

Fighting Crime with Data Mining

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1. Objectives and Capabilities

According to Ralph Kimball, Data Mining is "a continuing process of applying statistical techniques and artificial intelligence on large data warehouses in order to discover hidden trends, patterns and connections within the data, and converting this knowledge to business and executive decisions".

Data Mining techniques are often used to decipher customer behavior evident in the data electronically collected by commercial companies. Marketing uses such as customer segmentation and churn prediction are already common with many organizations, contributing to income augmentation. But deciphering relevant behavioral patterns is important not only with regard to revenues. When it comes to upholding the law and saving lives, Data Mining was found to be a powerful tool, with potential rescue capabilities.

In fighting crime, the law enforcement's objective is twofold: preventing the crime (in advance) and solving crimes (post factum).

Targeted Data Mining enables studying criminal behavior, analyzing past events and predicting future events, thus assisting in two ways:

- Crime prevention – locating crime centers and repeated offenders
- Solving crimes – connecting suspects to the crime scene.

The advantages of this type of analysis are that they enable analyzing events and patterns in a multi-factored environment, discovering causes and influences, allowing educated forecasts of long term trends, identifying irregularities and predicting specific future events.

It is important to note that unlike marketing goals, in which we aim to encourage customer activity, the goal of this strategy is to prevent people from taking certain actions. That said, the techniques used for both purposes are identical.

2. Strategic and Tactical Models

When we examine crime fighting Data Mining activities, we find that there are many ways of using the statistical abilities to our advantage.

The strategic aspect

- Mapping crimes according to regions and scoring each region according to: socio-economic status, income, education, etc.
- Performing behavioral segmentation and dividing offenders into crime segments: organized crimes, occasional crimes, intensifying crimes, juvenile crimes, etc.
- Performing trend analysis in order to predict crime levels as a result of internal and external factors.
- Performing link analysis and identifying the short and long term influences of mega-events on the geographical and social environments of those involved, both before and after the event.
- Social network mapping, as well as linking to the scope of the crimes and focusing on dismantling crime networks.
- Performing demand forecasting in order to evaluate the manpower needed to perform these tasks.

The tactical aspect

- Criminal prediction on the offender's level (recurring crimes and developing a criminal career).
- Solving crimes by connecting the suspect offenders to the crime scenes and the victims.
- Textual analysis for intelligence gathering purposes.
- Analyzing social influences within crime networks and identifying the leaders.
- Learning more about the offenders and incorporating that knowledge within the support systems in the field.

3. World Experience

There were many researches performed around the world, regarding the contribution of Tata Mining to crime fighting, and there is much evidence to the usage of these techniques to map and fight crime.

For instance, a segmentation of sex offences was performed and San Francisco, in which each offenders group was segmented according to the offender's profile, victim's profile and crime scene profile. For example, one of the offenders groups was characterized by: 80% of the victims were under the influence of alcohol, 80% of the offenders used prophylactics, and 80% of the crimes did not include a serious injury. Segmenting a map of the area enabled focusing on the offences according the specific characteristics.

Another example is an analysis performed of criminal statistics in the Netherlands, and presented in 2006 in ICDM (International Conference of Data Mining). This analysis included the identification and prediction of 3 segments of offenders according to their criminal careers: "one time", "minor" and "serious" crimes. According to that research, there are 4 factors affecting the identification and prediction of the offender's segment: the type of the crime, the frequency of the criminal behavior, its length and its severity. Using these insights, one will be able to predict the future victims and crime locations of each criminal.

As a final example we can note the Arizona research team who, along with the Tucson and Phoenix police departments, developed a methodology of examining this subject according to the different crime types. In mapping crime networks they presenting an example of finding a previously unknown connection between two networks, a finding which later proved to be true in the field.

4. The Required Data

The information which can be used to perform Data Mining analysis is vast:

- The details of the offenders and their offences
- Details of arrests and incarcerations
- Intelligence information
- Data on social connections between offenders
- Socio-economic data by regions
- Targeted surveys within the crime scene's zone.

5. Conclusion

Using Data Mining to fight crime is a social mission. The ability to focus and predict events is critical for police activities, and even more so, if it can save lives.

There are many ways in which we can apply the different techniques and use them to our advantage. We will probably not be able to completely eradicate crime, but we can focus on the problematic areas, learn to better understand the motives and connections between offenders, and study the criminal world so we can acquire better tactics to fight it.

It's up to us!

About Synergy

Synergy is a consulting company specializing in information based customer management, assisting organizations to maximize the business potential of their end customers, while providing them with tools of improving their marketing, service and retention activities.

Synergy's solutions revolve around customer management, and include Analytical CRM, Operational CRM, Loyalty and Web solutions, as well as Marketing Resource Management solutions.

Synergy Advanced Analytics Division perfects the business consulting services of **Synergy**, and adds another layer of insights and analytical tools to support the company's already thriving activities. Synergy Advanced Analytics' analytical solutions and services encompass innovative Data Mining techniques, allowing organizations to better understand their customers, actively prevent churn, establish an appropriate pricing policy, cut down on resource utilization and costs, and better deal with the ever changing market.

Synergy was established in 2003 and operates from Israel, the UK and Poland, working with local and international organizations. Among our customers are the foremost industry leaders in the Israeli and international markets, in industries such as communications, finance and retail, among which are banks, credit card companies, insurance companies, mobile operators, internet service providers, international call providers and television networks, as well as large membership clubs in the food, fashion and aviation industries.

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