



---

---

## A MOBILE APPLICATION DEVELOPMENT THAT SHOWS THE CRIME RATE IN ISTANBUL

Ceren Cubukcu, Mehmet Gurun

Computer Engineering Department, Engineering and Natural Sciences Faculty,  
Maltepe University, Istanbul, Turkey

**Abstract:** Crime rates have a very important place in evaluating social welfare of countries and the factors affecting this is a dynamic issue. Types of crimes can be classified in different categories. For example, categories of crimes according to the Turkish Criminal Code types include treason crimes, crimes against liberty, crimes against the state administration, crimes committed against the courthouse, crimes against public order, crimes against public trust, crimes against public welfare, crimes against public morality and family order, crimes of violence against individuals and properties and cybercrimes. Istanbul is experiencing a high problem in terms of crime rates. The fact that the number of unsolved cases is around 33% reveals the need for an urgent solution to this problem. It is possible to develop a program to slow down this increase and increase people's safety. This program can contribute to make people feel safer and help them have a more protected environment. This program is better suited as a mobile application. This application will both ensure the safety of the people and facilitate the work of law enforcement. As a result of this application, citizens will be able to see the safest and most dangerous neighborhoods with one-click and behave accordingly. This application is primarily intended for visitors of Istanbul in addition to the people who have just moved to the area. The aim of this study is to reduce the crime rate in Turkey starting from Istanbul and provide the safety of the citizens with the help of a mobile application. Therefore, this application targeted crime rates. However, this application can also be extended to other cities and other countries. Numbeo's API will be used in this application. Numbeo is the world's largest cost of living database. Numbeo is also a crowd-sourced global database of quality of life information including housing indicators, perceived crime rates, and quality of healthcare, among many other statistics. This study distinguishes from other studies by both raising awareness and taking on social responsibility.

**Keywords:** mobile application, software development, crime rate, city development, Numbeo

### 1. Introduction

The crime phenomenon that emerged with the birth of humanity depends on social ethics and/or it is defined as an illegal behavior. Crime rates, which have a very important place in evaluating social welfare, and the factors affecting crime rates is a dynamic issue. However, the examination of socioeconomic factors affecting crime rates in literature studies, showed inconsistent results due to the differences in the data set and the statistical analysis techniques. Another reason for achieving inconsistent results is within the crime rate statistics. It is usually a collective treatment of the various types of different crimes. The weight of the crime types that make up the crime rates of societies is different. Therefore, from these different gravity of crime types, the dynamics that affect the crime rate will also have a different effect. Types of crime can be classified in different ways and

**Съвременни управленски практики XI - БСУ, 2021**  
**ИНТЕЛИГЕНТНА СПЕЦИАЛИЗАЦИЯ В ДЕСЕТИЛЕТИЕТО**  
**НА СВЪРЗАНОСТТА И АВТОМАТИЗАЦИЯТА**

---

---

can be triggered by different dynamics; to kill, to injure, to insult, of liberty deprivation, sexual crimes, fraud, forgery, smuggling, theft, extortion, drugs trafficking, bribery, traffic crimes, forest crimes, military criminal law crimes of opposition, crimes against enforcement and bankruptcy law, traffic crimes and cybercrimes can be listed as different types of crimes. For example, crimes against individuals, crimes against property, anti-moral crimes, white collar crimes can be classified as organized crimes [1].

In Turkish Statistical Institute (TUIK); the number of people in the penal institution on December 31, 2019 is increased by 10.1% compared to the same date of 2018 and reached 291,546 [2]. This increase can be seen in below Table 1.



**Table 1** - Increase on crime rate over years.

In the case that convicts entering the penal institution commit more than one crime, the crime requiring the heaviest penalty is taken as the basis. When evaluated according to this principle, 15.2% of the convicts who entered the penal institution committed robbery, 12.4% of them committed injury, 7.0% committed the manufacture and trade of drugs or stimulants, 5.4% committed violation of the enforcement and bankruptcy law and 3.4% committed murder in 2019 [2]. It is possible to develop an application to slow this growth and increase people's safety. This application can contribute to making people feel safer and have a more protected environment.

