

Interoperability of Multimorbidity Patterns Across Multiple EHR Systems



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12:00 – 13:00 PM

BMI Classroom 4004

Woodruff Memorial Research Building

or

Join us on Zoom link:

<https://zoom.us/j/92264889156>

Meeting ID: 92264889156



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Abstract: Multimorbidity, where multiple health conditions co-exist non-randomly within an individual, is a growing challenge for healthcare and society. Understanding multimorbidity patterns can lead to better prevention, treatments, and personalized care. The advent of electronic health record (EHR) systems provides a vast trove of data for studying real-world patient health dynamics. However, concerns about the primary design of EHRs for billing and administration raise questions about the consistency and reproducibility of EHR-based research. In this study, we used the International Classification of Diseases (ICD) codes to analyze disease comorbidity patterns and employed network modeling to examine multimorbidity across two major EHR systems. Our findings revealed highly correlated multimorbidity patterns across EHR systems, with graph-theoretic analysis confirming the consistency of the multimorbidity networks at local (nodes and edges), global (network statistics) and meso (neighboring connection structures) scales. This result offered new insights for developing an efficient framework to analyze and compare complex structures within the multimorbidity network. Our case study demonstrated that identifying subgraphs within multimorbidity networks is an effective method for detecting disease condition clusters, and, supported by graph spectral characteristics of the multimorbidity networks, we developed a complete online network clustering algorithm as an efficient approach to identify those clusters. To facilitate access to these complex datasets and promote further discovery research and hypothesis generation, we have developed a suite of interactive visualization tools for complex online data analysis leveraging data from multiple EHR/Biobank data sources. These tools are open source, available to the public, and are designed to enable researchers to intuitively explore the complex disease relationships within the multimorbidity networks, thereby enhancing our collective understanding and fostering the development of novel precision medicine solutions in the context of multimorbidities.

Bio: Dr. Yaomin Xu, an Assistant Professor of Biostatistics and Biomedical Informatics at Vanderbilt University Medical Center, specializes in leveraging machine learning approaches to extract novel insights from large-scale, real-world health system data, including Biobanks and Electronic Health Records (EHRs). His expertise include multivariate data analysis, data visualization, and unsupervised learning, focusing on applying statistics, bioinformatics, and health informatics through team-based problem-solving using real-world patient data.