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CAN (SHOULD) THE POLICE SEE YOUR FUTURE?: analyzing predictive policing considering neuroscience's ethical and legal contributions

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CAN (SHOULD) THE POLICE SEE YOUR FUTURE?: analyzing predictive policing considering neuroscience's ethical and legal contributions, limits and perspectives

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ABSTRACT

Around the world, since the 2010s, predictive policing systems have been used in an attempt to predict the occurrence of crimes and provide support for police forces to act in the repression of crimes. Some systems make statistical predictions based on data about crimes previously committed in certain locations, while others identify dangerous people through unclear criteria and place them as targets for police reprimand as a means of prevention. To understand these systems, it is important to analyze what they take as their starting point: human behavior. Neuroscience studies the functioning of the brain and human behavior, so it is important to analyze the neuroscientific contributions to the discussion and question whether this field of study is currently able to identify statistically significant trends or human behavioral patterns, attributing a certain degree of predictability to human behavior. It is also observed that the use of predictability must meet the fundamental human guarantees of human rights and neurorights and can serve the purpose of creating non-repressive public policies.

Keywords: behavior; predictive policing; neurolaw; neuroscience; behavioral predictability; criminal behavior.

RESUMO

Ao redor do mundo, desde a década de 2010, sistemas de policiamento preditivo têm sido utilizados na tentativa de prever a ocorrência de crimes e dar substrato às forças policiais para atuar na repressão aos crimes. Alguns sistemas fazem predições estatísticas com base em dados acerca de crimes cometidos anteriormente em determinados locais, enquanto outros identificam pessoas perigosas através de critérios pouco aclarados e as colocam como alvos de repreensão policial como forma de prevenção. Para compreender esses sistemas, é importante analisar o que eles tomam como ponto de partida: o comportamento humano. A neurociência estuda o funcionamento do cérebro e o comportamento humano, assim, é importante analisar as contribuições neurocientíficas para a discussão e questionar se esse campo de estudo é, atualmente, capaz de identificar de tendências ou padrões comportamentais humanos estatisticamente significativos atribuindo certo grau de previsibilidade ao comportamento humano. Observa-se, ainda, que a utilização da previsibilidade deve atender às garantias humano fundamentais dos direitos humanos e dos *neurorights* e podem servir a um propósito de criação de políticas públicas não repressivas.

Palavras-chave: comportamento; policiamento preditivo; neurodireito; neurociência; previsibilidade comportamental; comportamento criminoso.

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INTRODUCTION

Predictive policing systems consists of applying analytical techniques, usually quantitative techniques, to help identify likely targets for police intervention, prevent crimes or even solve past crimes by making statistical predictions.

As the technology developed throughout the years and affected every single aspect of society, criminal investigations would not be left out. In the last two decades, some countries started increasing the development and usage of their systems. The goal of this research was to analyze the systems in three countries: United States, China and Italy. In the following topics, each of these systems will be analyzed and compared.

Speaking of technology, the law can benefit from its impacts and findings. For example, neuroimaging has provided a window into the brain. Therefore, it has made it possible to comprehend human behavior a little more, which is fundamental for law, since it has human behavior as its main object of study.

Chapter I

1 - Predictive Policing

1.1 – Investigations as a way to obtain evidence

A police investigation's main goal is an administrative procedure conducted by the police with the goal to obtain potential evidence to take a case to trial[1]. That is the concept that will guide this discussion. Most times, crimes are clandestine facts, committed in the dark, away from the public's eye. So, an investigation tries to bring it to light in order to punish those involved. The expectation is to obtain evidence regarding who committed the crime and in what circumstances so to convince a judge or a jury of someone's culpability.

In Brazil, much like in other democratic countries, the judge, during an investigation, is someone in charge of granting the police power to mitigate constitutional rights, such as privacy. But this paper will not go in to detail on the judge's role.

During a Brazilian police investigation, the person being accused is not able to defend themselves, nor do they have an immediate right to respond. This happens because, the procedure is guided by the notion that this is not the time for the defense to act, but time for the police to collect evidence that will, further in the trial, be subjected to discussion regarding its value by exercising the adversarial principle, which only has a place during the trial.

The Brazilian Constitution brings the concept of an adversarial principle. This principle is prescribed in Article 5, LV of the Constitution:

> "Art. 5. Everyone is equal through the eyes of the law, without any distinction of any nature, guaranteeing to every Brazilian and foreigners living in the country, the inviolable right to life, freedom, equality, safety and property, as follows:
> (…)

[1] Greenwood, Chaiken, Petersilia e Prosoff (1976, page 6)

> LV – to the litigants in a judicial or administrative suit and the defendants in general the adversarial and broad defense principles apply with the means and resources inherent to them."[2]

But, in the procedure prescribed in the law for the police investigation, these principles do not have a place. In fact, the defendant will only be able to contest and defend himself from the evidence obtained in an investigation during the procedure leading up to the trial.

Fazzalari[3] (2006, p. 114) defines a procedure as a sequence of acts and conducts prescribed by rules and laws. It is a series of faculties, duties and competencies. The police investigation is, therefore, a procedure, since the rules that guide it are prescribed by law.

For the author, a procedure can be qualified as a suit when it is guided by the adversarial principle[4]. The author describes the incidence of the adversarial principle as a situation where both parties in a suit dialog as equals and are able to act and react within the suit. That situation takes place because the parties are both subject to the final decision, the trial.

Rangel[5] explains that, because the person is not being charged with a crime, there would be no need for the adversarial principle to have an effect:

> "(…) Therefore, because there is not a charge in a criminal investigation, but a mere investigation of facts, the suspect does not need to defend himself. The constitutional rule prescribed in article 5, LV does not have a place (…). The adversarial principle will only be pursued when a judicial law suit is filled"[6]

[I] In the original: "Art. 5º Todos são iguais perante a lei, sem distinção de qualquer natureza, garantindo-se aos brasileiros e aos estrangeiros residentes no País a inviolabilidade do direito à vida, à liberdade, à igualdade, à segurança e à propriedade, nos termos seguintes:

(...)

LV - aos litigantes, em processo judicial ou administrativo, e aos acusados em geral são assegurados o contraditório e ampla defesa, com os meios e recursos a ela inerentes;"

[3] FAZZALARI, Elio. Instituições de Direito Processual. Trad. 8ª ed. Elaine Nassif. 1ª ed. Campinas/SP: Bookseller Editora e Distribuidora, 2006, page 114.

[4] FAZZALARI, Elio. Instituições de Direito Processual. Trad. 8ª ed. Elaine Nassif. 1ª ed. Campinas/SP: Bookseller Editora e Distribuidora, 2006, page 121

[5] RANGEL, Paulo. Direito Processual Penal. 17. ed. Rio de Janeiro: Lumen Juris, 2010, p. 79.

[6] In the original: "(...) Assim, não havendo acusação no inquérito policial, mas, sim, mera investigação de fatos, o indiciado não precisa se defender. Não incide a regra constitucional do inciso LV do art. 5º (...). O contraditório somente será exercido quando deflagrado o processo judicial".

So, it is safe to conclude that, if the suspect cannot defend himself and will only be able to do it in the future, evidence obtaining needs to be documented and needs to follow all the rules, respecting all human rights involved in the process.

The evidence obtained in a police investigation cannot be the only ones used to sustain a criminal conviction, but they are the ones that will be used by the prosecution to decide whether or not someone will be formally charged with a crime.

That is because investigators try to obtain evidence to prove, beyond reasonable doubt, that a person should be accused of a crime:

> "Proof beyond a reasonable doubt is the standard measure of proof that the criminal court will apply when determining if evidence presented by the prosecution is sufficient to convict the person charged with an offence. If the evidence is sufficient, and the burden of proof has been satisfied, the court may convict the accused. In these cases, the onus to prove all the elements of the charge rests completely with the prosecution. The accused person is not required to prove that they are innocent.
>
> (…)
>
> It is important for investigators to understand that "proof beyond a reasonable doubt" is a different test from what they are required to meet when considering the value of evidence during their investigation. Later in this book, we will examine the importance of collecting, documenting, and properly preserving as much evidence as possible to assist the court reaching their belief beyond a reasonable doubt."[7]

So, it is very important that the police follow all the rules foreseen by the law when obtaining evidence. Predictive policing can create evidence that can be used in a future trial, so, it is safe to say that the procedures involving predictive policing have to abide by specific and strict rules.

A police's investigation is something very complex. It is an administrative procedure, but it needs to be checked by a judge when measures that diminish privacy and intimacy are taken. So, it is a procedure that happens before a trial and is responsible for constructing evidence to take a case to trial[8].

[7] Gehl e Plecas (2016, pages 14 and 15).

[8] Idem.

The activity needs the direction provided by a judicial authority, but that does not mean that it is conducted by a judge. The judge acts like an impartial player, observing the game and acting only when it is necessary, like a referee.

The investigation is considered a pre judicial process since it is taken about by the police, which is a part of the judiciary that drives the investigation based on the rules that are applied to it. When police take notice of the commitment of a crime, they need to check and find evidence to base the information received in order to see if the information holds up.

The Brazilian doctrine stablished that the police investigation is a complex activity:

> "The legal nature of the preliminary instruction is complex, as it involves acts of a different nature (administrative, judicial and even jurisdictional). Therefore, when classifying it, we will take into account the legal nature of the predominant acts. position of a state body that does not belong to the Judiciary, that is, an agent that does not have jurisdictional power. Thus, we can classify the police investigation as a pre-procedural administrative procedure, as it is carried out by the Judiciary Police, a body linked to the Administration - Executive Power - and that, therefore, develops tasks of an administrative nature."[9]

The police investigation is a series of investigative acts, forming a logically organized chain of events. Each fact is dependable on the one prior. Then, when the evidence forms a judicial process, the procedure has a dialectical structure around which happens a kind of struggle and reactions, attacks and defenses. Both the prosecution and the defense provoke each other, expect a response while the other party waits for a new response to put themselves in motion again.[10]

So, in a typical criminal procedure, the defense has the right to respond to each and every one of the allegations being made.

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9 GLOECKNER, 2014, page 210. In the original: "A natureza jurídica da instrução preliminar é complexa, pois nela são praticados atos de distinta natureza (administrativos, judiciais e até jurisdicionais). Por isso, ao classificá-la, levaremos em consideração a natureza jurídica dos atos predominantes. Será administrativo quando estiver a cargo de um órgão estatal que não pertença ao Poder Judiciário, isto é, um agente que não possua poder jurisdicional. Destarte, podemos classificar o inquérito policial como um procedimento administrativo pré-processual, pois é levado a cabo pela Polícia Judiciária, um órgão vinculado à Administração – Poder Executivo – e que, por isso, desenvolve tarefas de natureza administrativa".

10 CALAMANDREI, 1936, page 118.

By the time a case is taken to trial, the evidence obtained in an investigation has to be considered carefully as the case develops. That is because some investigative measures are, by nature, necessary to take place away from the investigated person's knowledge. If a person is aware that he or she is being investigated, they will probably do whatever they can to suppress the information from the police.

As a general rule, evidence obtained in an investigation can serve as a base for a judge to take measures that mitigate rights to privacy and freedom. For example, if need be, the judge can determine that a person's calls are intercepted.

In Brazil, the defense does not get a say during the investigation. Police conducts everything and the evidence can only be contested during a trial[11]. Therefore, what value can be given to this evidence?

Some defend the idea that, in some cases, the structure of the criminal procedure should translate to the investigation, especially when talking about evidence that can only be obtained once, that is not susceptible to a double review by the defense due to the impossibility of obtaining the same result twice:

> "This conclusion is also necessary if we consider that it is impossible to intend to transfer the dialectical structure of the process and its full guarantees to the police investigation, in the same way that a conviction based on a procedure without the minimum guarantees cannot be tolerated. How to solve the problem? Adequately valuing the acts of the police investigation and, in exceptional situations, in which repetition in court is impossible, transferring the dialectical structure of the process to the pre-procedural phase through the incident of anticipated production of evidence."[12]

[11] As explained on page 10, the adversarial principle only takes place during the trail.

[12] GLOECKNER, 2014, page 245. In free translation: "Também se impõe essa conclusão se considerarmos que é inviável pretender transferir para o inquérito policial a estrutura dialética do processo e suas garantias plenas, da mesma forma que não se pode tolerar uma condenação baseada em um procedimento sem as mínimas garantias. Como equacionar o problema? Valorando adequadamente os atos do inquérito policial e, nas situações excepcionais, em que a repetição em juízo seja impossível, transferindo-se a estrutura dialética do processo à fase pré-processual através do incidente de produção antecipada de provas".

Following the aforementioned grounds, the elements provided by the police investigation have the value of mere acts of investigation, not serving to justify a condemnatory judgment. But even so, it is very important to consider:

> "However, it should be noted that, despite being "informative", the acts of the investigation serve as a basis for restricting personal freedom (through precautionary arrests) and the availability of assets (actual precautionary measures, such as arrest, kidnapping, etc.). Now, if, based on the elements of the investigation, the judge can decide on the freedom and availability of a person's assets, its importance is evident! Furthermore, due to judicial utilitarianism and even unconscious contamination of the judge, the acts of the investigation can acquire an evaluative transcendence incompatible with their nature. Another important situation is the urgency and impossibility of repeating an act that, as a rule, is repeatable, e.g. For example, testimonial evidence."[13]

If we are considering evidence that is repeatable or renewable, such as testimonials, confrontations, recognitions, etc., to enter the world of valuable elements in the sentence, they must necessarily be reproduced in the procedural phase, in the presence of the judge, the defense and the prosecution, with full observance of the criteria that guide the production of evidence in criminal proceedings.

So, if we are talking about evidence that is not repeatable, the investigative acts have to be considered as just that: investigative acts, not robust evidence. To give it the status of a dependable piece of evidence, they have to be produced following strictly the rules that are applied to them.

If the suspect does not have an active role, we cannot stablish that the investigation is dependable and truly trustworthy as it shows only one side of the story:

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[13] GLOECKNER, 2014, page 249. In free translation: "Entretanto, devemos destacar que, apesar de "informativo", os atos do inquérito servem de base para restringir a liberdade pessoal (através das prisões cautelares) e a disponibilidade de bens (medidas cautelares reais, como o arresto, sequestro etc.). Ora, se com base nos elementos do inquérito o juiz pode decidir sobre a liberdade e a disponibilidade de bens de uma pessoa, fica patente sua importância! Ademais, por utilitarismo judicial e até mesmo contaminação inconsciente do julgador, os atos do inquérito podem adquirir uma transcendência valorativa incompatível com sua natureza. Outra situação importante é a urgência e a impossibilidade de repetição de um ato que, em regra, é repetível, p. ex., uma prova testemunhal."

