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Thinking about predictive policing

Introduction

The intention of predicting the future is actually as old as humanity itself. Nowadays, the dynamic change in society as well as the economic crises of the recent years generates that increasing demand for predictions. According to this demand, a serious amount of literature and methodology of futurology has been established from the 1930s. Futurology appeared in Hungary in the 1970s in an institutionalised form, and this process has made an impact on the work of the police agencies as well.

The introduction of some predictive method

For bringing the concept of futurology closer to the reader of this document, I would like to introduce some predictive methods which can predict events for a longer time-frame.[1] One of the most general methodological possibility is to assume that the value of the examined indicator will continue its way in the same direction and with the same extent. This method does not count with the change of the existent trend (such constancy is nowadays rarely possible), nevertheless, this potential future perspective also has a right to exist, thus cannot be ignored. Another method is when we are counting on the recurring pattern of the examined indicator. This method appears for example, in the theory of the Kondratiev-cycle in economics. The third predictive method is useful for examining multiple indicators together with applying the choice of convergency (the value of the indicators approaching each other) and divergency (the gap between the value of the indicators widens further) for the conclusion. Other possible

[1] Robert, M. Clark (2016): Intelligence Analysis: A Target-Centric Approach. CQ-Press.

methods are the application of correlation and regression.[2] The most basic method for involving the analyser's way of thinking is the estimation method, which is for estimating the indicator's future value and interval. The method of projection, as a possible means of prediction, requires the examination of the environment of the indicator as well, in the way of identifying the factors and forces shaping the examined indicator, and examining the potential consequences of making the impact of one of the factors or the forces more intense.

The methods introduced above can be found in one of the possible methods of creating scenarios. This method of scenario creation also puts emphasis on the driving forces of the examined indicator. According to this way of examination, it establishes 3 scenarios:

1) The first is the scenario of interpolation, in which the strength of acting forces remain unchanged;
2) The second is the scenario of projection, in which one part of the factors' function remain unchanged, but the other part of the factors change their impact on the indicator;
3) In the third type of scenario, all the factors and forces are changing constantly, and other new forces can appear to have impact on the indicators.

In futurology, next to choosing the appropriate method, it is also important to give special attention to the impacts, that are strengthening each other as well as to the feedbacks.[3] The forecasts of the future can happen in various levels and time dimensions, however, this perspective will not be discussed in this essay, owing to the limitation of length. In the following parts, fresh recent experiences on the Austrian and German side will be discussed.

[2] Nemes-Nagy, József (ed.) (2005): Regionális elemzési módszerek [Regional analysis methods.]. ELTE Regionális Földrajzi Tanszék MTA–ELTE Regionális Kutatócsoport.
[3] Robert M. Clark: c.b.

Foreign experiences on the predictive policing

The society's demand on forecasts and prediction have reached the policy agencies as wellbecause of the intensifying tensions concerning the global terrorism and irregular migration.[4] As a consequence, "predictive policing" became established, which tries to draw conclusions and prevent future crimes according to crime data (primarily geographical coordinates) of the past. This method was initiated in the USA in the 1990s, primarily in State of New York, and was later applied with success in Chicago and California as well, consequently improving the performance of the police in law enforcement. However, it was not a resounding success, since two major problems appeared in connection with the method of predictive policing. One of them was the problem with the source and depth of the input data, the other problem was generated around the conclusions drawn from the data and the consumption of these conclusions later on. The main problems were defined from one point as the scale of unreasonable consumption of personal data and from the other point that as the crime maps[5] on some of the areas with detrimental conditions were made public it contributed to the further and deeper misjudgment of these areas. In the case of the source of input data, two main direction exists: one uses data in connection with committed crimes (coordinates of the location of the crime, statistical environment of the society, method of crime), the other adds personal data as well. The latter solution has been applied in the USA, GBR and Switzerland.[6]

[4] Mátyás, Szabolcs – Sallai, János – Tihanyi, Miklós – Vári, Vince (2019): A rendőrségi elérhetőség és a bűnözés közötti térbeli összefüggés térbeli elemzése. In: Területi Statisztika, 2019/2. [Police contact and spatial analysis of the spatial relationship between crime. In: Territorial Statistics, 2019/2.]
Source: http://www.ksh.hu/docs/hun/xftp/terstat/2019/02/ts590202.pdf
Accessed: 23.04.2019

[5] Salllai, János (2014): Bűnözésföldrajz: a rendőrség szolgálatába állított tudomány [Criminal geography: a science put at the service of the police.]. Belügyi Szemle, 2014/9.