Istanbul Police Chief Mustafa Caliskan stated that in 2018, a total of 390,101 crimes were committed under 228 different titles in Istanbul. Stating that 66.3% of these incidents were clarified, 33.7% of them seemed to be unsolved. Caliskan said, „287,970 suspects were caught in the events that took place last year.“ Mustafa Caliskan shared the assessments made on theft crimes from the workplace and home as follows: „During 2018, a total of 29,104 thefts occurred. When these data are compared to 12 months, 2,425 theft events occur per month.“[3]

Considering these statements; Istanbul is experiencing a high problem in terms of crime rates. The fact that the number of unsolved cases is around 33% reveals the need for an urgent solution to this situation. The application in this study will be made to resolve this situation. It will both ensure the safety of people and facilitate the work of law enforcement. In that sense, it is also aimed to make it difficult for people to commit crimes.

The aim of this application is to both follow and reduce the crime rates in Turkey. Therefore, the project is targeted crime rates unlike the applications made previously in Turkey. These applications will be discussed in detail in the next section. Numbeo.com is a website with similar features to the purpose of this study. However; it differs from the



application in this study by including other information and countries. The most important difference of this project is its take on social responsibility and raising awareness.

The rest of the study will continue as follows. In the next section, related literature will be discussed. In the third section, methods and technical requirements of this application will be explained. In the results section, the functionalities and the screenshots of the application will be stated. Finally, the last section includes the conclusion and mentions the limitations of this application and points to potential future studies.

## 2. Related Literature

There are different kinds of mobile applications related to crime in the app stores but these are mostly available in other countries. For example; there is Predpol application which tries to predict new crimes by analyzing past crimes. This app uses artificial intelligence (AI) technology to predict when and where new crimes will most likely occur. In China, there is the CloudWalk application which uses AI and facial recognition technology to predict if a person is going to commit crime or not. This application helps government track individuals and their behaviors in order to prevent potential crime and identify potential criminals. There are also applications available that especially help women protect themselves in case of an emergency. In Turkey, there is KADES application and with this application any women living in Turkey can call the police and request help by clicking only one button in the application.

In this study, the application which is going to be developed is going to show the crime rates in different neighborhoods using Google maps. The Google map utilization will be used to generate a crime map. In the literature, crime maps are used in different studies by scientists. It is handled from different perspectives. These studies are; the impact of crime on the economy [4], the city and criminal studies about countries [5, 6, 7], crime prevention studies [8, 9, 10], and crime mapping [11, 12, 13, 14, 15].

There are crime mapping websites developed by different companies. Members of the public can display police data in a high-impact map or summary informative format in CityProtect.com, which blends the importance of police data with the ease-of-use of Internet-based mapping and an analytics module. CentralSquare Technologies created CrimeMapping.com to assist law enforcement agencies across North America in providing the public with useful information about recent crime activity in their community. Our mission is to help police departments reduce crime by increasing public awareness. ReportSee, Inc. owns SpotCrime.com, a Baltimore-based company that was established in October 2007. On a Google map, it shows arrests, arsons, rapes, burglaries, robberies, shootings, thefts, and vandalisms around the United States.

## 3. Methods

This research studies the development of a mobile application that shows the crime rates throughout Turkey. In the first registration of the application, end users will be able to get membership with their Turkish ID numbers and phone numbers. When they make their first membership, a map will appear in front of them showing the view of their location. It will appear on that page with a risk map about their location. According to the colors of the map, they may have an idea about the crime rate of their location. Through the bars on the top right of the map, end users will be able to switch between crime types on the map and have an idea about which crimes are committed in their area. By specifying the places to go on the map, it will be ensured that end users have an idea about the crime situation in the

place where they are going. There will be three menus on the left side of the screen. The purpose of the menus will be explained in the rest of the article.

### **3.1. Technical Contents of the Application**

The application will be developed on Android Studio so it will work on Android smartphones. Also, it will be coded by using object oriented platforms and java language. JSON will be used for communication between the services and the application. Numbeo analyze will be used on the application. Finally, Google Cloud Platform will be used to work with Google Maps easily.