> “Furthermore, it is absolutely inconceivable that the acts performed by an administrative authority, without the intervention of the court, have probative value in the sentence. Not only were they not practiced before the judge, but they symbolize the accuser's inquisition, since the contradictory is merely apparent and often absolutely non-existent. In the same way, equality is not even an intended ideal, on the contrary, in every way it seeks to accentuate the advantage of the public accuser.
>
> No greater effort is needed to conclude that the IP lacks the minimum guarantees for its acts to serve more than the provisional judgment and verisimilitude necessary to adopt precautionary measures and decide whether or not to open criminal proceedings. As Tovo explains, repeatable or renewable evidence, as inquisitorial, have a merely informative value – the so-called investigative acts – and cannot serve as a basis or even subsidiarilysupport the condemnatory verdict, but nothing prevents them from serving as a foundation for the absolute verdict."[14]

In Brazil, the criminal proceedings legislation establishes that the evidence obtained in the investigation cannot be the only ones used to justify an imposition of penalty, a conviction. This rule is crystal clear in Article 155 of the Criminal Proceedings Code, which establishes that the judge will be convinced by freely appreciating evidence produced respecting the defenses right to respond. Then, the Code prohibits that the judge forms his opinion based exclusively on evidence obtained in a police investigation. Why is that so?

The response is given by Ferrajoli[15] when he says that, in judicial proceedings, the ends do not justify the means. The means, the rules and laws, are what guarantee truth and freedom and, as such, have to have their value strictly protected and respected.

In conclusion, the investigation can be defined as a series of actions perpetrated by agents of the state, having a potential crime as starting point in

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[14] GLOECKNER, 2014, page 761. In the original: “Ademais, é absolutamente inconcebível que os atos praticados por uma autoridade administrativa, sem a intervenção do órgão jurisdicional, tenham valor probatório na sentença. Não só não foram praticados ante o juiz, mas simbolizam a inquisição do acusador, pois o contraditório é meramente aparente e muitas vezes absolutamente inexistente. Da mesma forma, a igualdade nem sequer é um ideal pretendido, muito pelo contrário, de todas as formas se busca acentuar a vantagem do acusador público.

Não é necessário maior esforço para concluir que o IP carece das garantias mínimas para que seus atos sirvam mais além do juízo provisional e de verossimilitude necessário para adotar medidas cautelares e decidir sobre a abertura ou não do processo penal. Como explica Tovo, as provas repetíveis ou renováveis, enquanto inquisitoriais, têm valor meramente informativo – os chamados atos de investigação –, não podendo servir de base ou sequer apoiar subsidiariamente o veredicto condenatório, mas nada impede que sirvam de alicerce ao veredicto absolutório”.

preparation for a criminal proceeding in court that wishes to obtain evidence of who committed a crime and in what circumstances to justify (or not) the existence of the criminal proceeding[16]

1.2 – How do the predictive policing systems work?

Predictive policing systems consists in applying analytical techniques, usually quantitative techniques, to help identify likely targets for police intervention, prevent crimes or even solve past crimes by making statistical predictions:

> "The use of statistical and geospatial analyses to forecast crime levels has been around for decades. In recent years, however, there has been a surge of interest in analytical tools that draw on very large data sets to make predictions in support of crime prevention. These tools greatly increase police departments' reliance on information technology (IT) to collect, maintain, and analyze those data sets, however. These analytical tools, and the IT that supports them, are largely developed by and for the commercial world. Universities and technology companies have created computer programs based on private-sector models of forecasting consumer behavior. Businesses use predictive analytics to determine sales strategies. For example, Walmart analyzes weather patterns to determine what it stocks in stores, overstocking duct tape, bottled water, and strawberry Pop-Tarts before major weather events. The first two items are expected, but the Pop-Tarts represent a "non-obvious relationship."2 These relationships are uncovered through statistical analyses of previous customer purchases during similar major weather events."[17]"

According to Bachner (2013), crime mapping first appeared in the 19th century with the first map containing a visualization of crime data in England, which was the first country to implement an organized law enforcement service. In the 20th century, the U.S. started to organize the law enforcement service and began crunching crime numbers to help prevent them:

> "In 1900, the U.S. federal government began collecting national data that aided the development of crime statistics. Mortality statistics, which indicate the cause of death, were used to calculate homicide rates. Additional measures, such as prison rates and arrest data, were collected by cities and states during the 1920s. In 1930, the Federal Bureau of Investigation (FBI) was given the authority to collect and disseminate crime data. The FBI continues to publish *Crime in the United States* annually, and this comprehensive publication served as the chief data input for crime analysis models in the latter half of the 20th century. With the advent of affordable computers, both police organizations and scholars began to explore automated crime mapping. Academic researchers investigated the

[16] See explanation on page 10.
[17] PERRY, 2013, page 2.

> relationship between environmental characteristics and the incidence for crime. Sociologists, for example, used mapping to uncover a quantifiable, causal relationship between the presence of taverns and the incidence of violent and property crimes."[18]

As the technology developed throughout the years and affected every single aspect of society, criminal investigations would not be left out. In the last two decades, some countries started increasing the development and usage of their systems. The goal of this chapter is to analyze the systems in three countries: United States, China and Italy. In the following topics, the article will describe each of these systems and compare them.

Technological advances have enabled the creation of tools for the most diverse areas of daily life and knowledge. Law can also benefit or suffer from these advances. In several cities around the world, since the beginning of the decade of 2010, data crossing systems are being created to enable the practice of predictive policing[19].

According to Ferguson[20] (2017, p. 200), the first experiments with prediction within the criminal justice system trace back to the 1920s and it was directed to predict the possibility of convicted criminals reoffending. One of the early adopters was Ernest Burgess, who, by systematizing risks and applying risk factors to individuals, created the actuarial approach.

Actuarial prediction can be defined, according to Ferguson (2017), as a formal method that provides a probability or expected value of a particular outcome. So, this approach identifies and weights specific factors that have a correlation with a probability of future actions:

> "Many elements of an actuarial assessment involve factors that suspects are born into, rather than choose, and, of course, even the choices can be impacted by environmental forces. 23 Person-based predictive methods, like all risk-assessment instruments, include potentially discriminatory socioeconomic factors. Awareness of these influences and intentional correctives to avoid unintended discrimination must be a priority. In other words, the actuarial tools chosen must be cautious to avoid discriminatory

[18] BACHNER, 2013, page 86.
[19] FERGUSON, 2017, page 1125.
[20] A professor at Columbia School of Law and author of a book called "The Rise of Big Data Policing: Surveillance, Race, and the Future of Law Enforcement".

> effects, and the predictive models must guard against implicit or explicit bias."[21]

The author gives some examples of actuarial instruments. The Violence Risk Appraisal Guide (VRAG) measures potential violent re-offense for perpetrators with mental disorders and the Rapid Risk Assessment for Sexual Offense Recidivism (RRASOR) predicts sexual offenders reoffending, for example, consist on a set of questions that, depending on the responses, can assess the risk of re-offense.

Predictive policing consists in an intense monitoring of what happens on the streets and on social networks in order to identify patterns of behavior that indicate the possible practice of crimes. From there, the police monitor individuals over whom suspicion hangs that they may commit crimes[22].

With the use of these systems, there is a vigilant State, which can generate discretionary interventions in the privacy and privacy of citizens. The logic behind such vigilance is: if the individual is being watched most of the time, they are less likely to commit deviant conduct. However, this premise ignores two main factors: crimes committed in hiding (domestic violence, rape, etc.) and facts that this prevention system cannot avoid.

Predictive policing can also be an example of algorithmic governmentality:

> "(…) we are clearly facing a new governmentality, in the sense proposed by Foucault, that is, a way of making the world predictable and being able to act effectively and in a calculated way on the action of others. The greater the mass of correlated data, the greater the predictive effectiveness. It is also about working with the future: taking into account what can happen (a management of open series, controlled by probability estimates)".[23]

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[21] FERGUSON, 2017, page 203.
[22] BACHNER, page 1.
[23] ALVES, 2019, page 224. In the original: "(...) estamos claramente diante de uma nova governamentalidade, no sentido proposto por Foucault, ou seja, uma maneira de tornar o mundo previsível e ser capaz de agir eficazmente e de modo calculado sobre a ação dos outros. Quanto maior a massa de dados correlacionados, maior a eficácia preditiva. Trata-se também de trabalhar como o futuro: levar em conta o que pode acontecer (uma gestão de séries abertas, controladas por estimativas de probabilidades)".

Offenses that cannot be avoided through this system may be punished more severely, which is a direct consequence of the implementation of the totalitarian variant of this surveillance model (ROXIN, 2006, p. 6).

Analyzing the penal system from the perspective of the guarantor theory and under the interpretation according to the Brazilian Federal Constitution, one should consider the implementation of these systems by guaranteeing maximum protection of constitutional fundamental rights and guarantees.

The study of predictive policing through the method of comparison between legal systems seeks to identify if there is a predictive policing model that is compliant with constitutional guarantees. Bearing in mind that, in view of technological advances, the implementation of these systems proves to be almost inevitable, one must seek the best way to do so. It should be noted that the comparative study will respect the historical, social and economic limits of each country.

According to Perry, McInnis, Price, Smith and Hollywood (2013), there is a lot of evidence to support the fact that crime is predictable. The authors say that criminals tend to continue to commit crimes they successfully committed in the past. Although this is not an absolute truth, it occurs often enough so that it becomes a statistically relevant truth. Predicting crimes involves studying data on past crimes and victims using a variety of methods looking for patterns:

> "As with most forecasting methods, predicting future criminal events—whether from a tactical (next incident) or strategic (long-term) perspective—involves studying data on past crimes and victims, often using a variety of methods but generally always looking for patterns. The underlying assumption is that the past is prologue—at least the more recent past (days for tactical approaches, months to a few years for strategic approaches)"[24]

So, given that fact, the theoretical reason for the existence of predictive policing is that many patterns regarding criminal's comfort zone can be identified and justify police intervention.

[24] PERRY et al, 2013, page

Perry, McInnis, Price, Smith and Hollywood (2013, chapter 2) divide these patterns into four categories:

1) Classical statistical techniques: this method consists on standard statistical processes, analysis of times, dates, data mining etc.
2) Simple methods: checklists and indexes, this method does not require much expertise or analytical effort.
3) Complex applications: these methods include a considerable amount of data and sophisticated computing tools,
4) Tailored methods: consists on other classical statistic methods adapted to predictive policing.

The authors developed a report for the National Institute of Justice where they talk about these methods in a different way. According to them, there are a few methods police departments use to find suspects, that is, to predict who is likely to commit a crime. The most common approach would be to assemble a combination between data on crimes in a particular area and on past perpetrators in that area.

The first method the NIJ talks about is what they call “basic queries”, which consists on analyzing data on information collected through database queries of people under supervision to identify threats and find likely suspects.

Secondly, there is the method which consists on monitoring, in real time, updates on selected social media accounts to provide police with immediate information on crimes that have just been committed and on criminal activity being planned.

Some police departments, on the other hand, partner up with public registries, motor vehicles, for instance, to develop profiles of potential suspects, known offenders or even possible witnesses. An analysis of those data, coupled with information and intelligence from other sources, such as the areas frequented by the subject and the types of crimes committed, can provide information on behavioral so that police can respond accordingly and more effectively.

One of the most used methods is the geographic profiling. It consists on an analytic tool that determines the most probable area for a crime to be committed in, based on the location of an offender. Usually, the starting point is the offender's home or workplace. Usually, this tool is applied to a crime series believed to have been committed by the same person.

Lastly, there is the modus operandi similarity analysis. To exemplify the use of this tool, the NIJ provides an example:

> For instance, suppose a known burglar targeted aging strip malls in a given county where he found an unsecured door or window for entry and then cut drywall to gain access to adjacent businesses. This type of case can be examined on a microscopic level to predict future activity. By asking such questions as "Has this offender ever repeated any targets?" and "What is the age range of the strip malls he has targeted?"—along with examining all possible targets in the jurisdiction and conducting temporal analysis—analysts can perform next-incident predictions on an individual basis.[25]

This type of analysis can be done manually or with the help of a software. If done manually, the analyst usually puts together a table that compare key characteristics of a set of crimes to other who have not been matched yet to determine whether it is part of the series or not. In the version done by a computer, the software comes up with a probability that a recent crime is part of a crime series.

In conclusion:

> "Predictive policing can be defined as: 'any policing strategy or tactic that develops and uses information and advanced analysis to inform forward-thinking crime prevention' (Uchida, 2009). The fundamental principle underlying the theory and practice of predictive policing is that it is possible to make probabilistic inferences about future criminal activity on the basis of existing data (Bachner, 2013). Not all predictive policing applications are strictly Big Data, and many currently still work with 'small data', but what we can see is that they all have the potential to become Big Data as more and more data is becoming available and as the ICT infrastructure of law enforcement agencies is becoming more advanced."[26]

[25] Available at: https://www.ncjrs.gov/pdffiles1/nij/grants/243830.pdf, p. 138.
[26] VAN BRAKEL, 2016, page 3.

1.3 – Comparing predictive policing methods around the world

1.3.1 - Predictive Policing in Italy

In Italy, predictive policing was implemented in 2008 using a system created by a company called KeyCrime, founded by Mario Venturi, a former police officer from Milan[27]. Venturi created the Dynamic Evolving Learning Integrated Algorithm (Delia) software which is said to help officers detect criminal series and predict future criminal behavior by analyzing past events.

Mastrobuoni (2019) clarifies that the system focuses on commercial robberies in Milan by using artificial intelligence and crossing data to identify the criminal group or individual offenders since, in commercial robberies in Italy, offenders are usually serial criminals. According to Vice News[28], pharmacies are the top target for robbers and represent 40% of such crimes.

Mastrobuoni spent three years studying the system, from 2008 to 2011, and noticed that the software works by collecting and analyzing around 11,000 bits of information about each robbery. These data can be divided into two categories: information about the crime itself and information about the perpetrators.

