**Housing Code Violations: Understanding their spreading nature and predicting the next violation**

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**Abstract-Housing Code Enforcements enforces the city's housing, zoning, building and related codes. they have made sure that the tenants in their counties are provided houses that are safe, habitable and in livable conditions by the landlords. Violation inspectors are employed by these enforcements who inspect and provide detailed violation report that describes the nature, time and place of the violation occurrence. In this paper, we plan to use the information from this violation reports for prediction of housing violations and prove that these housing violations possesses a transitive nature among themselves. We are considering Boston city data set on housing code violations for our analysis.**

1. **INTRODUCTION**

Housing Code violations have been noted by various housing bodies in cities all across the country. These violations are reported by the occupants, mostly tenant, who feels the landlord have not maintained habitable housing standards. Hence, a complaint record is noted by the regulatory board. As far as Housing violations in DC is concerned, A two step process is undertaken by the board to ensure the violation complaints are addressed at the earliest. The board notifies the violator with the Notice of Violation (NOV). The violator then has to undertake measure to address these violations within a given period of time. If they fail to address them then they are issued notice of infraction (NOI) and are issued a civil penalty.

The shortcoming of this approach is that these bodies have a limited human resource that can keep a track on the housing violations. The random unannounced violation checks which the inspector undertake often turns out to be a false call since the place of inspection had no violation. This results in the loss of time for this officer. It is therefore necessary to find an alternative that can help reduce the number of such false calls saving time. We therefore, propose this research which focuses on predicting a housing violation with the maximum probability of occurrence and to study the transitive nature of these violations.

The rest of the paper is organized as follows: Section II presents related work in the housing code violations and understanding the spreading of violations. After that, we describe our technique to automatically identify land use and its evaluation in Manhattan in Sections III and IV, followed by our technique to detect landmarks and its evaluation in Sections V and VI. Finally, Section VII presents the conclusions and future research lines.

1. **RELEVANT RESEARCH**

Researchers have used density of housing violations related to asthma to predict a hospitalized patient's risk of subsequent morbidity, i.e what is the probability of the asthma patient getting admitted again within 12 months[1]. However, they have used relationships between a patient’s demographic characteristics and his or her risk of an ED revisit or rehospitalization for asthma were assessed using chi-square tests and logistic regression. Our paper suggests using Long term short model (LSTM) (Research Question 3) to find the recurrence of housing violation happening at the same location. Hardt NS et. el. used ESRI software to plot hotspots of disease prone area and based on the hotspot density, primary care is sent[2]. They have used ArcGIS Software 9.3 and Spatial Analyst Kernel density estimation tool to detect the hotspots and identify the color of the area (color determines probability). Our paper uses Gaussian Mixture Models to find the probability distribution for each violation and code enforcement inspector can visit the most probable area more frequently. Many researcher have worked on modeling the disease spreading in human population[3] and contamination after taking preventive measures. Similar theory is proposed in this paper. Disease can be compared with violation and human contact can spread the disease, similarly violation also spreads \*due to human nature\*. Ning, Y. et. el. have used Hidden markov model to predict Vehicle trajectory.

1. **RESEARCH QUESTION**
2. **DATASET**

**References**

Engelmore, R., and Morgan, A. eds. 1986. *Blackboard Systems.* Reading, Mass.: Addison-Wesley.

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