#### **3.1.1. Numbeo**

Numbeo will be used to develop this application. Numbeo is the largest cost of living database in the world. Numbeo is also a crowd-sourced global database of quality of life data, such as housing metrics, perceived crime rates, and healthcare quality, among other statistics. Numbeo helps you to view, upload, and compare data on crime levels and forms around the world. It investigates the following aspects of city crime and safety:

- How bad do you think the crime problem is?
- Has the level of crime changed in the last three years?
- Do you feel comfortable walking during the day?
- Do you feel safe walking at night?
- Are you afraid of being mugged or robbed?
- Fears of getting a car (or items from it) stolen
- Fears of being physically attacked by strangers
- Fears of being insulted or pestered by someone on the street or in another public place
- Fears of being physically attacked because of your skin color, ethnic origin, gender, or religion
- The issue of drug users and dealers
- What is the extent of the issue with property crimes?
- How serious is the issue of violent crime? [16]

#### **3.1.2. Google Android Studio and Google Cloud Platform**

Based on JetBrains' IntelliJ IDEA software and developed specifically for Android production, Google Android Studio is the official integrated development environment for Google's Android operating system. In 2020, it became available for download on Windows, MacOS, and Linux operating systems, as well as a subscription-based service. It takes the place of the Eclipse Android Development Tools as the primary IDE for developing native Android applications.

Google Cloud Platform will also be used to develop the application. Tables, storage, and maps can all be made with this platform. Google Maps is the most critical component of the Google Cloud platform. Using the Maps JavaScript API, the maps can be customized with any material and imagery for display on web pages and mobile devices. The Maps JavaScript API includes four basic map types (roadmap, satellite, hybrid, and terrain), each of which can be customized with layers and styles, controls and events, and a variety of services and libraries.

### **3.2. System Architecture**

Individuals who want to use the application will be signed in and then, there will be maps on their view. The user and the developer systems is shown below on Figure 1. The architectural design of the system is shown on Figure 2.

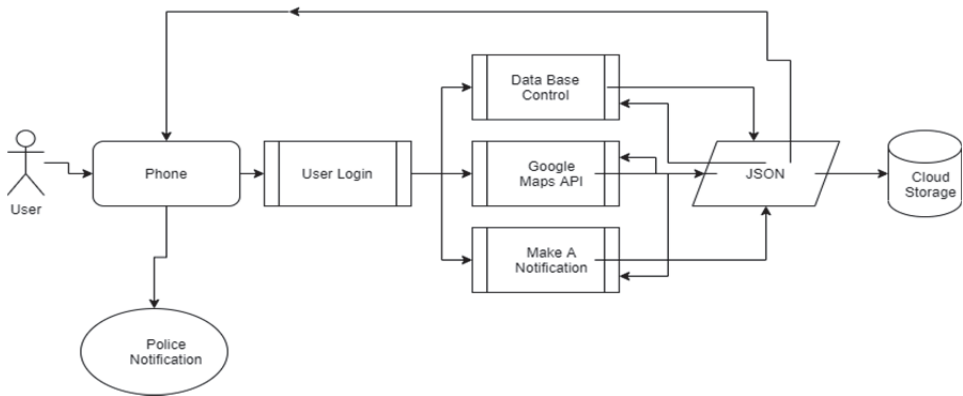


Figure 1 - System Design

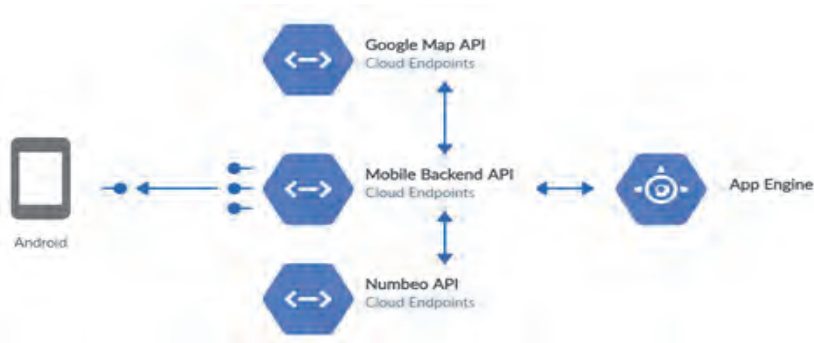


Figure 2 - Architectural Design

### 3.3 Databases

There will be 3 databases. The first one will store the user information and the second one will store the crime rate ratios. The last one will be for others section. Preferences of language selection of user will be held on the first one. Figure 3 and Figure 4 show the database diagrams.