The KeyCrime Delia system analyzes footages to identify individuals and their *modus operandi.* The system operators also take notes of details regarding the criminal's physical appearance and attitude:

> "Milan's KeyCrime is focused on commercial robberies, as robbers are believed to be mainly professional and hardened criminals who sooner or later are going to perpetrate a crime. According to private conversations with Mario Venturi, the software's aim is to improve the officers' role as apprehension agents (see Nagin et al., 2015).19 The software is used to input and analyze large sets of individual characteristics of robbers and individual criminal strategies (modus operandi) collected from closed-circuit security cameras and victim reports to: i) identify robberies that share at least one ofender or one vehicle (a sequence of a criminal group); and ii) predict when and where the ofenders are going to strike next. Thus, rather than generating aggregate predictions, like most predictive policing software does, it generates individual predictions. It is important to highlight that the linkages across robberies are constructed regardless of whether an arrest is made. KeyCrime equips police

[27] Information collected at: https://www.keycrime.com/about-us.
[28] News available at: https://www.vice.com/en/article/kzggz3/the-milan-police-have-a-high-tech-solution-to-catch-robbers.

> officers and prosecutors with well-summarized analytics that are used to help police patrols decide where to drive and what to look for."[29]

Regarding the crime, the system collects and analyses the time of the crime, its location, date, type of business, type of crime and weapons and vehicles involved. When it comes to the supposed criminal, the system storages information regarding their perceived age, height, body structure, skin, hair and eye color and clothing.

Based on these notes, the system makes comparisons and tries to predict future criminal behavior from these individuals. With this database, it is possible to identify an area where a criminal group takes on their criminal spree.

The software has five characteristics that deserve to be mentioned: it is analytically complex, depends on a human being to make the final decision, influences the prevention, prosecution and the legal procedure of crimes and it went through and evaluation process before being implemented.

First, when it comes to the complexity of the system, it is capable of analyzing up to 1,5 million variables and, as mentioned above, these data can be simple – like dates, times and places – or complex – like physical characteristics. These data are, then, compared with the other ones already logged into the system to, firstly, identify similarities between them and, secondly, make predictions based on eventual similar circumstances identified. This can be looked at as a strong suit, because the software's complexity strengthens the conclusions it gets to.

The next relevant element to be analyzed is that, after the software completes the first phase – which consists on the identification of similarities between the criminal event being analyzed and others that have already been through this process – it doesn't automatically go to the next phase – the prediction making process.

[29] MASTROBUONI, 2019, pages 10 and 11.

Before the system can move on from comparisons to predictions, the supposed similarities found go through the analysis of a specialized professional: a trained analyst. This person is responsible for classifying the comparisons made by the system as probable, accepted or dismissed.

This evaluation process can be interpreted two ways. On one hand it can be seen as a positive feature because it can prevent the loss of important information being dismissed by the system for some reason. On the other hand, an analysis made by a human being is always going to carry some degree of subjectivity and bias into the investigation, so, it needs to be done as technically and objectively as possible:

> "Cognitive biases, including automation bias and confirmation bias, may be ingrained in the human brain and, as a result, may be impossible to completely overcome and challenging to reduce.187 Police departments and the creators of predictive policing technologies such as Patternizr would benefit from engaging with experts on cognitive biases188 to better understand the impacts of such biases and specific methods to reduce the harms of cognitive biases when developing and implementing predictive technologies.
>
> (…)
>
> Existing literature on the impacts of cognitive biases on policing suggest two main ways of reducing the impact of automation and confirmation biases on the use of predictive policing tools.189 These suggestions include providing law enforcement with training on the limits and problems of predictive tools as well as requiring procedures to disrupt the influence of biases and rigorously test hypotheses."[30]

Regarding the influence of the program in the prosecution of crimes, the software makes it possible for an individual to be charged with a group of crimes at once, resulting in one longer sentence instead of various smaller ones, making the judicial response more effective.

Finally, according to the Delia website, the system went through a double evaluation process before its implementation. The software was first tested in a smaller city before being implemented in Milan and analyzed by different specialists.

[30] GRIFFARD, 2019, page 78 and 79.

According to Vice News, the system can identify where and when a particular robber (or group) usually commits crimes. Based on that information, the Milan police force sends officers to such location to intercept the criminals if they try to act. The system has been in use for more than a decade, and, according to crime statistics in Milan, the scenario is nearly the same. According to the online paper Il Sole 24 Ore[31], in 2015, in Milan, there were 380,8 commercial place robberies per 100.000,00 habitants in Milan and, in 2019, there were 311,1. A small change, but Milan is currently the number one province when it comes to commercial robberies.

Although numbers cannot be seen as an absolute indicator of anything and it is recognizable that many factors can and do influence crime statistics, on the other hand, the fact that the implementation of the system does not show it self through numbers should not be ignored.

For now, this software is being used only regarding commercial robberies, so its efficiency when it comes to other types of crime cannot be discussed.

1.3.2 - Predictive Policing in the U.S.

In the U.S., predictive policing systems are more common. For the purposes of this presentation, we will focus on only one of the first cities to implement a predictive policing system was Los Angeles, in the state of California. They were targeted by a series of accusations that the system had a racial bias. Based on those accusations, after a long run, the Los Angeles Police Department (LAPD), has published a document explaining how the data is gathered and analyzed[32].

[31] Data available at: https://lab24.ilsole24ore.com/indice-della-criminalita/index.php. Acessed on 09/29/2020.
[32] Document available at: http://lapd-assets.lapdonline.org/assets/pdf/data-informed-guidebook%20042020.pdf. Accessed on 09/29/2020.

In 2011, the LAPD started using a program called Los Angeles Strategic Extraction and Restoration (LASER). According to the LAPD, this software analyzes data from crimes that were committed to determine trends in crime and locations where police efforts should be focused on. When analyzing crimes involving gangs or other important occurrences, the data that is fed to the system consist of the type of crime, time and location of the offense, *modus operandi* and any other important information. Based on this information, the system creates crime maps to guide the police departments.

According do Ferguson (2017) the LAPD system was originally designed to focus on three types of crime: burglary, automobile theft and theft from objects in automobiles. These crimes were selected for four reasons. Firstly, because property thefts are one of the biggest community concerns for security; secondly, these types of crime tend to be more reported; third, these offenses are usually linked to factors that can be more clearly identified, like the lack of job and educational opportunities. Finally, given the fact that these crimes usually happen in the same areas, there is a belief that police presence could repel criminal activity:

> "With the encouragement of then chief William Bratton and then-captain Sean Malinowski, the Foothill Division of the LAPD began testing whether predictive policing could work in the real world. A project was designed to test whether Brantingham's algorithm could reduce property crime (again focused on burglary, automobile theft, and theft from automobiles). Targeted areas, usually limited to 500-by-500-square-foot boxes, were identified around the Foothill Division north of downtown Los Angeles. Officers had instructions to patrol those areas when not responding to calls for service or handling other priorities. The expressed goal was to be a deterrent—a presence of police authority to discourage the "near repeat" temptation. An initial pilot project in 2011 showed a 25% reduction in burglaries, and other targeted crimes also dropped. Suddenly, the idea that a computer algorithm could predict and prevent crime became a national phenomenon."[33]

In Brazil, something similar is done but, for now, without the use of any software. In Brazil, the state police is responsible for patrolling and answering emergency callings. They feed the data (mostly location and time) into a document to identify areas in which violence is more present. Then, based on this information, the police department increases policing in those areas.

[33] FERGUSON, 2017, page 74.

For example, in the state of Minas Gerais, Brazil, the local police placed mobile police stations, called “Bases of Community Security” in places that reportedly have higher crime rates:

> “The installation locations of the Bases will be defined by the General Commander together with the RPM in compliance with technical aspects, among them: socioeconomic, demographic, cultural and geographical characteristics of the location; criminal incidence; concentration of commercial/banking establishments (potentially susceptible to crimes against property); target Audience; demand for PMMG services; and the demand for occurrence records. The safety of the police team and the community that will access the service will also be considered, in addition to aspects such as the existence of adequate lighting and the possibility of flooding the site.”[34]

But, according to CBS News[35], the program was originally created to target individuals most likely to commit a crime based on their past run ins with police. Every time someone was stopped on the street by police due to suspicion of criminal activity, that person would get a point in the system.

The more points someone had, the more they would be observed and stopped by police. The police department would then say that people would get removed from the list if they did not have interactions after some time. But, if the program’s goal is to create a list of people for the police to observe and follow, it gets a little hard for those people on the list to not interact.

Community members then started to worry that they had been unfairly targeted by police. So, an activist group named “Stop LAPD Spying Coalition” requested, in 2017 and 2018, judicially, that the LAPD disclosed information

[34] PMMG, page 16, in the original: Os locais de instalação das Bases serão definidos pelo Comando-Geral em conjunto com as RPM em observância a aspectos técnicos, dentre eles: características socioeconômicas, demográficas, culturais e geográficas da localidade; incidência criminal; concentração de estabelecimentos comerciais/bancários (potencialmente suscetíveis a crimes contra o patrimônio); público alvo; demanda por serviços da PMMG; e a demanda por registros de ocorrências. Considerar-se-á também a segurança da equipe policial e da comunidade que acessará o serviço, além de aspectos como existência de iluminação adequada e possibilidade de alagamentos do local.
[35] Avalibale at: https://www.cbsnews.com/news/los-angeles-police-department-laser-data-driven-policing-racial-profiling-2-0-cbsn-originals-documentary/. Accessed on 09/30/2020.

regarding the program. The request was ignored, and, after that, they filled a lawsuit against the LAPD.

Under pressure, the LAPD started to release the records. The records showed some inconsistencies. Half of the people police were calling “chronic offenders” had zero or one arrest for a violent crime and 10% had absolutely no quality interactions with police.

On the other hand, Latinos and African American people represented 84% of the 233 chronic offenders.

After the release of the records and the pressure that followed, the LAPD put out a statement saying:

> "The [LASER] Chronic Offender based program is no longer in use. The LAPD is moving to a Data-Driven - Community Focused model of building trust and reducing crime built on three goals: Increase trust between police and public, reduce violent crime … specifically, gun and gang-related crime, and assist victims of crime, including businesses, residents, and those most vulnerable to crime and disorder."[36]

In Chicago, on the other hand, the system is a little more controversial. The system was implemented in 2013 and, in 2016, Saunders, Hunt and Hollywood (2016) wrote an article detailing the software. The system used social network (meaning, a net of people) to previous homicide victims to “*predict the likelihood of someone becoming a victim of a homicide*” (SAUNDERS, HUNT, HOLLYWOOD, 2016, page 54). This prediction is made upon the number of links someone has to previous homicide victims, then, that person would be at risk of becoming a victim themselves.

Also, according to Fergusson (2017, page 89), the system had another side: it rated every person arrested with a “threat score” from 1 to 500+. But which data the system used to do that and what criteria was applied to the data to get the

[36] Ibid.

results was a secret. Activists fought to reveal the criteria, but failed up until January, 2020, when the system was quietly shut down[37].

Adding to the list of problems, the Chicago system faced a lot of criticism regarding its definition of dangerous areas:

> "For one, the Predictive Analytics Group concentrated on finding spatiotemporal irregularities within official data sets but did not address the racialized irregularities implicit in the collection, recording, and dissemination of those data. Given city officials' enchantment with geovisualized crime data, the subsequent precrime maps based on these data did not only leave this racialized dimension embedded in official crime data intact but they also codified this dimension with a seal of scientific credence. Moreover, the CPD's Predictive Analytics Group correlated police data with other geocoded information and subsequently produced a range of geographic "indicators" of crime that were distinct to racialized districts. Both factors converged to further entrench the statistical criminalization of racialized police districts and legitimize the differential police control of them."[38]

The police department from Santa Cruz, California, was the first one to ban their predictive policing system due to problems regarding discrimination.

The U.S. National Institute of Justice (NIJ) conducted a case study contemplating some cities, which have implemented predictive policing techniques. Most of the case descriptions were provided by the cities themselves; therefore, no independent verification was made.

In Shreveport, Louisiana, the police department conducted an experiment to flag potential crime spikes one month ahead on robberies, burglaries, vehicle break-ins, outside thefts and stolen vehicles. This was done in some districts, and the prediction later evolved to identifying hot spots on a much smaller scale. After the program was designed and implemented, the police department noticed a 40% drop on the crime rate of the crimes listed above.

Memphis, Tennessee, on the other hand, according to the NIJ, had a problem with violent crimes. Then, they created, in a partnership with Memphis University, the Blue CRUSH (Crime Reduction Utilizing Statistical History) which is

[37] See the News published by the newspaper Chicago Tribune on the subject: https://www.chicagotribune.com/news/criminal-justice/ct-chicago-police-strategic-subject-list-ended-20200125-spn4kjmrxrh4tmktdjckhtox4i-story.html. Accessed on 09/30/2020.
[38] JEFFERSON, 2017, page 6.

a data mining approach that focuses on the analysis of location and time criminal patterns. According to Memphis police, quoted in the NIJ report, because the program allows analysts to rapidly evaluate incoming patrol data against historical trends, they are able to respond to predicted threats before a criminal act is committed.

Crime maps and data analysis integrated with police planning around problem neighborhoods, the allocation of patrol and special units, and strategic planning for citywide crime reduction. The software the city uses relies on existing criminal records and incoming patrol data (crime locations, type of crime, times of day and week and victim characteristics) to generate tactical crime predictions. With this data, police places unmarked cars in determined locations to catch criminals red handed and they have also placed police vans in some blocks to inhibit criminal action.

In Nashville, Tennessee, there was a spike in car accidents related to drunk driving up to 2003. In 2004, according do the NIJ, the police department started using a software that identified problem areas by using crime mapping. These areas were ranked afterwards, and the police chief held weekly meetings to discuss progress in these areas. According to the NIJ: "*Simultaneously, the Nashville police started to carefully collect and code large quantities of traffic, crime, and drunk-driving data across the city. With oversight by a team of specially trained analysts, the data were used to produce multilayered crime maps that arrayed traffic violations alongside other criminal activities*"[39].

In Minneapolis, Minnesota, there is a park called Peavey Park, a location well-known for gang activity and crimes like drug use and prostitution. According to the NIJ, in the 1980s, the police department asked for the help of two criminologists: Lawrence Sherman and David Weisburd. So, in the 1990s, they developed a system which has scaled up to become a big report management system integrated with the police's weekly strategic planning department.

[39] Available at: https://www.ncjrs.gov/pdffiles1/nij/grants/243830.pdf, p. 104. Accessed on Aug. 2020

The leadership department reviews data-driven analysis made by the police in what's called CODEFOR (computer-optimized deployment–focus on results, similar to CompStat) meetings, which guide the tactical planning to attack predicted crime areas and times.

