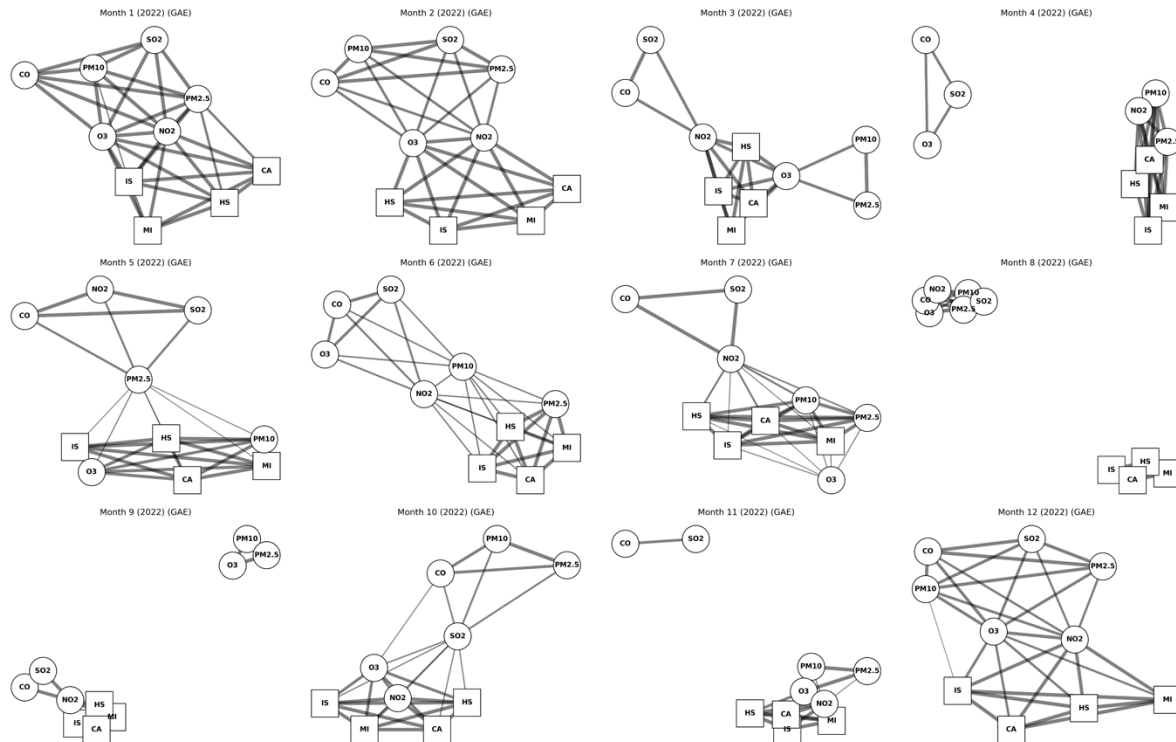


Supplement 4. Monthly Graph Autoencoder (GAE) Networks Depicting Pollutant–Disease Associations in 2022



This figure shows the monthly network visualizations generated by the Graph Autoencoder (GAE) model for each month of 2022.

Graph Construction:

Nodes: Circles indicate air pollutants (SO₂, NO₂, O₃, CO, PM₁₀, PM_{2.5}), squares indicate disease categories (CA, MI, IS, HS).

Edges: Black lines represent predicted structural associations between nodes. Thicker edges indicate stronger learned connections (higher adj_pred values).

Interpretation:

Each panel (Month 1–12) corresponds to a specific month in 2022.

Seasonal variation is visible in the network density and clustering patterns. For example, winter months (January–February, December) exhibit dense connectivity, particularly among NO₂, O₃, and disease nodes, suggesting heightened structural similarity and potential synchronous trends in pollutant exposure and disease occurrence.

Conversely, summer months (June–August) show more fragmented networks, with weaker and fewer connections, indicating a relative decoupling of pollutant and disease patterns during this period.

These month-by-month visualizations help illustrate how the learned graph structures evolve over time, supporting the identification of temporal hotspots in pollutant–disease associations.