

National Crime Analyses and Forecasting: Case Study of North Macedonia

Sonja Filiposka¹, Anastas Mishev¹, and Aleksandra Dedinec¹

Ss. Cyril and Methodius University - Skopje, North Macedonia
sonja.filiposka@finki.ukim.mk, anastas.mishev@finki.ukim.mk,
aleksandra.kanevche@finki.ukim.mk

Abstract. Reducing national crime rate is an extremely important, but also difficult problem. For solving it, it is necessary to discover patterns of its occurrence, the various factors that influence it and the connection between criminal actions, which can help forecast future events, especially violent crimes where the police should act immediately. For this purpose, a database for crime records within 9 years period (2011-2020) is used in this paper, based on data presented in Crime Map of North Macedonia¹, where the system uses natural language processing to extract information from the official written reports published by the Ministry of Interior. From these reports, information about the date, the location (latitude and longitude), city, type of crime and description are extracted. Since the accuracy of this database is crucial for the precision of the crime analysis and forecasting, an additional data verification and cleaning process was conducted, certain inconsistencies were corrected and additional detailed information about the municipality and settlement of the crimes was added. Detailed analysis of the historical data is made in this paper, in terms of the number of crimes per region, year, month and type of crime, which help in establishing an appropriate forecasting model. Crime forecasting is considered as a classification problem in this research, and a model based on gradient boosted decision trees has been developed, where aggregated historical features for each cluster (based on location) and day combination are used as input. The results of the model show whether on a given date and location, violent crime will occur, where a police is needed beforehand that can potentially prevent the crime.

Keywords: Crime forecasting · Crime analysis · Gradient boosted decision trees.

¹ <http://crimemap.finki.ukim.mk/home/en>