In 2011, Minneapolis invested in an advanced software and intelligence center where some officers monitor hundreds of live video feeds from different parts of the city. This resource helped enhance the police department's ability to recognize and respond faster to criminal events:

> "In 2011, Minneapolis added to its predictive policing capabilities by investing in a state-of-the-art police intelligence center, where a few officers will be posted to monitor hundreds of live video feeds from across the city. Speaking about the new resource, then-Chief Dolan said that the center would help the department send police. Where they need to be by integrating live data feeds and updated estimates of risk across the city. As of 2012, the Minneapolis Police Department's Fusion Center was housed in the First Precinct and operated continuously, responding to requests from pedestrians and law enforcement officers on the streets. This type of resource has reportedly further enhanced the city's ability to recognize and respond to critical events."[40]

Charlotte-Mecklenburg County, North Carolina, lastly, in 2005, observed a significant rise in juvenile delinquency, vandalism and curfew violations in several neighborhoods. The department's predictive policing program used data analysis to identify neighborhoods in this situation to create a community response.

Analyzing data from 2003 and 2007 using mapping tools, he police department developed strategies to target local communities, precisely one called Brookshire Corridor, where police noticed most foreclosures occurred. The department then used the information about this neighborhood to test on others and realized that 96% of the affordable housing communities were high risk areas.

To stabilize the neighborhoods, the department partnered with neighborhood preservation organizations:

> "For example, one community partnership arranged for a local contractor to replace the landscaping in a troubled community. The Charlotte community also created a website with resources for preventing foreclosures. Ultimately, the Charlotte-Mecklenburg Police Department had identified a problem using geospatial data analysis and exposed the underlying community trends; it then

[40] FERGUSON, 2017, pages 74 and 75.

> successfully partnered with community organizations to address both components."[41]

1.3.3 - Predictive Policing in China

When it comes to information on what goes on inside any Chinese government agency, the sources are very slim:

> "Discreet visits and personal interactions provided the bulk of the research materials. Finally, since 1980s, researchers from China were allowed to study outside of China. They brought with them valuable data sets, personal experience and family connections. In the 1990s, the Internet provided armchair researchers with direct access to many of the library sources or local materials that could only be had by having personal access or physical visits. Researching into public security and policing in China is a difficult task. Cohen's observation about the difficulties of researching into China, while dated, remains to be relevant."[42]

Policing in China is also new, but rapidly growing, in comparison to the rest of the world:

> "Policing in China, much like policing elsewhere, has a comparatively short history. In the Chinese case, the modern police force emerged in the early 1900s as urban areas began replacing the constabulary—a coterie of guards charged with defending city gates and in possession of some powers of arrest—with law enforcement agents more closely resembling the police we know today."[43]

Regardless, the Human Rights Watch (HRW) exposed, in 2018, how a predictive policing system was being put to work in Xinjiang. The police force uses an app called Integrated Joint Operations Platform (IJOP)[44], which gathers all kinds of data on people and classifies them according to 36 profiles, forming lists of people of interest to the police. These people are, then, watched and, sometimes, taken in to arrest for "further investigation".

[41] FERGUSON, 2017, page 77.
[42] WONG, 2007, page 114.
[43] SCOGGINS, 2019, page 83.
[44] Available at https://www.hrw.org/report/2019/05/01/chinas-algorithms-repression/reverse-engineering-xinjiang-police-mass.

People are maintained in custody indefinitely without being charged or submitted to trial. According to HRW[45], since August 2016, the Xinjiang Bureau of Public Security has posted documents that confirm the creation and establishment of the IJOP.

The IJOP gathers information from cameras equipped with facial recognition positioned in locations that are considered sensitive by police, like entertainment locations, supermarkets, schools and homes of religious figures. Another source, still according to HRW[46], are “wifi sniffers” that collect identifying addresses of computers, smartphones or other devices connected to the internet.

Some regions have security checkpoints that collect license plate numbers, citizen’s ID cards and officers are required to submit to IJOP any information they view as unusual. It is unknown how the IJOP analyses the data it possesses. But another report noted that the IJOP, according to HRW[47], flagged villagers who fail to pay their phone bills and get disconnected, as well as villagers whose phone calls or texts reference violence or terrorism.

The people are arrested in places called Occupational Skills and Education Training Center for a “re-education”. In August, 2020, a Chinese model was taken to one of these centers and managed to send text messages and share a small video about what goes on inside. BBC News reported[48] that the model, Meerdan Ghappar, was able to share a video that showed him handcuffed to a bed, with water covering the floor so that he couldn’t move, in the background government announcements are audible. He also sent his family text messages detailing a little of what went on during his arrest. The model hasn’t been seen or heard of since.

These measures of the Chinese government are mostly directed towards the Uyghurs population. According to HRW, Xinjiang is home to 11 million Uyghurs, which is a Muslim ethnic minority. Since May 2014, the Chinese government started

[45] Available at https://www.hrw.org/report/2019/05/01/chinas-algorithms-repression/reverse-engineering-xinjiang-police-mass.
[46] Idem.
[47] Idem.
[48] Available at https://www.bbc.com/news/world-asia-china-53650246.

a “strike hard” campaign against violent activities and terrorism. Officially, the government states that the IJOP program’s goal is to uncover hidden terrorists and criminal groups.

It is important to understand a little about how the police works in China:

> “Chinese police rely heavily on mini-stations in urban and rural areas to control criminal activities in an area. The basic idea is similar to that of Japanese practice, but because of its socialist nature, Western scholars are more critical of it. These mini-stations are geographically arranged to coexist with the neighborhood committees and are coordinated with public security committees in the work-units within their jurisdiction. Since police officers actually live and work in a neighborhood for a long time, they become familiar with the residents”[49]

But there is very little information available to come to a definitive conclusion about how the system works over there. China has a long history of strict media, information and population control.

[49] CAO, Liqun; HOU, Chares. **A comparison of confidence in the police in China and in the United States**. **Journal Of Criminal Justice**, S.L., v. , n. 29, p. 87-99, abr. 2001, page 88.

Chapter II

2 – Neuroscience and neurolaw

2.1 – What does neuroscience have to contribute to law?

Technological advances have made it possible to create tools for the most diverse areas of everyday life and knowledge. Law can also benefit or suffer from these advances, in addition to being improved through interdisciplinarity. Neuroscience was one of the fields that started contributing to the concepts involved in law, but not without its challenges:

> "Due to the advent of modern neuroscience, several traditional scientific disciplines have developed entirely new theories, perspectives, and methodologies. The substantial advances and discoveries made in this field over the last three decades have steered the course of many research areas, especially those concerned with human cognition and behavior. Nevertheless, the adoption of neuroscientific knowledge in different sciences has also met considerable challenges, resistance, and even hard skepticism." [50]

Neuroscience can be defined as follows:

> *"Neuroscience* refers to the collection of disciplines concerned with the structure and function of the nervous system and brain. The topic of study is so complex that it requires disparate basic, clinical, and applied disciplines to cover the terrain. Within neuroscience are cross-cutting paradigms— general perspectives that underlie a range of theories and methodologies in the field. The fulcrum for some of these perspectives rests squarely under constituent structures at different levels of organization, whereas the fulcrum for others falls under the function of the brain and nervous system. Illustrative of the latter is behavioral neuroscience, in which the nervous system and brain are viewed as instruments of sensation and response. Research representing this perspective tends to focus on topics such as learning,memory, motivation, homeostasis, sleep and biological rhythms, and reproduction— and on the neural mechanisms underlying these behavioral functions.Cognitive neuroscience emerged as a distinct functional perspective in which the brain is viewed as an information processing organ, with a focus on topics such as attention, perception, representations, decision making,memory systems, heuristics, reasoning, and executive functioning— and on the neural mechanisms in the human brain that underlie these representations and processes.6 Social neuroscience represents yet another broad perspective, one in which the emphasis is on the functions that are altered by or are derived from the association or interaction of conspecifics (imagined or real)—and on the neural and hormonal mechanisms underlying these structures and functions."[51]

[50] CARDOSO, 2021, page 56.
[51] CACIOPPO; DECETY, 2011, page 163.

Jones, Marois, Farah & Greely (2021, page 59, *apud* CARDOSO) gives seven examples (but not in a limiting way) of how neuroscience can contribute to law:

> "Of course, the relevance of neuroscience to law depends intimately on the specific legal issue and context. And neuroscientific evidence is but one kind of evidence, to be weighed alongside other kinds. But, speaking quite generally, neuroscientific evidence might aid law in at least seven (sometimes overlapping) ways:
>
> 1. *Buttressing*—by increasing juror confidence in a conclusion to which other, non-neuroscientific evidence already independently points (such as in the context of "diminished capacity" determinations);
>
> 2. *Challenging*—by calling into question or contradicting either other evidence in a case or a relevant legal assumption (such as those reflected in certain evidentiary rules);
>
> 3. *Detecting*—by identifying the existence of legally relevant facts (such as injuries, lies, or pain);
>
> 4. *Sorting*—by separating people into useful categories (such as those most likely to respond to drug rehabilitation);
>
> 5. *Intervening*—by providing new methods to achieve legal goals (such as through pharmacological interventions that would help to reduce recidivism);
>
> 6. *Explaining*—by illuminating decision pathways with information that may lead to more informed and less biased decisions (such as in the context of third-party punishment [TPP] decisions);
>
> 7. *Predicting*—by improving law's ability to estimate probabilities of future behavior (such as future violence)

Eagleman (2011, page 162) points out the importance of biological insight for a better understanding of recidivism. It is noteworthy that this is not about trying to include the rejected notion of the author's criminal law in the discussion, however, understanding criminal behavior is an essential measure to understand how to punish and deal with the problem of recidivism.

Nadelhoffer and Sinnott-Armstrong (2012) say that:

> "Neurolaw is neither an intellectual movement nor is it tied to a certain ideological point of view. Some researchers push a progressive agenda, whereas others adopt a much more conservative approach. Given the wide range of views adopted by researchers in the field of neurolaw, it is a mistake

> to identify the overall field with any particular positions, as some commentators have been prone to do."[52]

The law deals with everyday events. So, Nadelhoffer and Sinnott-Armstrong also point out that this is the main difference between the law and other fields when it comes to ethical discussions. Given the fact that the law has real consequences, the ethical issues have real contours and definitions:

> "One of the most important differences between law and many other branches of ethical study is its engagement with real dilemmas, opportunities, and controversies. There is nothing speculative about a criminal prosecution or, for that matter, about a tort claim, contract, property deed, or worker's compensation request."[53]

Joshua Greene and Jonathan Cohen (2004) point out, in their text "For the law, neuroscience changes nothing and everything" that, in criminal cases, a successful conviction must prove, in addition to the existence of criminal behavior, a guilty mind. The question that surrounds a trial when it comes to a crime is "what was this person thinking"?[54]

The authors add that, to answer this question, the law usually turns to science, and the most recent to integrate this has been neuroscience. However, the question the authors go on to pose is to what extent cognitive neuroscience impacts legal understandings[55].

The importance of neuroscience in the legal field begins to be pointed out by the authors as a way of adding new details, new sources of evidence to the law, but nothing for which it is not prepared. Neuroscience is then presented as something capable of bringing a new perspective to old concepts. It is about illustrating, in a vivid way, that the legal principles that bring the common conceptions about responsibility and human behavior can be defective.

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[52] NADELHOFFER and SINNOTT-ARMSTRONG, 2012, page 1.
[53] GOODENOUGh; TUCKER, 2010, page 81.
[54] "Narrowly interpreted, mens rea refers to the intention to commit a criminal act, but the term has a looser interpretation by which it refers to all mental states consistent with moral and/or legal blame. (A killing motivated by insane delusional beliefs may meet the requirements for mens rea in the first sense, but not the second.) (Goldstein et al. 2003) Thus, for centuries, many legal issues have turned on the question: 'what was he thinking?'." GREENE, COHEN, 2004, page 1775.
[55] Idem, page 1776.

> "Existing legal principles make virtually no assumptions about the neural bases of criminal behaviour, and as a result they can comfortably assimilate new neuroscience without much in the way of conceptual upheaval: new details, new sources of evidence, but nothing for which the law is fundamentally unprepared. We maintain, however, that our operative legal principles exist because they more or less adequately capture an intuitive sense of justice. In our view, neuroscience will challenge and ultimately reshape our intuitive sense(s) of justice." (GREENE, COHEN, 2004, p. 1775)

Legally, what matters is whether the person who was behaving rationally enough at the time of his action for responsibility to be attributed to him. The authors point out that people generally want to know if "it was really him" or his upbringing, his genes, the circumstances of the moment or his brain (GREENE, COHEN, 2004, p. 1777). Going in the same direction, for example, some studies have come to the conclusion that people who believe in free will have a bigger tendency to attribute behavior to internal circumstances:

> "As people use their own representations to understand and predict other people's behavior (for an overview, see refs. 36 and 37), the intention attribution hypothesis predicts that individuals also perceive others' behavior as internally driven and, thus, less strongly influenced by the environment, resulting in an increased correspondence bias."[56]

Correspondence bias can be defined as follows:

> "People make correspondent inferences when observing others. They infer stable personality characteristics from the behavior of others, even when the presence of external factors severely constrains the range of others' possible behaviors. This correspondence bias leads observers to overattribute the behavior of actors to their enduring dispositions and underweight the influence of situational factors. Correspondent inferences are prevalent and consequential"[57]

Thus, the authors then point out that people see the mind in a dualistic way. For the purposes of the text, the authors define dualism as the belief that the mind and the brain are separate but interacting entities. On the other hand, there is materialism, which is the conception that all events, including mental operations, obey the laws of physics.

[56] GENSCHOW, et al, page 5.
[57] SCOPELLITI; MIN; MCCORMICK; KASSAM; MOREWEDGE, 2018, page 2.