[6] Tobias, Knoblauch: Vor die Lage kommen: Predictive Policing in Deutschland: Chancen und Gefahren datenanalytischer Prognosetechnik und Empfehlungen für den Einsatz in der Polizeiarbeit – Bertelmann Stiefung.

Another challenge in predictive policing lies in the different kind of algorithms that can be used up to the prediction of the next crimes, not to mention those ethical and professional questions that are possible to arise. In this case, I consider the German professional conference held in 2018 April a good exercise, where regional policy agencies, researchers and representatives of the civil sphere took equally part. The dilemma of choosing softwares for performing predictive algorithms' activity can be also shown on German examples. In this case, the role of market is also significant, because of the tremendous amount of money being invested into the development of such predictive softwares. In those regions of Germany applying the method of predictive policing, three solution exist: they apply a purchased software, or apply a software of their own, or apply a further developed software that was once purchased. Applying the method of predictive policing in practice requires some preparatory process, thus in Germany three level of application exists: a test phase, test in practice and finally the regular application in everyday life.[7]

Source: https://www.bertelsmann-stiftung.de/fileadmin/files/BSt/Publikationen/Graue Accessed: 15.08.2018
Publikationen/predictive.policing.pdf. Accessed: 23.04.2019

[7] Tobias, Knoblauch: Vorausschauende Polizeiarbeit: mit Algorithmen „vor die Lage kommen".
Accessed: 23.04.2019

Figure 1: The levels of application in the case of predictive policing in the regions of Germany – January 2018[8]

In Hungary, a university note on predictive policing was published in 2019, and there has been an attempt to apply predictive policing in everyday work located the 3rd district of Budapest – they even created a software of their own with the name BÖBE.[9] The possibility of linking "Robotzsaru Neo" and the method of predictive policing would deserve a separate study in this topic.

Crime geography, which is related to predictive policing, is a topic of several Hungarian studies. These studies made an analysis on the crime geography condition of some areas units (Hungary, XV., V., IX., XII. district, Budapest between 1960 and 1985, Debrecen, Hajdú-Bihar county,

[8] Source: https://www.spiegel.de/panorama/justiz/kriminalitaet-in-deutschland-polizei-setzt-auf-computer-vorhersagen-a-1188350.html
Accessed: 23.04.2019

[9] Mátyás, Szabolcs (2018): Az utazó bűnözés és a szervezett bűnözés kapcsolatrendszere [The relationship between traveling crime and organised crime]. In: Frigyer, László (ed.): Nemzetközi jelleg - szervezett bűnözés nyomozásának kutatása információáramlási szempontból. 189–205

Hungarian border[10]), and made separate studies on the crime geographical analysis of organised crime[11] as well as the educational possibilities of criminal geography.[12] From the perspective of the theoretical approach in criminal geography, Korinek László's definitions of „crime emitting areas" and „crime attracting areas" are worth to be mentioned and would also deserve a separate study in this field.[13]

The Austrian example

In the following part I will analyse the conditions of predictive policing in Austria. With this field deals the Criminal Analysis Department of the Federal Criminal Police Office, which consists of 6 persons, mainly psychologists and sociologists, whose study field incorporates cartography and criminology.

These professionals try to define the criminals' future attitude with analysing the number of cases and help the police in their investigations. The Criminal Police have used only the registered criminal data so far, but from 2019 they incorporate open source data in their analysis as well, for example, income data assigned to residence. This method is defined by the Austrian Police as Risk-Terrain-Analysis.

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[10] Kobolka, István – Ritecz, György – Sallai, János (2003): A MK államhatárának ezredfordulós kriminálföldrajza [Criminal geography of the state border of the MK at the millennium]. Szakmai tudományos közlemények. Katonai Biztonsági Hivatal. 82-97

[11] Mátyás, Szabolcs (2018): A szervezett bűnözés kriminálgeográfiai vizsgálata [Criminal geographic investigation of organized crime]. In: Frigyer László (ed.): Nemzetközi jellegű szervezett bűnözés nyomozásának kutatása információáramlási szempontból – Tanulmánykötet II, Budapest. 134–168

[12] Sallai, János – Mátyás, Szabolcs (2016): Criminal Geography as a New Subject in the Hungarian High Education. Magyar Rendészet, 2016/2. 139–146

[13] Mátyás, Szabolcs (2017): Magyarország általános bűnözésföldrajzi helyzete [The general geographical situation of crime in Hungary.]. Hadtudomány, 2017/4.
Source: http://epa.oszk.hu/02400/02463/00037/pdf/EPA02463_hadtudomanyi_szemle_2017_04_497-505.pdf
Accessed: 23.04.2019

In practice, there is a record for every crime that has become known. Every information is available in the internal system of the police in the so-called PAD (which means in German: Protokollieren, Anzeigen, Daten). Until 2019, only this information was used. „We are not using up traffic and administrative data, or data about terrorism, as Germany" – declared Vincencz Kriegs-Au, the Austrian BKA's press spokesman in an interview.[14]

For the analysis, they choose such cases from the system which can be related to data about the location, time and method of the crime. During the analysis, they do not use personal data. According to the experiences from the USA and Austria, the most essential points of the analysis are the data of location and the time of perpetration.

