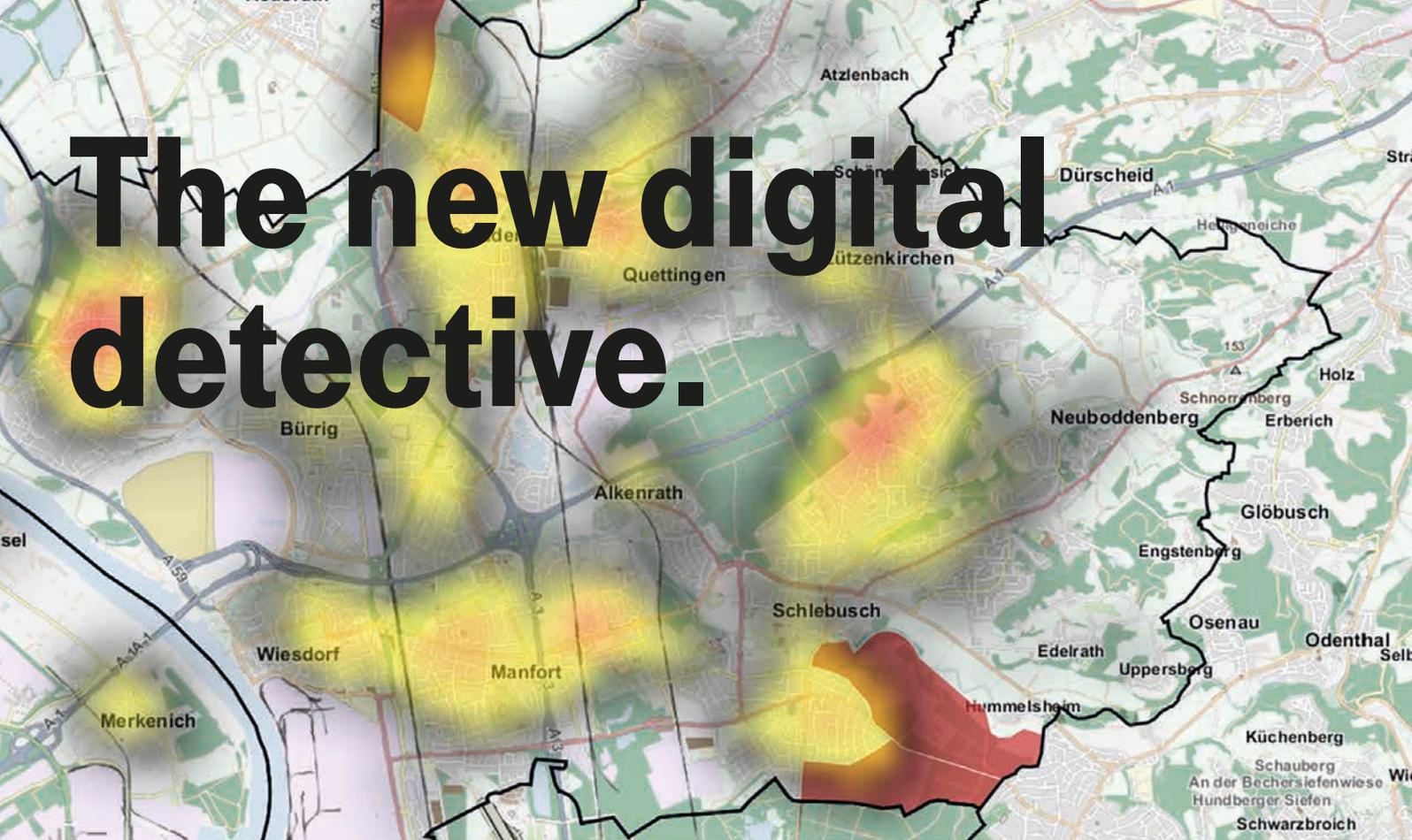# The new digital detective.

With their "system for crime analysis and location anticipation" (Skala) the police in NRW determine potential burglary risk areas in Cologne, Dusseldorf and Essen, among other places, based on what are called heat maps.

It's what most policemen dream about: To prevent crimes instead of investigating them – to know the when, where, why of a crime, maybe even before the criminal. This could serve to protect potential victims as well as perpetrators. It sounds appealing, but it's not without controversy. Thanks to predictive policing, modern investigators can now selectively look into the future. Burglary is the focus of this technology in Germany. In the USA, they are already working on other types of crime.

COPY —— Yvonne Nestler

The skylight crashes in and four masked policemen repel into the building ready for action. In no time, the likely murderer-to-be is overwhelmed and subdued. If this sounds like a scene from Steven Spielberg's science-fiction thriller „Minority Report," it's because it is: Three psychics who see into the future help the "Chief of PreCrime," performed by Tom Cruise, to track down and arrest offenders before crimes can take place.

This 2002 blockbuster with box office sales of 131 million US dollars is based on a short story from American science fiction author Philip K. Dick, published in 1956. At a time when big data still wasn't a topic of discussion for a long time. Unlike today: Dick's idea of a clairvoyant state power is no longer fiction. Although not thanks to human intuition, but – much drabber – thanks to huge amounts of data that fast computers automatically search through for patterns.