According to the authors, the law presupposes a metaphysical notion of free will[58], or, as Eagleman (2012, page 166) points out, free will as the uncaused causer, an inner voice that tells us what to do:

> “The crux of the question is whether all of your actions are fundamentally on autopilot or whether there is some little bit that is "free" to choose, independent of the rules of biology. This has always been the sticking point for both philosophers and scientists. As far as we can tell, all activity in the brain is driven by other activity in the brain, in a vastly complex, interconnected network. For better or worse, this seems to leave no room for anything other than neural activity—that is, no room for a ghost in the machine. To consider this from the other direction, if free will is to have any effect on the actions of the body, it needs to influence the ongoing brain activity. And to do that, it needs to be physically connected to at least some of the neurons. But we don't find any spot in the brain that is not itself driven by other parts of the network. Instead, every part of the brain is densely interconnected with—and driven by—other brain parts. And that suggests that no part is independent and therefore "free."[59]

Complementing, Eagleman (2012, page 169) points out that the judicial system is based on the assumption that we have free will, that is, we can act freely and human beings are judged based on this perceived freedom:

> “When a criminal stands in front of the judge's bench having recently committed a crime, the legal system wants to know whether he is blameworthy. After all, whether he is fundamentally responsible for his actions navigates the way we punish. You might punish your child if she writes with a crayon on the wall, but you wouldn't punish her if she did the same thing while sleepwalking. But why not? She's the same child with the same brain in both cases, isn't she? The difference lies in your intuitions about free will: in one case she has it, in the other she doesn't. In one she's choosing to act mischievously, in the other she's an unconscious automaton. You assign culpability in the first case and not in the second.”[60]

However, Eagleman (2012, page 171) explains that our actions are caused by a chain of events in the brain that neuroscience still does not have the necessary technology to fully understand, since it is not yet possible to make a total mapping. of deep brain activity.

But, to corroborate his explanation, the author brings some concrete cases to demonstrate that the “cause without a cause” is not able to explain certain events

[58] GREENE, COHEN, 2004, page 1776.
[59] EAGLEMAN, page 166.
[60] Idem, page 169.

and behavioral phenomena. The author brings concrete cases that denote interesting issues to be discussed.

As an example, the first case concerns a subject that the author names Alex. Alex, 40 years old, married for 20 years, begins to show a huge interest in child pornography, while complaining of severe headaches. His wife then takes him to a doctor, where Alex discovers a tumor in his frontal lobe.

With the tumor removed, Alex's sexual interests return to normal. The frontal lobe is the part of the brain responsible for controlling inhibitions, which means that its impairment will cause a person to let go of their inhibitions, which could lead to the conclusion that Alex is a pedophile socially molded to not act in the direction of your impulses. But is it really that simple?

The moral of Alex's story brings us to the idea that eventual changes in biology can directly affect behavioral aspects. However, this is a borderline case, which corresponds to a few potentially criminal events.

If imputability is understood as the ability to understand the illicit character, it is safe to say that this understanding is directly linked to subjective aspects of the person who holds it. In this sense, Eagleman (2012, p. 156) points out that the first difficulty, when talking about accountability, is that people cannot choose their path of development. A human being does not choose when, where and under what circumstances he will be born and develop his personality.

But cognitive neuroscience cannot be considered as a self-sufficient field, far from it:

> “Social cognitive neuroscience must be an intensely collaborative venture if it is to succeed. It must include data from ethologists, neurobiologists, anthropologists, and psychologists, and, if they are to understand one another, investigators from these different backgrounds must pursue a common language within which to communicate their ideas and findings.”[61]

Cognitive neuroscience has contributed greatly to the understanding of human behavior with the study of the brain and its activities since the 1990s, due

[61] ADOLPHS, 2003, page 123.

to technologies that made it possible to study brain cognitive activity (GOODENOUGH and TUCKER, 2010, p. 62). Many studies are focused oncriminal behavior and, in view of that, an area of study has emerged about the understanding and predictability of this behavior.

Such studies comprehend, among other topics, both the analysis of criminal behavior and the analysis of recidivist criminal behavior. The present work, in its first part, has presented an analysis of the functioning of predictive policing systems used around the world and the (im)possibility of a police investigative action to obtain evidential evidence about the predicted behavior through the systems of predictive policing.

It is important to bring a concept into the discussion. There is a theory called The Author's Criminal Law, which is an extremely controversial concept that has been used for unfair purposes, such as treating the elected enemy as not a person:

> "In the case of enemy criminal law, note the assertion that the state not only has a right to treat dangerous individuals as non-persons, but a duty to do so.92 And second, Jakobs often offers a foundation for their "descriptions", which is not limited to pointing to empirical data, which is somewhat incompatible with the assumption that these premises are nothing more than mere descriptions, indicating, rather, that they are already full of normative content. To explain it once more with a double example: the functional conceptof culpability is in turn also deduced from the need to guarantee such a "normative identity" of society, that is, a solid core of social norms; and, as we discussed above, the criminal law of the enemy is explained based on considerations about the constitution of legal personality."[62]

The criminal law of the author consists of, in short, punishing someone for their personality or even physical characteristics, instead of their criminal conduct, however, there is no single criterion of what is considered the criminal law of the author.

[62] Free translation. GRECO, 2005, page 228. In the original: "No caso do direito penal do inimigo, observe-se a afirmativa de que o estado não apenas tem o direito de tratar indivíduos perigosos como não pessoas, mas sim o dever de fazê-lo.92 E, em segundo lugar, oferece Jakobs muitas vezes um fundamento para suas "descrições", que não se esgota em apontar para dados empíricos, o que é um tanto incompatível com a suposição de que essas premissas não passem de meras descrições, indicando, isso sim, que sejam elas já plenas de conteúdo normativo. Para explicá-lo mais uma vez com um duplo exemplo: o conceito funcional de culpabilidade é por sua vez também deduzido da necessidade de garantir a tal "identidade normativa" da sociedade, isto é, um núcleo sólido de normas sociais;93 e, como vimos acima, o direito penal do inimigo é explicado com base em considerações sobre a constituição da personalidade jurídica."

Zaffaroni and Piangeli (1997, page 107) point out that the criminal law of the author would be, in its extreme, a corruption of the criminal law insofar as what is prohibited is the act as a manifestation of the author's way of being. It is their way of being that is considered truly criminal.

Günther Jakobs (2003) developed the Criminal Law of the Enemy, based on three basic premises: the State has the right to restore security by punishing persistent criminals more severely; citizens have the right to demand that the State take adequate and effective measures to maintain security; and a delimited Criminal Law of the Enemy inhibits it from contaminating the criminal law as a whole.

Thus, Jakobs divides people into two groups: citizens and enemies. Citizens are “good people” who, through a mistake or a slip, commit a crime. But, because they are good people and demonstrate participation, they are supported by constitutional guarantees and due criminal process. This form of law then guarantees the validity of the law as a social expression, since citizens are fully recognized as members of society.

Enemies, on the other hand, are people who don't fit social standards. The non-qualification of these people can occur for several reasons:

> “A person, for Jakobs, is a technical term, which designates the bearer of a role, that is, one in whose behavior conforming to the norm is trusted and can be trusted. "One individual who does not allow himself to be coerced into living in a state of civility, cannot receive the blessings of the concept of person.” Enemies are “strictly non-persons,” dealing with they do nothing more than “neutralize a source of danger, as a wild animal.” Characteristics of criminal law of the enemy are an extensive anticipation of the bans penalties, without the respective reduction of the sentence imposed, and the restriction of procedural guarantees of the rule of law, As is the case mainly in the fields of sexual and economic delinquency, terrorism and so-called crime-fighting legislation.”[63]

[63] Free translation. GRECO, 2005, pages 217 and 218. In the original: “Pessoa, em Jakobs, é um termo técnico, que designa o portador de um papel,30 isto é, aquele em cujo comportamento conforme à norma se confia e se pode confiar. “Um indivíduo que não se deixa coagir a viver num estado de civilidade, não pode receber as benções do conceito de pessoa.”31 Inimigos são “a rigor não-pessoas,” lidar com eles não passa de “neutralizar uma fonte de perigo, como um animal selvagem.” Características do direito penal do inimigo são uma extensa antecipação das proibições penais, sem a respectiva redução da pena cominada, e a restrição das garantias processuais do estado de direito, tal qual é o caso principalmente nos âmbitos da delinqüência sexual e econômica, do terrorismo e da chamada legislação de combate à criminalidade”

The enemy is inserted in society as a being of duties, but not as a being of rights. This is because the enemy does not convey to the State the security that he will act as a person and, therefore, should not be treated as such.

As basic characteristics of the legal system of Criminal Law of the Enemy are: the enemy must be punished with security measure; he must be punished according to his dangerousness (not according to his guilt); the measures against the enemy look primarily to the future, that is, to the risk of danger he presents for the future; the enemy is not a subject of law, but an object of coercion. This last characteristic concerns a general positive prevention idea, which means using the enemy as an object of coercion, an example of what can happen if other people become delinquents.

On the other hand, Ferrajoli (2002), throughout his book Law and Reason, develops the theory of criminal guaranteeism, which establishes rational criteria for state intervention guaranteeing fundamental rights and guarantees as limits of Criminal Law to guide the State and correct its excesses.

However, it is plausible to assume, based on what was said above about criminal behavior, that the reasons that lead to this behavior are extremely relevant to understanding it and, consequently, punishing it. Our brain activity is composed of several transmissions between neurons, basically, of which we are aware of a significant amount, but small in the face of the whole:

> "In the average adult human, the brain represents ~2% of the body weight. Remarkably, despite its relatively small size, the brain accounts for ~20% of the oxygen, and hence calories, consumed by the body, which is 10 times that predicted by its weight alone. In relation to this very high rate of baseline metabolism, functional imaging signals are remarkably small, in metabolic terms usually <5% of the ongoing metabolism of the brain, truly modest modulations in ongoing or baseline activity. Evidence now suggests that this baseline activity may instantiate important components of brain function [for an introduction to these issues see Gusnard and Raichle and Raichle and Gusnard. Thus, in our quest to understand brain function we must be careful not focus exclusively on the tip of the iceberg.
> Finally, I believe that these papers convey a more general message. As a result of much important new work in neuroscience and the cognitive and social sciences, we can presently say with some confidence that all parties bring important, unique, and complementary perspectives to the task of understanding brain function. No one has a corner on the truth. Working together we have the prospect of progress in one of the last great frontiers of

> science, understanding the human brain and, in the final analysis, ourselves."[64]

Thus, with current technology, it is difficult to say for sure how brain activity occurs and how behavior is caused. A criminal behavior is preceded by seconds, minutes, days, months, and years of brain activity, which is affected by the environmental factors that surround an individual.

The control that a person has of his impulses (among them, the criminal) is intrinsically linked to his genes and the environment that surrounds him, even if the latter cannot be chosen by the former:

> "Many of us like to believe that all adults possess the same capacity to make sound choices. It's a nice idea, but it's wrong. People's brains can be vastly different—influenced not only by genetics but by the environments in which they grew up. Many "pathogens" (both chemical and behavioral) can influence how you turn out; these include substance abuse by a mother during pregnancy, maternal stress, and low birth weight."[65]

Criminal law tries to move away from assigning punishment to a person for what he is and attributing culpability to a person for what he has committed. However, there are some internal contradictions in the system regarding this fact that lead to the conclusion of the importance of understanding the behavior and the person who performed it in order to arrive at the correct and just punishment.

For example, the Penal Code provides, in its article 65, item III, subparagraphs "a" and "e", that an individual's penalty must be mitigated when he commits the crime for reasons of relevant social or moral value or when he commits the crime under the influence of a mob in turmoil, if not provoked, respectively.

From reading the provisions of the code, it appears that the influence of external and internal factors on the individual is inseparable from the assessment of his guilt.

Regarding the first example brought up above, the code does not define what can be understood as a reason of relevant social or moral value. The concepts

[64] RAICHLE, 2003, page 3958.
[65] EAGLEMAN, page 157.

of what can be considered as moral will not be approached in this work, due to the nebulous and dissonant contours about its conceptualization. However, the fact is that it is something internal to the individual.

What is morally right is not right for everyone, universally. Different people have different conceptions about the moral precepts that must be followed and respected during life in society. Likewise, the “relevant social value” can only be considered as such after analyzing the social context in which the individual lives, their customs, and everyday social practices.

That is, it is impossible to totally distance oneself from the individual itself and look only at the fact to assess their guilt and apply a fair penalty that, in fact, serves the purpose of resocialization to which it proposes.

This does not mean that such analyzes should not be carried out with caution and in order to avoid extremism, following objective and scientifically well-defined criteria. Thus, the more studied and understood human behavior, the more useful it will be to apply and serve the sentence to achieve the purpose of ressocializing an individual.

And it is undeniable that the study of issues related to legal responsibility have been the center of many studies in neurolaw:

> “For the better part of its trajectory, neurolaw has dealt prominently with questions relating to legal responsibility, especially on criminal law. Several cases involving brain damage (from trauma, tumors etc.) and the ensuing consequences for behavior and culpability have generated vivid discussions amid lawyers, philosophers, and neuroscientists alike. Challenging long time established ideas about conscious will, free will and moral responsibility, neuroscience has raised an entire set of new problems for legal reasoning, shaking the grounds of traditional practical philosophy.”[66]

Since the law focuses on regulating human behavior, the better understanding of that behavior can be greatly beneficial:

> “Although interdisciplinarity is often more defended than actually practiced, jurists and neuroscientists alike would greatly benefit from working closer

[66] CARDOSO, 2021, page 66.

together and learning from each other's expertise. After all, both of them share an extended interest in a common object: human behavior. Their perspectives and final goals might be very far apart from each other, but crossing the disciplinary borders offers great promises, not only for law and neuroscience but for the humanities and the natural sciences in general."[67]

[67] Idem, page 75.

2.2. – Using neuroscience to predict behavior and recidivism

Ruiz and Muñoz (2021) point out that there are efforts by neuroscience scholars to understand the existence of risk factors for delinquency or recidivism. The authors define neuroprediction as the prediction, prophecy or announcement of future behavior based on evidence or neuroscientific tools. It is undeniable, however, that although based on scientific evidence, neuroprediction can lead to the construction of an erroneous notion that its predictions have an irrefutable degree of certainty (RUIZ and MUÑOZ, 2021, p. 3).

