**Sport vs Crime**

February 26, 2019

**1. Introduction**

**1.1. Background**

Crime and youth antisocial behavior are complex social issues. There one of the most important risk factors is living in a deprived area. People often fall into criminal companies from adolescence. And 70 % of teenagers believe antisocial behavior occurs because young people are bored, and six in ten say that there isn’t enough for young people to do in their area [https://www.sportandrecreation.org.uk/pages/gol-anti-social].

Sport can attract people and help them solve a number of problems that push them into crime:

* Developing self-regulating and problem-solving abilities as a result of developing skills needed to sport activity.
* Adventurous sport can satisfy the thirst for risk.
* Sport helps people to socialize, playing sport, a person turns into a group, also can find friends and mentors, who provide positive role models.

**1.2. Problem**

The development of sports in the city requires large investments from business, municipal and federal governments. I wanted to show that sports organizations, such as sports fields, swimming pools, sports schools, ways to reduce crime in the city. That is, such investments are profitable for everyone.

However, this is still our guess. **I needed to check whether there is an obvious relationship between sports venues in the city and the crime rate.**

Our **audience** is businessmen and municipal government interested in reducing crime for the long-term sustainable development of their city.

**2. Data**

**2.1. Data sources**

The data about sports venues of a certain city can be found in Foursquare. In Foursquare a venue specified by a category. There are the Foursquare Venue Category Hierarchy, but there is not a sports category group, so I needed to manually select sports categories: Basketball Courts, Baseball Field, Athletics & Sports, Climbing Gym, etc.

The data about crime rates by cities can be found in Wikipedia, for example, <https://en.wikipedia.org/wiki/List_of_United_States_cities_by_crime_rate>. Also, this page gets the population of cities.

To search venues in a city using Foursquare API, I apply the geolocator GeoPy geocoders to translate the state name + city name to geolocation (latitude, longitude).

**2.2. Data cleaning**

1. The table of crime rates has a few missing values. I dropped rows (cities) with gaps in this table.

2. Initially, I planned to use the rating of venues from Foursquare. However, it turned out that the venue rating is included in the premium calls. Free account tier provides only 50 premium calls / day. It is too little to get a rating of hundreds of venues.

3. Big cities have too much sports venues. So even for a specific category, the number of found venues exceeds the query limit. Therefore, I limited the research to cities with a population of up to 300 thousand.

**2.3. Feature selection**

As features (X) the following values are used:

* city population (thousands)
* count of sports venues / city population (thousands) by categories:
  + athletics stadium
  + badminton court
  + baseball field
  + basketball court
  + football field
  + gym / fitness
  + hockey field
  + rink
  + ski tracking
  + sport club
  + swimming school
  + tennis court
  + university gym
  + volleyball court
* total count of sports venues / city population (thousands)

The target (Y) is crime rate of city = total number of crimes per year per number of inhabitants.

**2.4. Struct of an instance**

|  |  |  |  |
| --- | --- | --- | --- |
| **Filed** | **Type** | **Used to create a model** | **Feature / Target** |
| City | String | No | - |
| Population | Float | Yes | Feature |
| Number of athletics stadiums / populations | Float | Yes | Feature |
| Number of badminton courts / populations | Float | Yes | Feature |
| … | Float | Yes | Feature |
| Number of o volleyball courts / populations | Float | Yes | Feature |
| Crime rate | Float | Yes | Target |

**2.5. Example of an instance**

‘Boise’, 225677, 0.005, , 0.08, , …, 0.06, **2741.97**

**3. Exploratory Data Analysis**

**3.1. Relationship between xxx and xxx**

**…**

**4. Methodology 4.1. Regression Modeling**

**I applied linear models (linear regression, Ridge regression, and Lasso regression), support**

**vector machines (SVM), random forest, and gradient boost models to the dataset, using root**

**mean squared error (RMSE) as the tuning and evaluation metric. The results all had the same**

**problems. The predicted values had much narrow range than the actual values (Figure 8), and as**

**a result, the prediction errors were larger as the actual values deviated further from zero (Figure**

**9). These results were not acceptable, because players with large improvement/decline were**

**arguably more important for NBA teams to predict than players with little change in**

**performance. Having larger errors on those predictions was obviously not desirable.**

**4.2. Results of models**

**5. Conclusion**

**6. Future directions**

The study has a number of simplifications.

1. The number of cities is not large enough.

2. Some venues could be counted several times in different categories.

3. Rating of each venue is not taken into account.

4. The severity of the different types of crimes is not taken into account.

Eliminating some of the shortcomings can be accomplished with improved data pre-processing. Some drawbacks are associated with the restriction of access to Foursquare using free account tier.

Thus, I think that the initial phase of this study presented here can be continued to produce more reasonable results.