In the next step, the collected data will be analysed with various methods. The information gained from the analysis will be shared with all the federal crime offices as well as the police offices, for making the task fulfillment of the police more effective. For Germany, the Austrian predictive policing's data process is set as an example. As every federal state in Germany is independent and owns independent police as well, transfederal crimes and information can cause problems, especially because federal police agencies are not bound to cooperate with each other. Therefore, it is hard to establish a data base which covers the territory of the whole country.

[14] Muyazen, Al-Youssef (2019): Predictive Policing: Wie die Polizei Verbrechen voraussagt.
Source: https://www.derstandard.de/story/2000091840678/predictive-policing-wie-die-polizei-verbrechen-voraussagt
Accessed: 23.04.2019

Forecast, analysis, warning

Predictive policing can be basically divided into 3-4 steps. The simplest step is the hotspot- analysis, when the location of the perpetration is highlighted with a point on the map.[15] In the following steps these points became visualised based on the number of recently committed crimes in each area. This will be done on every type of crime belonging to one time period, chosen by the analyser. Choosing a very long time period can be unfortunate and inadequate to lead us to our target. The Austrians usually use the half-year period, which is, according to the experiences, proved to be successful with its good results.

After this process it is possible to compare the different time periods with each other. During the analysis, the displacement of some crime nodes can have strategical meaning. But this method cannot be applied to every form of crime, for example, in the case of murder hotspot analysis makes no sense. The predictive analysis can be relevant in those cases where the committed crimes draw a certain territorial pattern and possess high number of cases, which is fortunately not the feature of murders. The cases related to each other can often possess a common motive, and this can be determined during the analysis, but it is, nevertheless, not hundred percent sure that the analysis can effectively help the executive activity of the police, because the predictive method of analysis can only provide useful results in the case of the crimes occurring frequently. Kriegs-Au, the Austrian Federal Crime Department's spokesman once provided for this fact a good example: *"In the period before Christmas, the cases of stealing bags in Wien increased with such a speed that the area of Rathausplatz turned red on the map"*.[16]

[15] Mátyás, Szabolcs (2017): A térinformatika rendészettudományi alkalmazási lehetőségei [Possibilities of GIS application in law enforcement]. In: Boda, József – Felkai, László – Patyi, András (ed.): Ünnepi kötet a 70 éves Janza Frigyes tiszteletére. 371–377
[16] Muyazen Al-Youssef: Ibid.

The method related to those casesthat repeatedly occur close to each other on the map is also frequently used. In the case of a professionally committed crime, the next case often occurs near to the location of the previous one. According to the leader of the Crime Analyser Department, in this time the work of the police can be compared to the research made on earthquakes. *"The main earthquake is followed by others, which can be manifested near to the epicentre"*.[17] The analysis of recurring cases basically work in this way in *predictive policing*.

According to a case study, the number of burglaries during the nightfall period has increased. The reason for this is that in wintertime the burglars can take advantage of the longer dark hours. The analyser can sense the connection between time and space related to the crime, and after the prognosis he/she can make suggestions on the method of prevention, how to make the criminal's work more difficult, or how to catch the criminal. In the example explained above, the place and the time of the next crime can be predicted with great probability.

The prediction of the perpetrator's moves can be helped by the method of analysing the cases occurring repeatedly near to each other. However, in the case of occasional burglars and thieves, the situation is not so easy, because their movements cannot be predicted with this method. As Kries-Au explains: "*The situation can be imagined easilywhen someone walks home on a street and observes that the window of a shop is open, he/she suddenly comes up with the idea of entering that shop in order to look around and bring something home"*.

The methods of predictive policing can be applied for supporting the fight against travelling groups of burglars.[18] These groups travel across Austria, commit their crimes and travel forth. This usually happens under some days, therefore, the prognosis must be set up under a considerably short period of time.