82 %
of burglaries
in Germany in 2017
remain unsolved.

Source: Polizeiliche
Kriminalstatistik 2017

In Germany as well. Here, the police use data-driven predictions – predictive policing – primarily to predict in which areas of a city houses and flats are likely to receive uninvited visitors and when. One reason: Domestic burglaries were one of the most common offenses in Germany with 117,000 registered offenses in 2017, despite a decline compared to the previous year. In addition, professional burglars usually follow certain patterns, like the way they pursue and select their targets.
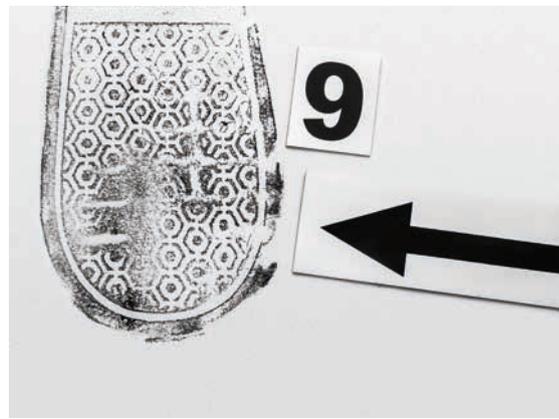
RECURRING CRIMES
The State Criminal Police Office (LKA) of North Rhine-Westphalia, for example, has been using the "Skala" software since 2015, a system for evaluating crime and anticipating situations. Skala uses past experiences, such as the near-repeat theory. This means that burglars like to return to areas where they were previously successful. A connection that is scientifically proven. However, the forecasts also consider other theses and questions like: Is

Victim and perpetrator protection at the same time – the police are increasingly searching for clues before crimes even occur.

there freeway access near the property that allows for a quick getaway? What kind of loot can one expect in a particular district? Detectives feed the analysis system with data from police incident processing systems such as the scene of the crime, the time of the crime, and the circumstances surrounding previous burglaries, as well as information on the development, infrastructure, and social structure in certain areas within the framework of data protection.

Once a week, Skala spits out forecasts of residential burglaries for police authorities in Bonn, Duisburg, Dusseldorf, Essen, Gelsenkirchen, and Cologne – maps showing residential districts with a high probability of burglary. The police use the forecasts to decide, for example, where to send more patrol cars and whether to personally advise the population in vulnerable areas on burglary protection. At the beginning of May 2018, NRW Minister of the Interior Herbert Reul announced that it would extend its deployment to the whole of North Rhine-Westphalia, initially to all main crime departments. "Where exactly we can use Skala depends on the crime volume of the respective areas. Without data, forecasting is impossible," points out Dr. Felix Bode, who heads the six-member Skala team at LKA NRW. "In rural areas, we are thus considering models other than predictive policing."

LIKE AN EXPERIENCED INVESTIGATOR, ONLY FASTER

The Bavarian State Criminal Police Office also relies on predictive policing. After a feasibility study in 2014 and 2015, the authority introduced "Precobs," a software solution reminiscent of the three psychics from Minority Report: the Precogs. This forecasting software is also used in Baden-Württemberg: Since September 2017, the second phase of a pilot project has been running in Stuttgart and Karlsruhe, which started in 2015.

In contrast to the LKA NRW, the forecasts of Precobs are based only on recorded offenses. According to a report by Ulrike Heitmüller on heise.de, socio-demographic data would not have significantly improved the forecasts. The program uses predefined crime scene, target, and action criteria to assess whether another break-in could occur soon in the same area. Experienced police officers would come to similar if-then decisions – the program is only faster, writes Dominik Gerstner of the Max Planck Institute for Foreign and International Criminal Law in an evaluation of the first project phase with Precobs in Baden-Württemberg (also see the box). If a break-in is detected that could be part of a series, the police officers who operate the program receive an alert.

The state police departments in Berlin, Lower Saxony, and Hesse use self-developed predic-

tive policing programs. Other federal states such as Hamburg and Rhineland-Palatinate are considering introducing such a system. The states regularly exchange information with each other and with the Federal Criminal Police Office. Germany has not yet used predictive policing at the federal level and does not plan any such systems. The federal government confirmed this in April 2018 in an answer to a minor inquiry from the Free Democratic Party. This means that Germany's law enforcement officers are nowhere near their US counterparts in terms of technology and coverage, whose methods are more reminiscent of the Wild West.

WILD WEST FOR COPS

2011 marked the very first time a computer program in Santa Cruz, California sent police patrols to areas where burglaries and car thefts were expected that day. The "Predpol" software is a development of Santa Clara University and the University of California Los Angeles. Today, US cities such as Atlanta, Richmond, and Seattle are using the solution, and Kent in the UK is also relying on Predpol. The system now even predicts armed violence, personal injury, drug-related crime, and bicycle theft – without using personal information.

