

# **Innovative Graph Theoretic and Population Based Approaches for Big Data Analytics in Healthcare and Engineering Applications**

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## **ABSTRACT**

The last several years have witnessed major advancements in the development of sensor technologies and data measuring instruments with the goal of collecting various types of data in to be used in various application domains. Although these developments are certainly welcomed, so much left to be done to take full advantage of the data gathered by such technologies. The critical missing component is the lack of advanced data analytics. In the case of health monitoring, like many aspects of healthcare, the focus has been primarily on producing devices with data collection capabilities rather than developing advanced models for analyzing the available data. How to leverage this raw data to advance biomedical research and improve healthcare through personalized and targeted medicine, can be considered one of the most exciting scientific challenges of our generation. Similar gaps exist in other critical business, engineering and education applications.

In this talk, we attempt to fill this gap by presenting new data analytics tools using graph modeling and network analysis along with how to effectively utilize population-based approaches in implementing such tools. We demonstrate how the proposed tools can be applied to analyze complex data and reveal new useful relationships in several case studies. We also utilize graph-theoretic mechanisms to zoom in and out of network models and extract different types of information at various granularity levels. The proposed approach paves the way towards a new decision support system that leads to new discoveries in healthcare and engineering applications.

## **Brief Bio**

Hesham H. Ali is a Professor of Computer Science and the director of the University of Nebraska Omaha (UNO) Bioinformatics Core Facility. He served as the Lee and Wilma Seemann Distinguished Dean of the College of Information Science and Technology at UNO between 2006 and 2021. He has published numerous articles in various IT areas including scheduling, distributed systems, data analytics, wireless networks, and Bioinformatics. He has also published two books in scheduling and graph algorithms, and several book chapters in Bioinformatics. He has been serving as the PI or Co-PI of several projects funded by NSF, NIH and Nebraska Research Initiative in the areas of data analytics, wireless networks and Bioinformatics. He has also been leading a Research Group that focuses on developing innovative computational approaches to model complex biomedical systems and analyze big bioinformatics data. The research group is currently developing several next generation big data analytics tools for analyzing large heterogeneous biological and health data associated

with various biomedical research areas, particularly projects associated with infectious diseases, microbiome studies, early childhood development and aging research. He has also been leading two projects for developing secure and energy-aware wireless infrastructure to address tracking and monitoring problems in medical environments, particularly to study mobility profiling for advancing personalized healthcare. He has led several local and national outreach initiatives including Women in IT initiatives, IT education and training programs, and IT summer internship camps.