

CureGraph: Contrastive Multi-Modal Graph Representation Learning for Urban Living Circle Health Profiling and Prediction (Abstract Reprint)

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Abstract Reprint. This is an abstract reprint of a journal article by [Li and Zhou, 2025].

Abstract

The early detection and prediction of health status decline among the elderly at the neighborhood level are of great significance for urban planning and public health policymaking. While existing studies affirm the connection between living environments and health outcomes, most rely on single data modalities or simplistic feature concatenation of multi-modal information, limiting their ability to comprehensively profile the health-oriented urban environments. To fill this gap, we propose CureGraph, a contrastive multi-modal representation learning framework for urban health prediction that employs graph-based techniques to infer the prevalence of common chronic diseases among the elderly within the urban living circles of each neighborhood. CureGraph leverages rich multi-modal information, including photos and textual reviews of residential areas and their surrounding points of interest, to generate urban neighborhood embeddings. By integrating pre-trained visual and textual encoders with graph modeling techniques, CureGraph captures cross-modal spatial dependencies, offering a comprehensive understanding of urban environments tailored to elderly health considerations. Extensive experiments on real-world datasets demonstrate that CureGraph improves the best baseline by 28% on average in terms of across elderly disease risk prediction tasks. Moreover, the model enables the identification of stage-wise chronic disease progression and supports comparative public health analysis across neighborhoods, offering actionable insights for sustainable urban development and enhanced quality of life. The code is publicly available at <https://github.com/jinlin2021/>

References

[Li and Zhou, 2025] Jinlin Li and Xiao Zhou. Curegraph: Contrastive multi-modal graph representation learning for urban living circle health profiling and prediction. *Artificial Intelligence*, 340:104278, 2025.