Unlike Precobs, Predpol's algorithm is not based on simple if-then decisions, but on complex math and machine learning. Dr. Tobias Singelnstein, Professor of Criminology with the Law Faculty of the Ruhr University Bochum considers this to be legally and criminologically very problematic, since the results are incomprehensible. "Firstly, the forecasts often include measures that interfere with fundamental rights. Whether the necessary conditions are met must be verifiable. Secondly, predictive policing techniques can only capture certain forms and methods of crime. This selection process must be comprehensible."

ON THE BLACKLIST

In Chicago, the omission of personal data is irrelevant. There were 650 homicides in 2017 in the third largest city in the United States – more than in New York and Los Angeles combined. To deal with the violence, the police in Chicago have been working since 2012 with an algorithm that targets individual citizens. It spits out a list of people who are likely to be the victims or culprits in a shooting: the so-called "strategic subject list." A list of nearly 400,000 entries is available online without naming any names.

117,000

attempted and successful residential burglaries reported to the police in 2017 in Germany.

Source: Polizeiliche Kriminalstatistik 2017

Photos: Landeskriminalamt Nordrhein-Westfalen, iStockphoto (2)

The risk score of individuals is calculated, for example, from their criminal records, gang memberships, and age – the younger the higher the score, for example. As a precautionary measure, the Chicago police have reportedly visited people on the list together with social workers to deter them and help them with their personal lives. According to the news network CBS Chicago, 1,400 such house visits occurred between 2013 and 2016. "Processing personal data for predictive policing would be possible in Germany within extremely narrow limits," says Singelnstein. "The right to informational self-determination requires a legal basis and cause for such interventions. In addition, person-related predictions are more prone to errors the earlier they are made before the potential damage."

But how successfully do predictive policing systems prevent crime? For Chicago, an analysis by the consulting firm Rand in September 2016 showed that the risk list and police visits neither reduced the murder rate, nor the likelihood of someone being involved in a shooting. In addition, the listed persons were likelier to be arrested more often than others. Perhaps, the analysts guessed, because the law enforcement officers did not use the list to provide social services, but to identify suspects for crimes already committed. The Chicago police department responded that RAND evaluated old versions of the forecasting software and intervention strategy.

EFFECTIVENESS IS HARD TO MEASURE

In Germany, the state criminal police are restrained when it comes to the success rate, even though burglaries fell in the Bavarian, North Rhine-Westphalian, and Hessian test areas after the clever police oracle was introduced. But it is difficult to say whether the respective predictive policing system is responsible for any of the other prevention measures or whether the perpetrators are simply behaving differently. "Success cannot be claimed based on just one factor alone," explains the project manager for the Bavarian test area, Günter Okon, to heise.de. "The control concepts, especially in the area of home burglary, are very complex and multifaceted."

The Max Planck Institute for Foreign and International Criminal Law in Freiburg draws a conclusion in its analysis of the Precobs project in Stuttgart and Karlsruhe: The crime-reducing effects of predictive policing in the pilot project are probably only moderate. The study's author, Gerstner, points out its limited scope, however, occurring only over a short period of six months and in two pilot areas. The recently published final report on the LKA NRW project draws a positive conclusion: "The probability of burglary in selected forecast areas if often three to four times higher than in other residential areas of a police district."

How predictive policing will continue to evolve remains to be seen. What it certainly should not be, however, Philip K. Dick knew 60 years ago: an inscrutable system that orders people to be arrested before they have even committed a crime.

lka.polizei.nrw
www.ifmpt.de/lka-bayern/ (German only)
www.t-systems.com/security

"Expect no wonders".

Dominik Gerstner from the Max Planck Institute for Foreign and International Criminal Law evaluated the predictive policing project in Baden-Württemberg. The software predicts where break-ins may occur soon, on the basis of reported residential burglaries and defined parameters.

INTERVIEW —— Yvonne Nestler

Mr. Gerstner, what effect does it have from your point of view that the analyses of the Precobs system only include reported burglaries?
Through dark field research, we know that most residential burglaries are reported. That's why this isn't a problem. Problems arise, however, in that the burglaries usually take place when no one is home. When the residents are gone for a longer period of time, the incident is oftentimes discovered and reported very late. This makes it difficult to predict regionally limited and small crime sprees.

What do the police think of Precobs?
The police who operate the software see it as a useful addition to existing resources. However, opinions differ among the cops on the ground who respond to Precobs alerts. Because the system challenges established routines and makes decisions on behalf of officials. In addition, the preventive benefit is not directly noticeable among patrol officers, of course.

You rated the project's success only as moderate. Do you think that predictive policing can yield better results if the algorithm is self-optimizing with machine learning?
It is hard to say – mainly because there are virtually no research results so far. Also, machine learning, like predictive policing, is a broad field. In the case of residential burglaries, we know which parameters can explain spatiotemporal patterns. However, there are a great number of cases that cannot be explained. Chance plays a major role here, but machine learning may also help in these cases. However, it should be remembered that predictive policing is a process: What happens with the forecasts must be measured and incorporated again and again into the models. This is laborious – and miracles cannot be expected either. But it would be exciting to explore this.