But what is the main predictive tool available in the world? The brain itself. That is why the majority of studies on the subject have the goal to use neuroimaging as a way to identify future behavior:

> "The human brain is a massively interconnected network consisting of 86 billion neurons with trillions of connections between neurons (Azevedo et al., 2009). Human cognition requires coordinated communication across macroscopic brain systems composed of both gray matter (cell bodies) and white matter (axons; Bassett & Sporns, 2017). The gray matter is typically divided into brain regions composed of large groups of adjacent neurons that have similar properties, and these regions demonstrate specialized information processing and knowledge representation. The white matter provides the structural connections between distant brain regions and is often described as the wiring in the brain (Vettel, Cooper, Garcia, Yeh, & 2 Verstynen, 2017). Together, brain networks support cognition and human behavior by communicating information among brain regions for integrated processing and rely on the structural connections to enable efficient and rapid responses across distant brain regions (Passingham, Stephan, & Kötter, 2002). Consequently, coordinated communication across the brain is fundamentally constrained by specialized processing in individual brain regions and patterns of interconnections reflected in functional connectivity of synchronized activity between regions.
>
> The brain-as-predictor approach measures brain activation while individuals evaluate information about various behavioral options, and then uses that activation to predict subsequent behavioral outcomes, often over the course of weeks, months, or even years (see Cascio, Scholz, & Falk, 2015; Falk & Scholz, 2018; Knutson & Genevsky, 2018 for a review). The majority of these studies use functional magnetic resonance imaging (fMRI) to measure brain activation, although other imaging modalities such as electroencephalography (EEG), functional near infrared spectroscopy (fNIRS), magnetoencephalography (MEG), or positive emission tomography (PET) could also be used."[68]

[68] BASSET et al., 2019, page 18.

The concept of prediction is invaded with misconception. Commonly, to predict means to anticipate the future using information available in the present, but the term's meaning can vary:

> "First, prediction can refer to a correlation between two contemporaneous values, such as height predicting weight. Second, prediction can refer to the correlation of one variable in a group at an initial time point to another variable in the same group at a future time point (an in-sample correlation). Third, prediction can refer to a generalizable model that applies to out-of-sample individuals. All studies reviewed here relate an initial brain measure to a future behavioral outcome, and the term correlation refers to in-sample findings, and the term prediction refers to out-of-sample generalizations."[69]

But, when talking about neuroprediction, we must put aside the notion that a prediction is something set in stone.

We are not talking about pinpointing the exact time and place when a crime will take place. Neuroprediction is, as seen in this work, about identifying potential risk factors of criminal behavior.

The criminal justice system is always based on some form of prediction. When legislators create a disposition in the criminal code, they are, somehow, predicting the consequences that can come from the occurrence of a type of behavior.

When judges apply the penalty for a crime, they also consider the personality of a person to try to determine whether that person is at risk of reoffending. We will not go into detail about the many (and there are many) complications that can come from analyzing someone's personality.

The criminal behavior is always cause for curiosity. The media and the people are always trying to make sense of the reasons that led someone to commit a crime. It is as if that behavior is something to be understood and people will go the distance to try to achieve this goal.

[69] GRABRIELI, et al, 2015, page 12.

AHARONI (2013, page 1) highlights how the initial attempts to predict future antisocial behavior based on clinicians' opinions only were very inaccurate. In the same sense:

> "Counseling psychologists make far too many decisions in which the absolute right answer is not the issue and in which determining statistical decision rules may never be practical (e.g., moment-to-moment decisions; Spengler et al., 1985). For these decisions, the clinical strategy is necessary. However, after reviewing 56 years of research, we conclude that clinical prediction should not be the only method. After being shown by two meta-analyses and several independent analyses to be at least equal and often superior to clinical decision making in counseling psychology and mental health contexts, statistical methods must be one of the strategies of the careful clinician. Quoting Meehl (1954), "We have no right to assume that entering the clinic has resulted in some miraculous mutations and made us singularly free from the ordinary human errors which characterized our psychological ancestors" (p. 28)."[70]

But subsequent research showed that using evidence-based statistics like age, sex and criminal history can improve the prediction of risk factors concerning recidivism. Aside from evidence-based statistics, dynamic factors also started being studied to try to predict risk factors for recidivism, like impulsivity, drug use, social support etc.

And why did this subject become important to so many studies? When laws are created and enforced, not only is it done in order to punish, but also with the hope that doing so will prevent that person from doing it again.

It is important to differentiate clinical from actuarial violence risk assessment:

> "In other words, whereas clinical risk assessment employs "intuitive" and "subjective" methods, actuarial risk assessment employs "mechanistic" and "automatic" methods. According to this way of carving out the difference between the two general approaches, "actuarial tables spell out precisely what kinds of data are to be considered in the prediction, while the clinical approach appears to let the choice of data vary somewhat with the individual case"".[71]

Regarding clinical risk assessment, in a typical case, a mental health professional examines the patient's criminal record and interviews the patient. In

[70] ÆGISDÓTTIR et al, 2006, page 374.
[71] BIBAS, 2010, page 12.

the clinical risk assessment, there is a connection between the facts and the clinics' opinion.

Commonly, clinical predictions of future behavior, basically, consider guilt acceptance, the ability to act under stress, imagination, behavior during detention, and seriousness of anticipated conduct[72].

But it is important to note that every assessment done by a human being is, in its nature, full of biases and heuristics. Therefore, every analysis must be considered carefully. As an attempt to drive away from the effects human biases can bring into the analysis, an alternative can be actuarial risk assessment.

This work will not go into much detail about actuarial risk assessment since it is not the scope of the paper. So, back to our point, how does neuroscience help in this scenario?

Violence is a multifaceted and complex problem, but many studies have been conducted in the past two decades to try to contribute to the controversy and there are many factors that need to be considered as sources of prediction making:

> "The social environment—the actions and reactions of other human beings—can be predicted at a range of temporal scales, from milliseconds (where will she look when the door slams?) to minutes (when she comes back, where will she search for her glasses?) to months (will she provide trustworthy testimony in a court-case?). All of these contexts afford predictions of a person's actions in terms of her internal states, but the sources and timescales of the predictions are different. As we describe in the next three sections, many experiments find that neural responses to predictable actions and internal states are reduced, compared to unpredictable actions and states. This common pattern can provide telling clues about the different types, and sources, of predictions. We find that, while all regions show a higher response to unexpected stimuli, what counts as unexpected varies across regions and experiments, suggesting that, at different levels of processing, neural error responses are sensitive to distinct sources of social prediction."[73]

Bibas (2010, page 23) gives the idea that, soon, neuroscience will be used to improve the validity and reliability of future dangerousness. But for this to happen, here are a few points that need to be considered.

[72] Dix, G. 1975. Determining the continued dangerousness of psychologically abnormal sex offenders. Journal of Psychiatry and the Law 3: 327–344.
[73] KOSTER-HALE; SAXE, 2013, page 841.

First, for neuroprediction to be admitted as evidence in a trial, some precautions have to be taken. In the U.S., an important precedent was set regarding the criteria for admitting expert evidence into trial, called *Daubert* standard. Bibas (2010, page 23) explains that:

> "(...) in the landmark decision in Daubert v. Merrell Dow Pharmaceuticals, the U. S. Supreme Court held that in federal cases the Federal Rules of Evidence superseded the Frye test. More specifically, the Court held that federal judges have a duty to "ensure that any and all scientific testimony or evidence admitted is not only relevant, but reliable."75 The Court then provided a non-dispositive and non-exclusive76 list of criteria to assist judges in making determinations concerning the reliability of scientific evidence:
>
> 1. Has the technique been subjected to falsification and refutation via experimentation?
>
> 2. Has the technique been subjected to peer review and publication?
>
> 3. What is the known or potential rate of error?
>
> 4. Has the technique been generally accepted within the relevant scientific community?"

For now, there is no way to affirm that neuroprediction can be used in a trial. Since it is an incipient field of research there is very little to say about the way that neuroprediction can be interpreted by a judge or a jury. But beyond the evidentiary concern, there is a constitutional concern that will be discussed further on.

Nadelhoffer and Sinott-Armstrong (2012) believe that the advances in violence risk assessment and in the neuroscience of violence can make us cautiously optimistic when it comes to the promises of neuroprediction[74].

The authors point out that the main problem when using predictions of future dangerousness is that, from a purely retributive point of view, it does not matter. That is because what matters is what the person has already done, not what they might do in the far or near future.

But, as was said before, prediction is an important factor in the legal system. So, the authors stand by the idea that, if legal decision making is going to rely on predictions of future dangerousness, there is a need for these predictions to be as

[74] NADELHOFFER, Thomas; SINNOTT-ARMSTRONG, Walter, page 634.

accurate as possible. Decisions about bail, probation and the sentencing length take into consideration a person's probability of doing it again. The legal system is always worried about behavioral risk factors in this sense:

> "Methodologies have expanded the scope of assessing risk of reoffending, and over the past 40 years courts have become significantly more advanced in attempting to divide high- from low-risk offenders. The predicted level of risk can be used to determine pretrial release, steer bail amount (Desmarais and Lowder, 2019), length of sentence, or probation status, and it can also shed light on rehabilitation strategies. Having an idea of the risk someone poses to the public can allow courts to more optimally produce sentences to balance freedoms against societal protection."[75]

The advent or neuroimaging was a determinant factor to understand the biological basis of human behavior. But these neuroscientific advances carry a great deal of speculation about their applicability in the real world, how Poldrack (2018) points out:

> "Each new neuroscientific advance is greeted with a chorus of speculation about its application to the real world, and nowhere is the level of anticipation higher than in the courts, because law, more than almost any other profession, faces daily the challenge of rendering judgments based on the contents of that black box."[76]

However, neuroimaging has brought some light into how a behavior occurs and what does it mean, but there is still much more unknown than known territory when it comes to the brain:

> "(…) it appears likely that any one measure of brain function, structure, chemistry, and connectivity will account for only a small amount of variance in violent behavior. Furthermore, while the neurobiological basis of interindividual variability is coming into increasing focus, we still know relatively little about how individual brains change over time (intraindividual variability). Likewise, the relevance of lab-based measures of self-control (to take one relevant example) for predicting individual variability in real-world behavior remains largely unclear."[77]

So, how useful can neuroprediction really be? Aharoni (2013) talks about a study that examined the use of neuroimaging data for future criminal acts. Ninety-

[75] HAARSMA et al, 2019, page 2.
[76] POLDRACK et al, 2018, page 3.
[77] Idem, page 5.

six adult offenders were told to execute tasks while being monitored by and fMRI machine. The machine measured the task related activity in the anterior cingulate cortex.

After the collection of the data, rearrests of up to 4 years were examined and the study concluded that people that had anterior cingulate cortex activity below the medium response of the general population were 60% more likely to reoffend. On the other hand, those with higher responses were 46% less likely to reoffend.

Studies like this one show us that neuroprediction has promise when it comes to identifying risk factors for recidivism in a group. But there is no information in the studies conducted that can lead us to conclude that individual behavior can be predicted to any degree of certainty.

Another example is another study conducted that analyzed brain age as a factor for trying to predict future antisocial behavior:

> "Significant predictors included areas of the medial and anterior temporal cortex (e.g. amygdala and temporal pole), and the orbitofrontal cortex. When compared directly, models using brain-age measures performed better than those using chronological age. Further, these measures incrementally improved on previously developed models that incorporate a number of other important factors, including psychopathic traits, drug and alcohol use, and functional neuroimaging data corresponding to performance on a behavioral inhibition task"[78]

Regardless, neuroprediction is a reality. Therefore, it is an important subject to be discussed. Its importance does not mean that research in the field can be conducted carelessly. The though process needs to go in the immediate opposite direction.

By using neuroimaging and studying the data obtained from it, it is possible to identify, at least, risk factors for criminal behavior.

[78] KIEHL, Kent A.; ANDERSON, Nathaniel E.; AHARONI, Eyal; MAURER, J.Michael; HARENSKI, Keith A.; RAO, Vikram; CLAUS, Eric D.; HARENSKI, Carla; KOENIGS, Mike; DECETY, Jean. **Age of gray matters: neuroprediction of recidivism**. **Neuroimage**: Clinical, [S.L.], v. 19, p. 813-823, 2018. Elsevier BV. http://dx.doi.org/10.1016/j.nicl.2018.05.036, page 25.

One of the main challenges for neuroprediction is that the studies conducted in the field need to respect and preserve certain rights of the participants. For example, the participation needs to be preceded by informed consent regarding the use of a person's data and information. Exactly because of informed consent, there is an emergent point of discussion which are the neurorights.

2.3. – The importance of understanding the concept of neurorights

Since technology is advancing towards the increase in the use of neuroimaging and neurotechnologies it is important to discuss the possible impacts of their use in day-to-day life. Many articles and books are taking care of discussing the consequences of these technological advances.

With the use of neurotechnologies comes the concept of neurodata. Neurodata, on the other hand, is the data obtained from the function of the human brain. So, the person who possesses neurodata has the ability of taking a peep into the brain:

> "Neurodata is the description of data directly representing the function of the human brain. Information allowing the possessor to peer into the processes of the human brain would be of significant value in a plurality of contexts where one party seeks influence or knowledge about another—especially when it would allow the more complete understanding and prediction of the actions of one, or a group, of individuals."[79]

We can argue that there is very significant value in neurodata, which, as defined above, is data obtained from how the brain operates:

> "As cognitive science provides new theories of cognition and comprehension of the brain as a system (or set of systems), it provides templates through which relevance and insight can be extracted from neurodata related to individuals. Accordingly, its relevance stretches beyond the confines of being an isolated academic discipline (or an offshoot of medicine) to having relevance for all disciplines and areas of study in which the action of the individual is relevant."[80]

So, neurodata is easily defined as sensitive information about a person and, as such, need specific protection. There already exist many laws and rules that take care of data protection, which is a legal field that is responsible for regulation everything there is to know about a person's information. Many countries recently have been developing laws in this matter including Brazil.

In 2019, in Brazil, the General Law of Data Protection (LGPD) was published. In it, there are many provisions regarding data. Its main objective is to

[79] HALLINAN; SCHÜTZ; FRIEDEWALD; HERT, 2013, page 1.
[80] Idem, page 4.

protect the fundamental rights of freedom and privacy and the free development of the personality of the natural person.

It also focuses on creating a scenario of legal security, with the standardization of regulations and practices to promote the protection of the personal data of every citizen who is in Brazil, in accordance with existing international parameters.

The law defines what is personal data and explains that some of them are subject to even more specific care, such as sensitive personal data and personal data about children and teenagers. It also clarifies that all data processed, both in physical and digital media, are subject to regulation.

In addition, the LGPD establishes that it does not matter whether an organization's headquarters or its data center are in Brazil or abroad: if there is processing of information about people, Brazilian or not, who are in the national territory, the LGPD must be observed.

