of training data rather than complex logical processes. With a variety of data, it becomes simple to analyze gunshot audio files based on the type of firearm utilized, the type of caliber for the firearm, and the distance from the gunshot to the recording device based on delay and echo (Rigano 7). These types of measurements make it easier for officers to find the location of the fired shots and end conflict quickly in immediate emergencies as well as determine suspects in later investigations and court proceedings. To apply these technologies in cities, it can be useful to add additional capabilities to determine the precise location of any gunshots fired as well as test the effectiveness in areas with different crime rates and different general background noise levels (Morehead 1). This type of testing is a small block in the path to implementing these algorithms, and this incremental progress is essential for successful public safety.

Along with analyzing gunshot data, considering the analysis of crime data, including evidence, circumstances, and final verdicts, poses a beneficial effect. Predictive policing uses math and data analysis to help law enforcement predict where and when crimes might happen ("Predictive Policing."). By looking at past crimes, algorithms can figure out patterns and signals to help police prevent future crimes and protect communities more effectively ("Predictive Policing."). Trained on decades of past data, AI technology can analyze past crime situations and overcome human judgment errors to function as an expert. Algorithms can "detect complex events such as accidents and crimes (in progress or after the fact)" (Rigano 3). Using models creates an effective and efficient approach to predictive policing because it can rapidly consider multiple factors in determining a result. For example, predictive policing has been used in International Affairs, specifically in conflicts in Iraq, China, and Europe ("Predictive Policing."). The success of predictive policing will be determined by the accuracy of the data fed into it as well as how the models are used (Pearsall 19). Further, DNA evidence is often used to pinpoint suspects in crimes. AI can analyze large amounts of forensic data effectively and efficiently, which can lead to quicker suspect identification. Similar to predictive policing, interpreting large amounts of past DNA evidence can guide how to determine the significance of certain DNA evidence in new cases (Rigano 5). To humans, this data may not seem useful, but creating large models of information can uncover patterns not previously determined.

Unfortunately, all of the aforementioned advancements do not come without their flaws–one of the most important being bias. Addressing bias in AI technologies requires acknowledging the origins of intrinsic biases in AI algorithms. Because of the lack of representation in available data on minorities, “it is marginalized groups that are already even more marginalized by these technologies” (Landymore). Additionally, the representation of these groups is often prejudiced and biased, so the problem lies with the data being fed into the model (Landymore). Predictive algorithms are susceptible to skewing based on arrest rates and potentially biased police data, leading to disproportionate targeting of Black individuals and sustaining social inequities (Heaven). There is a pressing need to assess and address these racial disparities and biases in police data. These issues arise from interactions between individuals and law enforcement and require the establishment of a more objective benchmark system to assess suspicious behavior (NAP “Proactive Policing.”). NAP suggests multiple approaches to this, including randomized trials, benchmark analysis, and productivity assessments, to determine racially biased behavior (NAP “Proactive Policing.”). To ensure fairness in the development and implementation of these algorithms in law enforcement, it is essential to oversee the data collection and analysis methods. It can be difficult to do so, but fostering a culture of trust between law enforcement and all communities is necessary for public safety.

In conclusion, as we find AI integrating more deeply into our daily lives, its potential to revolutionize law enforcement processes and justice proceedings must be considered. Generative AI offers opportunities for revolutionizing police sketching methods, providing faster and potentially more accurate results. Voice cloning can protect witness anonymity in court, while deepfake technology challenges the validity of video evidence. Gunshot detection algorithms enhance emergency response times, and predictive policing, using crime and DNA data, can proactively prevent crimes. However, biases in AI algorithms and datasets need addressing through objective benchmark systems and continuous oversight. Potential avenues for exploration in this field include considering ethical guidelines for using neural networks and controlling what types of actions people can take with AI. Long-term impacts are especially important to consider with new technologies, and policies should be implemented accordingly. Similar to the technological advancements of the present, it is crucial to consider the advancements of the past. Reflecting on the inception of the first perceptron in the mid-1900s, we can observe the creation of a technological revolution that persists in redefining our way of life today.

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