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(57) Abstract :
The present invention discloses a graph theory-enhanced artificial intelligence (Al) system for accurately predicting the spread of infectious diseases within a population. The system constructs a dynamic contact network, where individuals or entities are represented as nodes and their interactions as weighted edges. Using realtime data sources such as mobility patterns, health records, and contact histories, the invention builds a time-evolving graph structure that reflects real-world social behavior. An Al prediction engine employing Graph Neural Networks (GNNs) and temporal learning models is integrated with this graph to analyze and forecast disease transmission pathways, identify high-risk individuals or zones, and simulate the outcomes of containment strategies. A visualization and alert module presents the results to stakeholders via interactive dashboards and early-warning systems. The invention includes a feedback mechanism to continuously retrain the Al model with updated infection data, enhancing accuracy and responsiveness. This hybrid system enables scalable, interpretable, and proactive epidemiological forecasting, supporting public health decision-making and resource optimization during disease outbreaks.

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