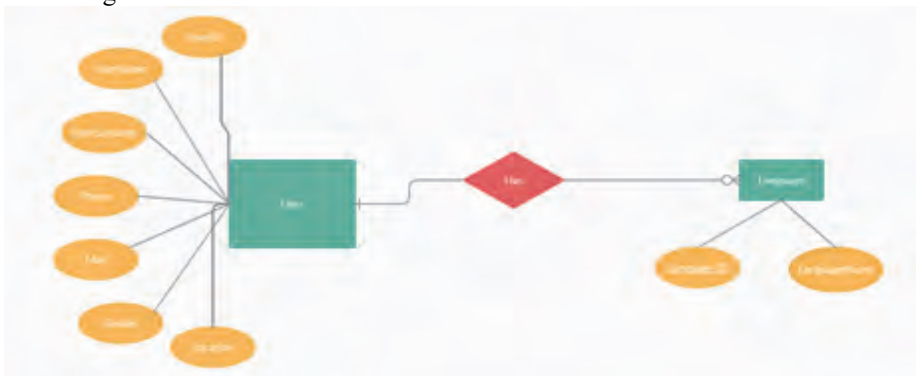


Figure 3 - User Database Diagram



Figure 4 - Table Database Diagram

Tables of Numbeo and other table will be held on the second database. When customers want to see another table the data will be sent from that database. All applications have their own terms and this one will have too.

### 3.4. Input / Output Diagrams

The management of input-output (I/O) operations is one of the earliest and most important factors for the creation and subsequent growth of systems. To begin with, writing code to handle I/O is one of the more complicated aspects of computer programming. Computing services have become more available to a larger number of casual programmers by removing the requirement that a programmer understand primitive I/O data. Second, when assemblers, compilers, sort packages, and other utilities became available, it became important to provide I/O services for each of them, as well as to prevent user programs from overwriting areas where these utilities or their work-spaces are stored [17]. Below in Figure 5, the input-output diagram of the application can be seen.

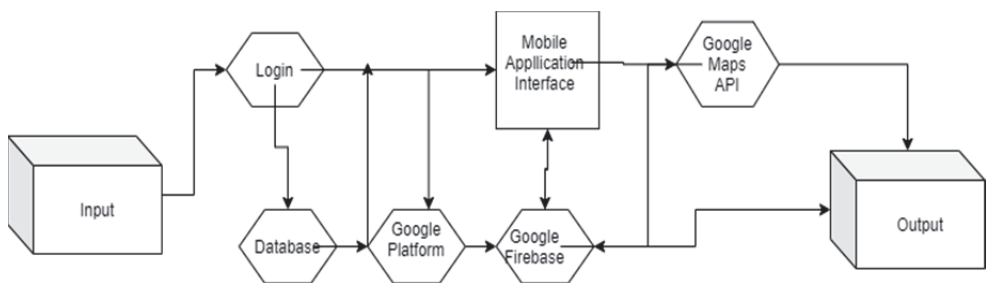


Figure 2 - Input-Output Diagram

### 3.5. UML Diagram

As it can be seen in Figure 6 below, there is a user and a driver which controls the application. When the user is logged in or registered correctly; the user will be sent to the maps screen and they will see their location in addition to that location's crime rate. After then; the user has the chance to choose between tables or different types of crime rates.