The law provides citizens with several guarantees, such as: being able to request that their personal data be deleted; revoke consent; transfer data to another service provider, among other actions. The processing of data must be carried out considering some requirements, such as purpose and need, to be previously agreed and informed to the data subject.

There is a law proposal being discussed in Brazil that aims to include neurodata into the legislation. The text defines neural data as any information obtained, directly or indirectly, from the activity of the patient's central nervous system, through brain-computer interactions, such as hearing and orthopedic equipment that operate through signals collected directly from the brain.

This data, according to the proposal, becomes part of a special category of sensitive data related to health and requires greater protection.

The project establishes that the processing of neural data will only occur with the consent of the patient or the person responsible for him. In the consent form, the patient must be clearly informed about possible physical, cognitive and

emotional effects of the treatment, in addition to contraindications and rules related to privacy and information security.

In Europe, on the other hand, the basis of the legislation is the Directive/95/46/EC 1995 and the rules are similar to Brazil. For now, saying that neurodata is data from the mind is difficult when it comes to the law:

> "However, the argument that the processing of neurodata is the processing of data from the mind, or an interference with the individual's interests in the mind, is legally difficult and inexact.
>
> (…)
>
> As Bublitz astutely states: 'I suspect legal scholars and courts are not too ambitious to get into these questions and rather cling to the belief that freedom of thought is not only legally, but factually inviolable as thoughts and the mind are "intangible" and beyond the reach of interventions' (Bublitz 2011: 97). Built upon this fundamental conceptual uncertainty is the consequent uncertainty as to what neurodata really reveals and how to categorise the data in relation to the mind. Can reading electrical signals from certain points on the skull be equated with an interference with the mind? Even if it could in certain cases, not all forms of neurodata processing are the same, or aim at the same level or form of insight into the individual."[81]

The discussion needs to evolve in a direction to decide if neurorights are encompassed in general data protection or if there is a necessity to develop new regulations that are specific to them.

The need for this discussion comes from the fact that technological tools allow (although in an embryonic way, considering the immensity of brain activity) a certain degree of certainty in obtaining brain data that belong to an individual's private sphere and deserve legal support and protection. Thus, there is the right to mental privacy, derived from the right to privacy (IENCA and ANDORNO, 2017, p. 13).

According to Bublitz (2013), pointed out by Ruiz and Muñoz (2021) as one of the first authors to address the topic of neurorights, people have the right to use the neurotechnologies that emerge, but they also have the right to be protected from harm coercive and non-consented use thereof to your disadvantage. The author conceptualizes this double dimension of neurorights as cognitive freedom.

[81] Idem, page 8.

Bublitz (2022) recently explored the proposed list of neurorights crafted by the Neurorights Initiative:

> "The *right to personal identity*: "Boundaries must be developed to prohibit technology from disrupting the sense of self. When neurotechnology connects individuals with digital networks, it could blur the line between a person's consciousness and external technological inputs".
>
> The *right to free-will*: "Individuals should have ultimate control over their own decision making, without unknown manipulation from external neurotechnologies".
>
> The *right to mental privacy*: "Any data obtained from measuring neural activity ("NeuroData") should be kept private. Moreover, the sale, commercial transfer, and use of neural data should be strictly regulated."
>
> The previously mentioned Nature paper considers the idea that a new regulation for neurodata "may be analogous to legislation that prohibits the sale of human organs" [3], 161). What sounds like an idea for discussion there apparently turned into a concrete policy advice by the NRI subsequently.7
>
> The *right to equal access to mental augmentation*: "There should be established guidelines at both international and national levels regulating the development and applications of mental-enhancement neurotechnologies. These guidelines should be based on the principle of justice and guarantee equality of
> access to all citizens."
>
> *The right to protection from algorithmic bias*: **"**Countermeasures to combat bias should be the norm for machine learning. Algorithm design should include input from user groups to foundationally address bias."
>
> These rights touch on broad issues, every right might merit elaborate, monograph-length treatment on its own. Here, only a brief commentary on them in light of quality criteria for novel rights will be provided in the sixth section. Before, more abstract and formal worries about the proposal shall be addressed."[82]

CARDOSO (2021) argues that, since it is a newly developed field, there is still much to be defined:

> "To be sure, there is still a lot to be clarified as to how terms like "mental", "identity", "free will" or "enhancement" should or would be interpreted and about the extension that these new "neurorights" will be implemented, but undoubtedly this is a very important, foundational step in the history of neuro-law. Further discussion on this is deeply needed, and it shall include scientists, legislators, jurists, philosophers, psychologists, and especially the civil society directly affected by these deep legal changes."[83]

[82] BUBLITZ, 2022, page 3.
[83] CARDOSO, 2021, page 65.

The more the discussion develops academically, the easier it will be to talk about the development of laws and rules in this sense:

> "The present, much less sophisticated criticism of neurorights might be misplaced as well. After all, the law is constantly evolving in response to technological and societal developments. But we should assure that these developments are shaped by substantive scholarly work rather than shiny declarations."[84]

If we don't take into consideration the emergence of neurorights as it develops and grows, we run the risk of coming late to it and then the damages can be too great to count:

> "However, these same technologies, in particular brain-computer interfaces (BCI) and those allowing the acquisition and interpretation of brain data, create unprecedented challenges to basic human goods, such as the privacy of our mental life, freedom of thought, freedom from discrimination, freedom from self-incrimination and self-determination, just to mention a few examples. Ultimately, these developments could directly jeopardize human dignity, as they relate to the heart of human personhood and identity."[85]

[84] BUBLITZ, 2022, page 13.
[85] GARCÍA-LÓPEZ; MUÑOZ; ANDORNO, 2021.

Chapter III

3 – Expectation *versus* reality: how to deal with predictive policing in the real world

3.1 – The (im)possibility of a predictive policing system respectful of human rights and neurorights

A lot of countries use predictive policing systems, and, in this article, we have examples of the simpler systems to the more elaborate ones. The questions are: How much does security cost? Can we legitimate a criminal justice system based on predictions?

Saying that predictive policing must be treated carefully would be an understatement:

> "(…) illegal police practices can significantly distort the data that is collected, and the risks that dirty data will still be used for law enforcement and other purposes. The failure to adequately interrogate and reform police data creation and collection practices elevates the risks of skewing predictive policing systems and creating lasting consequences that will permeate throughout the criminal justice system and society more widely."[86]

As explained above, the three countries whose predictive policing systems were described in this paper are essentially different. Regarding the Italian example, the Delia system seems to be less invasive. Because it is designed to target a specific type of crime, the system deals with more objective data and seems to be helpful identifying serial criminals in order to charge them for their crimes.

There is no way to affirm that predictive policing is the most effective solution when it comes to diminishing crime rates. It is not a miracle, but a complex solution invaded with more questions than answers:

> "Predictive policing, while remaining largely undefined, is still mostly an analytical challenge and curiosity for crime analysts and computational scientists. It currently lacks integration with operational policing as found with more holistic and established frameworks such as problem-oriented policing and intelligence-led policing. The evidence from this article has one clear

[86] RICHARDSON; CRAWFORD, 2019, page 48.

> implication: to capitalize on the opportunities provided by predictive analytics requires a range of complex organizational capabilities to be in place. Without simultaneously and explicitly considering the analytic and organizational structures necessary to implement the findings of predictive regimes, police agencies will not be able to effectively utilize predictive research, and frustration and disillusionment will result."[87]

However, it is not immune to risks. The fact that the system needs a human analyst to classify the data can be a problem due to each person's subjectivity. Although, with proper training and supervision, this issue can be minimized, as some authors defend:

> "While "data bias" presents a potential vulnerability, it may not be any worse than the existing policing practice. The same implicit and explicit biases that influence the data also influence the police officer on the street (with or without the data). Thus, supporters of predictive policing might rightly argue that while predictive policing programs are not completely free from bias, the move to a data-driven system could reduce bias, or at worst maintain the status quo.245 Further, if these vulnerabilities could be addressed, then an overall reduction of bias would occur."[88]

So, the system apparently does not seem to be a threat and, if properly used, it seems to be a very good tool to decrease violence:

> "The attempt to use neuroimaging studies (of groups and of a given individual) as bases to establish likely future conduct, and specifically future violent conduct, is a matter of controversy, and a work in progress. As explained, lawyers (from both sides) seeking to address a prediction of future dangerousness that is rooted in part in neuroimaging studies should carefully consider the panorama of relevant scientific literature and should consult with persons who are not only knowledgeable about the research in question but who are also knowledgeable about neuroscience-based research and diagnostic techniques— and the many variables, including the statistics, that will permit some understanding of the strengths and weaknesses of neuroimaging."[89]

The U.S. systems are more concerning. When the system starts to rate people according to some criteria, the justice system runs the risk of perpetuating the racial bias in criminal justice for good, and the problem's source can become more obscure:

[87] HABERMAN; RATCLIFFE, 2012, page 164.
[88] FERGUSON, 2017, page 1150.
[89] PHILIPSBORN, 2020, page 24.

> "Once a discriminatory result is discovered, the reasons for it are likely to be unclear. Even if the result can be traced to a data quality problem, those problems are often quite complicated to rectify. It might be easy to determine that something is off about the data, but it can be more difficult to figure out what that something is. While the source of some biases might be clear on the face of the analysis, most others are not. For example, the potential for skewed data because of biases in distribution of prior police resources is the most well-known data quality issue with predictive policing.274 Thus, it makes sense to check if that is what might be causing the skew. When past crime data is involved in the calculus, then the source of bias is clear.275 But commercial or social media data is likely to have biases that are not as apparent and could be skewing the program's outputs in unknown ways, with no way to investigate."[90]

But the racial bias is not the only problem. Even if we consider the systems that are based only on objective data like location and times of day, those kinds of directives for police action can also increase the occurrence of bias driven police action:

> "In regards to place-based predictive policing methods that forecast a time and location where a crime may occur, the concern is that racially biased police practices may be directed toward some areas rather than others (Ferguson, in press). In addition, knowing that they are in a prediction area may heighten the awareness of police officers in ways that amplify biases (Ferguson 2012). That is, a minority individual observed in a prediction area may be more likely to be subject to biased police actions than the same individual observed outside of a prediction area."[91]

The criminal justice system's objective, from the investigation to the charging and prosecution, is to reconstruct a criminal fact to bring responsibility to the perpetrators. People are judge for what they have done, not for who they are. Therefore, by allowing police to follow and monitor people based on personal criteria, there is a clear violation of privacy, intimacy, and fundamental rights.

When it comes to the Chinese system, the problem distances itself a little further from the criminal justice system per say because of its political use. There are no evidence pointing away from the system being used almost exclusively for political reasons, but that is an issue that deserves to be explored in another opportunity.

[90] SELBST, 2017, page 163.
[91] BRANTINGHAM et al, 2018, page 4.

The fact that risk factors for human behavior and criminal behavior can be predicted cannot be denied, but that does not legitimate an intervention that mitigates fundamental rights. The justice system exists and is designed to work as a response when faced with criminal activity. It does not serve the purpose of punishing someone for something they have not even done yet.

In 1999, in Germany, Gunther Jakobs created a theory called Feindstrafrecht, that is going to be referred to in this work. This theory classifies people into two different categories: citizens and enemies. The citizens are people that made mistakes, but showed willingness to participate, make commitments and showed loyalty respecting all the guaranties that the law has to offer. The Citizen's Criminal Law[92] guarantees the law as an expression of society.

People that do not fit in to the social patterns due to their profession, sexual or social conduct or some other reason, are considered enemies. And, for them, the constitutional rights and guarantees do not apply.

The author justifies the legitimacy of the legal system defended by him on three pillars:

1) The State reserves the right to preserve safety when faced with individuals that are reoffending.
2) The population have the prerogative of demanding that the State takes adequate and effective action to preserve everyone's safety.
3) It is best to perfectly define the rules that apply to the enemies so that they do not contaminate all of the criminal law.

For Jakobs, the enemy is not a part of society as an individual entitled to rights. This individual only has duties. According to him, if a person cannot be trusted to behave accordingly, cannot expect to be treated as a person. The State is not even authorized to treat this person as such because it the State were to do this, it would jeopardize the rest of the community's right to safety.

[92] This term was translated freely.

One of the most important characteristics of this theory is that an individual is not punished considering their culpability, but how dangerous they are.

Related to this theory is a concept that can be understood as the criminal law rules being designed and applied directly to people and their characteristics, instead of facts. That is exactly the risk of allowing systems like the ones from the U.S. and China legitimate criminal persecution. It can result on an anticipation of guilt, on making a person do the time by having their fundamental rights mitigated and diminished before they even think about committing the crime.

Therefore, these systems must be used carefully and should, maybe, go through a redesigning process so that they can be distanced from this risk.

In contraposition to this theory, there is a theory that considers rational criteria for the State to intervene when it comes to criminal law, which makes sure that fundamental rights are conceived as limits for the criminal law as a way to orient and correct excesses of power from the State. This theory is defended by the Italian Luigi Ferrajoli.

The predictive policing systems should be used carefully so that law enforcement does not jump the gun on inflicting punishment. For now, the majority of the existing systems use technologies that take into consideration more objective data:

> "According to Josh Scannell (2015), many of the current predictive policing technologies are based on disease or weather prediction models: these technologies focus on locations and operate preventively by, for example, increasing law enforcement presences in the areas of potential crime. In other words, the mapping of a location is based on techniques of data analytics and data visualization, which is then used to control certain areas."[93]

According to the NIJ, assessing the risk of an individual committing future crimes is sensitive when it comes to personal privacy concerns. They have

[93] KARPPI, Tero. **"The Computer Said So": on the ethics, effectiveness, and cultural techniques of predictive policing. Social Media + Society**, [S.L.], v. 4, n. 2, p. 205630511876829, abr. 2018. SAGE Publications. http://dx.doi.org/10.1177/2056305118768296, page 3.

discussed this topic on the first symposium held, where a group of specialists on privacy and civil liberties concluded that:

> "1. Policing has a rich history of dealing with privacy and related mistakes, and these issues have yet to be resolved. In Brazil, for example, there are many cases in which police accesses somebody's cellphone or even someone's home without warrant.
>
> 2. The suspicious activity reporting effort provides lessons for how to develop a privacy policy. We learn from our mistakes, but there should be crystal clear consequences to mistakes regarding privacy and fundamental rights violations.
>
> 3. There will come a time when training in privacy issues is considered as important to a policing program as its firearms policy.
>
> 4. Transparency is critical to establishing community trust.
>
> 5. Understanding what behaviors have a nexus to crime provides a valid purpose for law enforcement.
>
> 6. Predictive policing must be constitutional. The Constitution is the legal document that should guide all of the activities conducted by any government agency. With policing, it cannot be different. Therefore, it is the pathway to be follow in order to implement any predictive policing system, otherwise, it will be doomed to fail."[94]

It is important to have in mind that the idea of using predictive policing as a way to anticipate punishment is inadmissible:

> "There is an obvious utility in preventing crimes before they occur, but our notions of individual responsibility, guilt, and punishment rest on the commission of acts — of actually doing certain things that constitute crimes — rather than imagining, desiring, or simply being psychologically pre-disposed or circumstantially inclined toward doing things which would be criminal. In some instances, planning or discussing criminal acts with others are acts that can themselves constitute a lesser crime, such as conspiracy or solicitation to commit a crime, and a failed attempt, e.g., to kill someone, can still constitute the crime of attempted murder even if nobody is actually hurt."[95]

Neither can predictively policing systems be used as an excuse to justify all kinds of police conduct. The police still need to be held accountable for their actions and behavior when pursuing an investigation:

> "Accountability has two competing meanings in the context of policing: it is either concerned with control of the police or the requirement that police must explain their conduct – '[b]oth models of accountability seek to legitimate the conferring of extraordinary powers upon the police…by reassuring citizens

[94] WALTER et al, 2013, pages 82 and 83.
[95] ASARO, 2019, page 45.

