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Urban Silence Index (USI)

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Abstract: *Noise pollution has become a serious concern in rapidly growing urban areas. Traditional methods measure noise in decibels, but they do not provide a simple way to interpret or compare different locations. This paper presents the concept of the Urban Silence Index (USI), a data-driven model that converts noise levels into a standardized score for easy understanding.*
The study uses Python-based data analysis techniques, including libraries such as Pandas and Matplotlib, to process and visualize noise data. The proposed model calculates excess noise by comparing actual values with standard permissible limits and transforms it into an index. The results help in identifying high-noise zones and understanding urban environmental conditions..

Keywords: Noise Pollution, Urban Silence Index, Data Analytics, Visualization, Python, Smart City.

I. INTRODUCTION

With rapid urbanization and increasing population, noise pollution has become a common problem in cities. Sources such as traffic, construction, and industrial activities contribute significantly to noise levels. Continuous exposure to high noise can affect human health, causing stress, sleep disturbance, and reduced productivity.
In most cases, noise is measured in decibels (dB). Although this provides numerical data, it is not easy to interpret or compare across different areas. There is a need for a simple and meaningful representation of noise levels

II. METHODOLOGY

The study follows a systematic data analysis process using Python to extract and interpret practical steps:
I. Steps:
1. Data Collection: patient records were imported into python, and the most critical fields (doctor, hospital, insurance provider) were standardized by correcting inconsistencies in spelling, formatting, and date entries.
2. Data Cleaning: Remove duplicates, handle missing values, and format datasets.
3. Data Analysis: Use Python libraries (Pandas, NumPy) for statistical and comparative analysis.
4. Visualization: Create graphs and dashboards using Matplotlib, Seaborn, and Plotly.
5. Interpretation: Derive insights and summarize results to support data-driven conclusions.

III. RESULTS AND DISCUSSION

The analysis provided several useful insights into urban noise patterns..

A. Figures

Fig. 1. Average Noise Level by Area

This graph compares USI values for different areas. Higher values indicate peaceful areas, while lower values indicate noisy regions.

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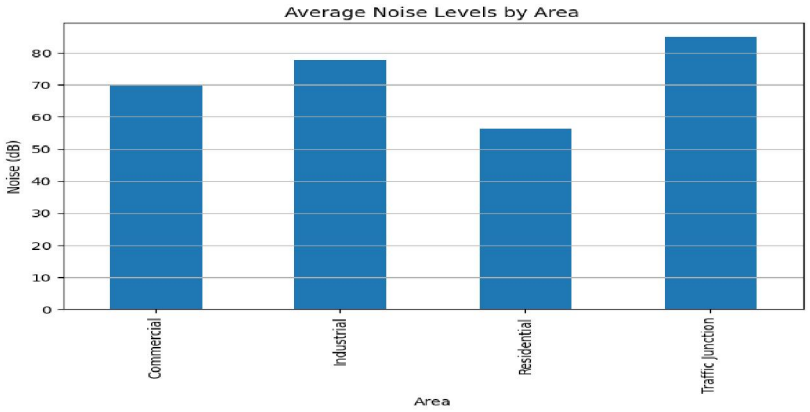


Fig. 2. Excess Noise Levels Across Areas

This chart shows that commercial areas have higher noise levels compared to residential zones..

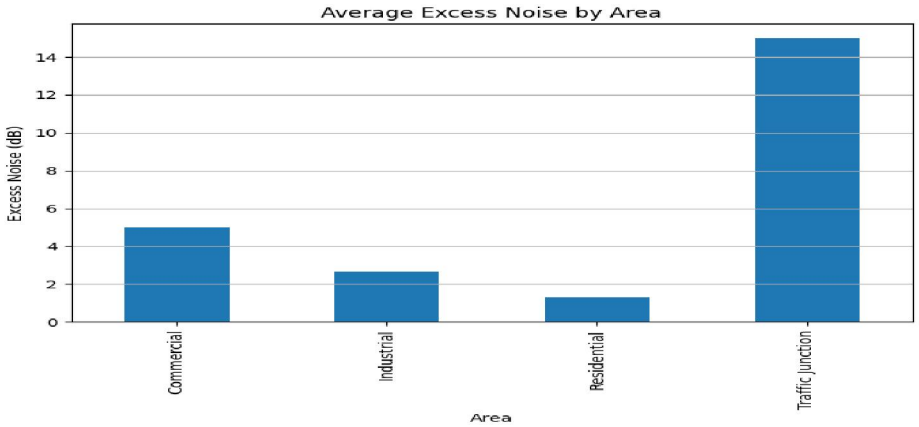
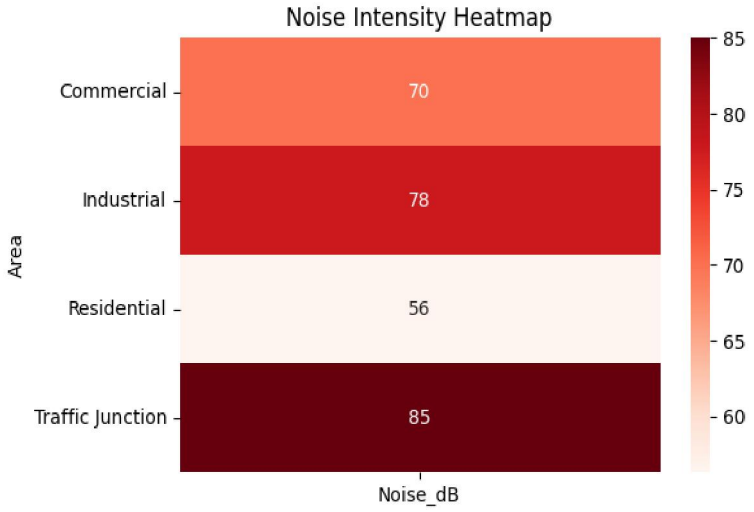


FIG 3. NOISE INTENSITY HEATMAP



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IV. CONCLUSION

The project demonstrates the practical use of data analytics in solving real-world environmental problems. With further improvements, such as real-time data integration and smart city applications, the USI model can be used for large-scale urban planning and monitoring.

V. ACKNOWLEDGMENT

I would like to express my sincere gratitude to my project guide for their continuous support and guidance. I also thank the faculty members of the department for providing necessary resources. Special thanks to my friends and classmates for their encouragement during the completion of this project.

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