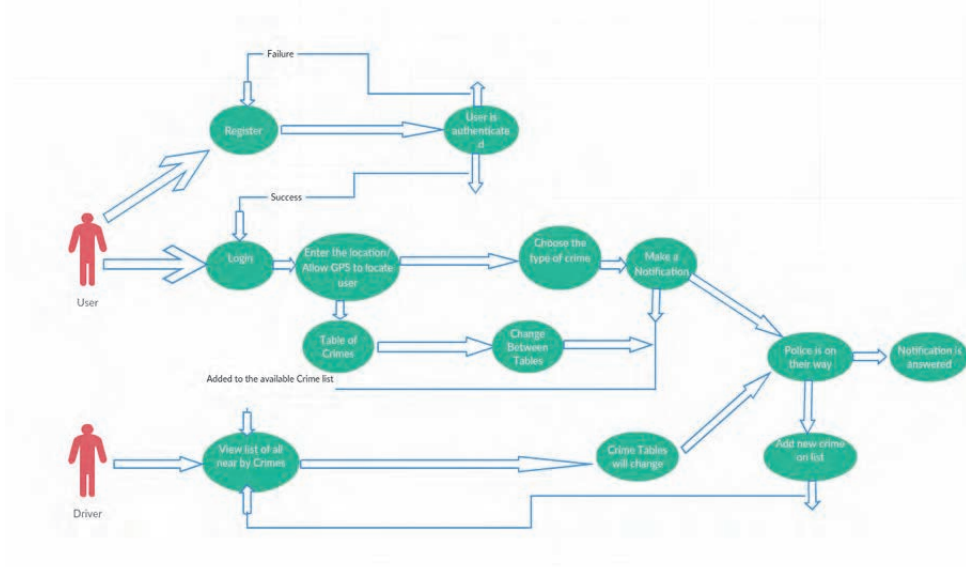


Figure 6 - UML Diagram

## 4. Results and Discussion

In this section, functionalities of the application and the end user interfaces of the application will be explained.

### 4.1. Functionalities

#### 4.1.1. Login and Register:

The end users will register first by email or phone number but they also have to use their Turkish Identity Number during registration because when they want to make a notification, the police will control their information with those id numbers. After registration, the application will send them a password which they can change with their phone number. One-time login will be available in order to login every time they want.

#### 4.1.2. Main Screen-Maps Screen:

The end users will change their crime screen with the top right buttons on the interface. They can change between different crime types using that button. On the left side, they also have a menu to change between the screens.

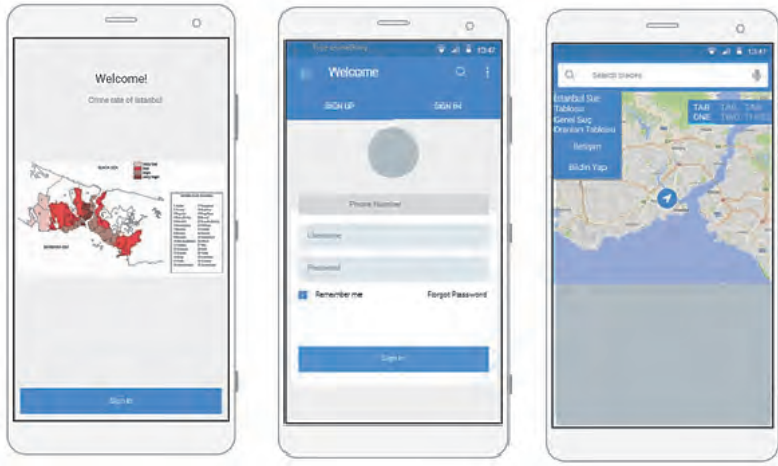
### 4.2. Interface Design:

In this study, proto.io is used for creating the user interfaces. The working interfaces can be found out on the website with the URL: <https://share.proto.io/OQQBGH/>. This website allows for creating a mobile application sample for this study. At the first; the users

**Съвременни управленски практики XI - БСУ, 2021**  
**ИНТЕЛИГЕНТНА СПЕЦИАЛИЗАЦИЯ В ДЕСЕТИЛЕТИЕТО**  
**НА СВЪРЗАНОСТТА И АВТОМАТИЗАЦИЯТА**

---

will see the Welcome page on Figure 7. Then, when they click the sign in button, they will be directed to the Sign in page. The users will sign in from that page or they can register to the application using the sign up button. When they sign in, they will be directed to the maps page which is also shown below in Figure 7.



*Figure 3-.Welcome, Sign-In and Maps Screen*

When the users are signed in correctly; they will see Google Maps page which contain crime rate colors. When they touch the right button on the top, the application will change colors according to the crime types. The users then can choose what they want to see from this page.

After the users click the menus on the left side, they will be able to see the tables. These tables show how much crime is committed per month. Also, there is a page which shows the rates of every city that can be seen below in Figure 8.



*Figure 8-Tables and Notifications Screen*



When the users click „make a notification” menu item, they will be sent to that page. They can make notification by phone calls or by text message. They can choose their notification method from this page. This is the 2nd most important page for this application because when people want to make a notification, it needs to be verified that it is not a fake notification. Therefore, their Turkish ID numbers will be requested for protection.

## 5. Conclusion and Discussion

The goal of this study is to reduce the crime situations experienced and to provide an instant help to individuals. Ensuring people's safety and creating a safer living space increases people's living standards. For this purpose, this application will provide people with a more prosperous environment.