> that police are not out of control or their actions free from appropriate scrutiny"[96]

3.2 – Behavior prediction as an instrument for the creation of public policies

Behavior prediction, whether it is neuroscientific, or police related, deals with data. Data regarding predictive policing, as presented above, can be obtained by objective or dynamic data. But does this data need to be used to predict crimes or can we find a better use for it?

There are some studies conducted in cognitive neuroscience that tell us important findings that can come from understanding human behavior. These conclusions can be used to substantiate the creation of public policies directed toward diminishing recidivism and crime rates.

For example, in 1935, a man named John Ridley Stroop created a test[97] to investigate the interference in serial verbal reactions. In the experiment, the participants were told to, when presented with color words written in different colors, read the color of the printing instead of the color that the word really represented:

> "The materials employed in these experiments are quite different from any that have been used to study interference. In former studies the subjects were given practice in responding to a set of stimuli until associative bonds were formed between the stimuli and the desired responses, then a change was made in the experimental 'set up' which demanded a different set of responses to the same set of stimuli. In the present study pairs of conflicting stimuli, both being inherent aspects of the same symbols, are presented simultaneously (a name of one color printed in the ink of another color—a word stimulus and a color stimulus). These stimuli are varied in such a manner as to maintain the potency of their interference effect. Detailed descriptions of the materials used in each of the three experiments are included in the reports of the respective experiments."[98]

[96] MOSES; CHAN, 2016, page 817.
[97] STROOP, 1935.
[98] Idem, page 947.

By doing so, the test created a relation between how the brain processes information and how long does it take for an information to come out depending on the complexity. This relation was called Stroop effect:

> "The effects of this practice were as follows: I. It decreased the interference of conflicting word stimuli to naming colors but did not eliminate it. 2. It produced a practice curve comparable to that obtained in many other learning experiments. 3. It increased the variability of the group. 4. It shortened the reaction time to colors presented in color squares. 5. It increased the interference of conflicting color stimuli upon reading words. 4. Practice was found either to increase or to decrease the variability of the group depending upon the nature of the material used. 5. Some indication was found that the sex difference in naming colors is due to the difference in the training of the two sexes."[99]

On the other hand, Eagleman (2012) presents a proposal of a prefrontal workout as a way to help reintegrate someone into society. His proposal would be to create an impulsivity training to mold irregular behavior to the standards of society living.

The author explains that the region of the brain responsible for controlling impulses is the frontal lobe. The frontal lobe is the part of the brain that drives our urges. Many crimes are committed in a state of pure impulsivity. Criminals usually still know the difference between right and wrong and understand theconsequences of poor decision making.

The author proposes a strategy to give the frontal lobe practice in controlling impulses:

> "Imagine that you'd like to get better at resisting chocolate cake. In this experiment, you look at pictures of chocolate cake during brain scanning—and the experimenters determine the regions of your brain involved in the craving. Then the activity in those networks is represented by a vertical bar on a computer screen. Your job is to make the bar go down. The bar acts as a thermometer for your craving: If your craving networks are revving high, the bar is high; if you're suppressing your craving, the bar is low. You stare at the bar and try to make it go down. Perhaps you have insight into what you're doing to resist the cake; perhaps it is inaccessible. In any case, you try out different mental avenues until the bar begins to slowly sink. When it goes down, it means you've successfully recruited frontal circuitry to squelch the activity in the networks involved in impulsive craving. The long term has won over the short. Still looking at pictures of chocolate cake, you practice making the bar go down over and over until you've strengthened those frontal circuits. By this method, you're able to visualize the activity in the parts of your brain

[99] Idem, page 660.

> that need modulation, and you can witness the effects of different mental approaches you might take."[100]

Impulsivity control seems to be able to, as Eagleman (2012) describes it, identify a risk factor capable of determining who has more tendencies toward recidivism. The experiment as he presents can identify that a person who has less control over his impulses is more likely to commit another crime.

This information could then be used to create a way to implement this treatment as something able to identify a risk factor for recidivism, which would be that people with poor impulse control can be more susceptible to committing more crimes.

As a treatment, this solution is controversial at best. Using it can be problematic and there are no clear and definite conclusions about it, therefore, it is not worth it to put people through it without proof that it can lead to some benefits.

The Iowa Gambling Task (IGT) is a task designed to simulate real-life decision-making situations under conditions of uncertainty regarding consequences, that is, regarding reward or punishment:

> "With respect to the study of impaired decision-making in addiction, the Iowa Gambling Task (IGT; Bechara et al., 1994) has been regarded as the most widely used and ecologically valid measure of decision making in this clinical population. One of the reasons for this ecological validity is that performing advantageously on this task requires, as in real-life, dealing with uncertainty in a context of punishment and reward, with some choices beingadvantageous in the short-term (high reward), but disadvantageous in the long run (higher punishment); other choices are less attractive in the short-term (low reward), but advantageous in the long run (lower punishment). Hence, the key feature of this task is that participants have to forgo short-term benefits for long-term benefits, a process that is presumably severely hampered in drug and gambling addicts (APA, 2013). Accordingly, performance on the IGThas been shown to be a sensitive measure of impaired decision-making in a diversity of neurological and psychiatric conditions (Bechara, 2007)."[101]

[100] EAGLEMAN, 2012, page 178.
[101] BREVERS; BECHARA; CLEEREMANS; NOËL, 2013

It was developed in view of the lack of evidence capable of assessing the role of emotions in decision-making in patients with lesions in the orbitofrontal cortex and supports the somatic marker hypothesis.

The original IGT is a game in which the subject must choose cards from four different decks (A, B, C, D). The objective of the game is to win as much money as possible or avoid losing, and the subject is given an initial credit of 2,000 dollars. Whenever the individual selects a card, he receives a monetary reward, but in some cards the reward is followed by a variable loss of money.

Each deck has a predefined sequence of rewards and punishments. The subject does not know the number of cards per deck and the number of choices he must make (100 selections).

Decks A and B offer the highest rewards ($100 for each selection) but also the highest punishments ($1,250 for every 10 selections). Regarding the frequency of punishments that are repeated in every 10 selections, in deck B there is only one punishment of 1,250 dollars, while in deck A there are five punishments of 150, 200, 250, 300 and 350 dollars.

These decks are classified as “disadvantageous” because, in the long run, monetary penalties outweigh rewards. Decks C and D provide lower rewards ($50 for each selection) but also produce significantly lighter losses ($250 for every 10 trials). Regarding the frequency of punishments that are repeated in every 10 selections, in deck D there is a punishment of 250 dollars, and in deck C there are five punishments of 25, 50 and 75 dollars. They are classified as “advantageous” because, in the long run, the rewards outweigh the penalties.

Thus, in order to earn money, which is the objective of the task, the most effective strategy is to select more cards from decks C and D than from decks A and B. Cognitive apprehension of this strategy can only be acquired through experience.

However, normal subjects decide advantageously before knowing the advantageous strategy, guided by somatic markers (emotional signals) that anticipate emotions previously triggered by the rewards and punishments

associated with each deck. Success in performing the task is thus dependent on the articulation between emotional and cognitive factors.

This first version, called the original ABCD version included a manual procedure with imitation cards and money. Subsequently, an electronic version with virtual money was developed that maintained the same reinforcement guidelines.

The final version allows the alteration of several characteristics of the task before its administration, such as the time between trials, the number of trials, the type of currency and the opening balance. However, the reinforcement guidelines of the first version have been the most widely used. The IGT is used to measure someone's ability to make decisions by taking risks in determined situations:

> "The output of decision-making processes, i.e., which action is taken in the end, is suggested to be determined by an interaction of two different forebrain systems: an emotional (limbic) system and a cognitive control (associative) system (e.g., McClure et al., 2004; Bechara, 2005; van den Bos et al., 2006b; de Visser et al., 2011a; Gläscher et al., 2012; Figure 1). During IGT performance these systems are activated in parallel, i.e., act as feed-forward and feedback systems, to optimize long-term behavior, and only differ in relative weight in different phases of the task (de Visser et al., 2011a). While the emotional system may be dominating the early phase in healthy individuals, the cognitive control system may be dominating the late phase, suppressing (eventually) activity in the emotional system."

So, in these studies, it is possible to identify that neuroscience has a way to identify risk factors for recidivism and crime committing.

The entire criminal justice system is based on facts (or, at least, it should be). A person needs to be held accountable for what they have done, not considering their thoughts or their wishes. But is that the same thing as saying that knowledge of future behavior is useless?

The answer is no, but this information can be put to good use, for example, to the creation of public policies. By using a general, broad definition, public policies are a system of laws and rules that a government puts together in order to address a problem. Therefore, a major factor of public policy is the law. In this sense, the law usually includes specific legislations and provisions.

There are many public policies directed towards recidivism. So, behavior prediction can be used to construct these policies. If we identify risk factors for recidivism, we can construct policies to help prevent recidivism.

As HORTA (2012) highlights, biological factors have much to contribute to the creations and implementation of public policies:

> "The current challenge is to formulate and implement a policy that could intervene in early adverse environments. Contrary to what some "biophobical" social scientists think, biological research provides evidence that reinforces the need for environmental intervention. Since neurobiological research shows that early adversity has effects upon language, cognitive and socioemotional development, stress and immune system function, gene expression, physical and mental health (Mustard, 2009), it serves as an extra argument for the importance of social and cultural environment, not the opposite."

But that also means that, if we are going to consider biological factors as contribution and guidance for public policies, we have to consider that these factors will be identified and obtained by experiments, which are conducted in a lab. It seems fairly obvious to mention, but these conditions bring an important factor into light:

> "Experimentation in laboratory settings may seem a good and rigorous way of isolating variables – but that is precisely the point. When human subjects are taken out of their community contexts, many factors influencing their behavior are also wiped out. Behavioral phenomena are embedded in contextual circumstances, and the former change as the latter does. Therefore, generalizability of laboratory experiments may be compromised. For this reason, Kenneth Dodge has suggested a paradigm shift, arguing entire-community studies should be pursued due to higher ecological validity of findings"[102]

HORTA is precise when affirming that environment matters[103]. The research can benefit greatly from exploring studies on how the environment affects action. Only by uniting both of these factors can we come to an important construction of public policies based on evidence.

[102] HORTA, 2012, page 111.
[103] Idem, page 112.

But it is safe to say that biological and neuro factors can contribute immensely to the understanding of human behavior, which is exactly towards what the public policies are directed.

Conclusions

A lot of countries use predictive policing systems and, in this article, we have exemples of the simpler systems to the more elaborate ones. The questions are: How much does security cost?; Can we legitimate a criminal justice system based on predictions?

Predictive policing systems can only be supported if they use already fully public data. Information that is not widely disseminated by individuals cannot be used, under penalty of discretionary intervention by the State in privacy, intimacy and neurorights. If used in this way, these systems can be interpreted as a viable means of obtaining evidence.

That is because the system is a present reality. Instead of affirming that there is no way that these systems can be used safely, it is more prudent to identify that their use is a reality and focus on how can we prevent problems that can come from it.

The behavior of humans has statistically predictable factors, risk factors that can be identified by neuro experiments. But the use of this predictability must comply with the guarantees of human rights and neurorights and must be directed to the creation of non-repressive public policies as a way of reducing recidivism.

As explained above, the three countries whose predictive policing systems were described in this paper are essentially different. Regarding the Italian example, the Delia system seems to be less invasive. Because it is designed to target a specific type of crime, the system deals with more objective data and seems to be helpful identifying serial criminals in order to charge them for their crimes.

However, it is not immune to risks. The fact that the system needs a human analyst to classify the data can be a problem due to each persons subjectivity. Although, with proper training and supervision, this issue can be minimized. So, the system apparently does not seem to be a threat and, if properly used, it seems to be a very good tool to decrease violence.

The U.S. systems are more concerning. When the system starts to rate people according to some criteria, the justice system run the risk of perpetuating the racial bias in criminal justice for good.

But the racial bias is not the only problem. The criminal justice system's objective, from the investigation to the charging and prosecution, is to reconstruct a criminal fact to bring responsibility to the perpetrators. People are judge for what they have done, not for who they are. Therefore, by allowing police to follow and monitor people based on personal criteria, there is a clear violation of privacy, intimacy and fundamental rights.

When it comes to the Chinese system, the problem distances itself a little further from the criminal justice system per say because of its political use. There are no evidences pointing away from the system being used almost exclusively for political reasons, but that is an issue that deserves to be explored in another opportunity.

The fact that human behavior and criminal behavior can be predicted cannot be denied, but that does not legitimate an intervention that mitigates fundamental rights. The justice system exists and is designed to work as aresponse when faced with criminal activity. It does not serve the purpose of punishing someone for something they have not even done (yet).

Instead of focusing on what can come from trying to punish someone for a crime that has not been committed yet, our focus is best directed towards putting this emergent knowledge to another use: the construction of public policies.

If we can identify risk factors for criminal behavior and recidivism, we should use these discoveries as base for creating public policies directed to those individuals that fit into the risk factors, without labelling them, as a way to diminish the occurrence of recidivism.

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