[17] Muyazen Al-Youssef: Ibid.
[18] Mátyás, Szabolcs: Ibid. 189–205

On the basis of analysis, the forces at disposal have to be regrouped. In the case of burglaries committed at nightfall, prevention plays a crucial role, therefore, the police forces of the area intensify their presence in that given part and in that given time. Along with these steps happens the regrouping of the detective groups as well, and for such cases establishing specialised groups of investigators are frequent.

There are cases when the Police of Wien sends a warning via Facebook: "There has a great possibility that burglary occurs (in the area)" – this message appears on the screen of mobile phones in order to reach those people who can potentially be concerned for warning them and giving them advices. As a criticism on predictive policing appeared the phenomenon that sometimes the perpetrators committed their crime somewhere else and in another time, not as it was previously assumed. All the same, there are positive opinions on the method as well: "As far as I can see, this method has more positive values than negative, think just only to its deterrent nature".[19]

Predictive policing follows two intervening strategies: the prevention and the reaction. The analyser relies on the fact that the defined state can help the work of the police from one point, because the intensified presence of the police on the critical points can have a deterrent impact on the potential perpetrators with urging them to give up their intentions, and simultaneously this can increase the sense of security in the society. Moreover, this method can help the process' speed and efficiency in resource-consumption for deterring perpetrators.

Analysis of territorial risks

The method of analysing the territorial risks has been in the test phase since 2016, in which the official and statistical data are part of the analysis additionally to the time parameters. Such data can be, for example, the data of the infrastructure and the data of the Austrian Statistical Office – data on demography and income. With these data they try to identify the risk areas.

[19] Said Kriegs-Au in his interview.

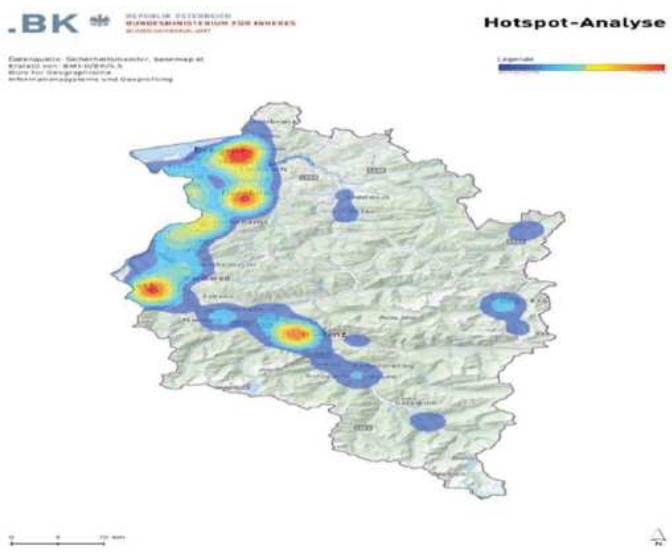

Figure 2: An example for the hotspot analysis.[20]

The data have to be as detailed as it is possible, raster-like and cell-level data are required. For ensuring the provision of such data, the establishment of cooperation between the organizations accessing data bases is required. This method has been in use from 2019 in Austria.

Critics

Predictive policing had some critics in the past. Although the Austrian police does not use personal data, the method, nevertheless, generated criticism from the side of the Fundamental Rights NGO-Epicenter Works. One of the critics addressed the questionable impact of predictive policing because it cannot be stated clearly whether the wrong prognosis or the presence of the police is responsible for the prevention of the crime in case

[20] Muyazen, Al-Youssef: c. b.

when the police visits the place, where an alleged crime will be committed in the future.[21]

Efficiency

According to the Austrian police officers, this method is the appropriate one for using up the accessible abilities and resources in the targeted way. The Austrian police puts a great emphasis on transparency, and they consider the method of predictive policing to be efficient. One of the studies on the field explains that the Police of Milano was with 8% more successful in solving cases of burglary with using the methods of predictive policing than were other police agencies who did not use such methods. This fact proves that despite its circumstantiality, predictive policing can work properly.[22]

Conclusion

The key concerns of predictive policing on the basis of the international experiences are the following: the source of the data analysis, the usefulness and publicity of the data, the methodology of the analysis as well as choosing the best software for the task. According to the Austrian experiences, with predictive policing it can complete and support the work of law enforcement efficiently. Therefore, this study's aim is to encourage the development of the Hungarian law enforcement with the recommendation of using predictive policing methods more frequently in the everyday work.

[21] Muyazen Al-Youssef: c. b.
[22] Source: http://www.hec.unil.ch/documents/seminars/deep/1587.pdf. 6 Accessed: 23.04.2019