This application will contribute to the development of humanity as a social responsibility project. There are already applications available in other countries related to crime mapping and prevention but not currently in Turkey. In Turkey, there are several applications which help to protect women in terms of emergency. However, there is not any application available which show the crime ratios or help prevent potential future crimes. This application has limitations such as it is based in the cities of Turkey and it doesn't use AI or facial recognition technology. Future studies and applications can extend to other countries and can embed AI or facial recognition technologies in order to predict future crimes and identify potential criminals.

## References:

1. EUROPEAN COMMISSION FOR DEMOCRACY THROUGH LAW [Internet]. Legislationline.org. 2021 [cited 3 May 2021]. Available from: [https://www.legislationline.org/download/id/6453/file/Turkey\\_CC\\_2004\\_am2016\\_en.pdf](https://www.legislationline.org/download/id/6453/file/Turkey_CC_2004_am2016_en.pdf)
2. (TÜİK) T. TÜİK Kurumsal [Internet]. Data.tuik.gov.tr. 2021 [cited 2 May 2021]. Available from: <https://data.tuik.gov.tr/Bulten/Index?p=Ceza-Infaz-Kurumu-Istatistikleri-2019-33625>
3. İstanbul Emniyet Müdürü Çalışkan açıkladı! En fazla suç bu günlerde işleniyor [Internet]. Hurriyet.com.tr. 2021 [cited 5 May 2021]. Available from: <https://www.hurriyet.com.tr/gundem/istanbul-emniyet-muduru-caliskan-acikladi-en-fazla-suc-bu-gunlerde-isleniyor-41172112>
4. Pradhan M, Ravallion M. Who wants safer streets? Explaining concern for public safety in Brazil. *Journal of Economic Psychology*. 2003;24(1):17-33.
5. Bromley R, Nelson A. Alcohol-related crime and disorder across urban space and time: evidence from a British city. *Geoforum*. 2002;33(2):239-254.
6. Craglia M, Haining R, Signoretta P. Modelling High-intensity Crime Areas in English Cities. *Urban Studies*. 2001;38(11):1921-1941.
7. Appiahene-Gyamfi J. Urban crime trends and patterns in Ghana: The case of Accra. *Journal of Criminal Justice*. 2003;31(1):13-23.
8. Hamermesh D. Crime and the Timing of Work. *Journal of Urban Economics*. 1999;45(2):311-330.
9. Coetzer C. Crime Prevention at Business Complexes. A Case Study at Centurion Centre. *Crime Research in South Africa*, 1(1). 2000.
10. Carmichael F, Ward R. Male unemployment and crime in England and Wales. *Economics Letters*. 2001;73(1):111-115.

**Съвременни управленски практики XI - БСУ, 2021**  
**ИНТЕЛИГЕНТНА СПЕЦИАЛИЗАЦИЯ В ДЕСЕТИЛЕТИЕТО**  
**НА СВЪРЗАНОСТТА И АВТОМАТИЗАЦИЯТА**

---

---

11. Harris K. ve La Vigne N. (Ed.), J. Travis. Mapping Crime. Principle and Practice, Diane Publishing Corporation. 1999.
12. Vigne N. Computerized Mapping as a Tool for Problem Oriented Policing. Crime Mapping News, 1(1). 1999.
13. Velasco M. and Boba R. Manuel of Crime Analysis Map Production. Police Foundation, Community Orient Policing Services, US Department of Justice. 2000.
14. Karakaş E., (2004), „Elazığ Şehrinde Hırsızlık Suç Dağılışı: ve Özellikleri,” Fırat Üniversitesi Sosyal Bilimler Dergisi 14(1), 19-39.
15. Karakaş E., Karadoğan S. ve Arslan H., (2004) „Suç Haritaları ve Bilgisayar Teknolojisi,” Pamukkale Üniversitesi Mühendislik Fakültesi Mühendislik Bilimleri Dergisi, 37-42.
16. Living C. Cost of Living [Internet]. Numbeo.com. 2021 [cited 2 May 2021]. Available from: <https://www.numbeo.com/cost-of-living/>
17. Taylor, Robert W. Input-output control system (IOCS). Encyclopedia of Computer Science. 2003. 870-874.