Séminaire du CIRRELT / CIRRELT Seminar

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Nurse Workload Balancing using Real-Time Location Data

Abstract: Sustained inequities in the workload distribution can lead to increased stress and reduced job satisfaction, high turnover, and shortages in the nursing team. These imply that healthcare quality could also eventually suffer from the imbalances in nursing workload. We develop a data-driven analytical framework to achieve balanced nurse workloads by optimizing the nurse-patient assignment decisions at the beginning of every shift. To this end, we utilize an extensive data set collected by a real-time location system installed in the surgical services department of a large tertiary hospital. This enabled us to track the care providers as well as the surgical patients through their journey from the emergency department to the operating room, and the surgical ward. The nurse workload is modeled as a multi-attribute, multilinear function, where the significance of each attribute (for the nurse manager) is elicited using an inverse optimization procedure integrated into a clustering method. This involves inverse optimization with a nonlinear integer original problem, which has not been well studied in the literature. The nurse workload balancing problem is then formulated for the upcoming shift, whereby the nurse-patient assignment decisions constitute the primary lever. This requires deploying the proposed dynamic panel-data model to predict each patient's required direct care. We also robustify the model to incorporate the uncertainties in the attribute weights. Through a real-life case-study we show that the proposed approach would have reduced the maximum travel distance by 50% - 77%. In addition, the average ranges for total direct care, maximum travel distance, and number of assigned patients decrease by 65%, 45%, and 31%, respectively.

Biography: Vedat Verter is the Stephen J.R. Smith Chair of Management Analytics at Queen's University. Prior to joining Smith School of Business in August 2022, he worked at Michigan State and McGill universities. He has been a long time member of CIRRELT, and now is a collaborating member. Professor Verter specializes on the application of operations research and data analytics for assisting policy makers in the public sector. His primary areas of research are socially responsible supply chains and healthcare analytics. In the area of healthcare, he focuses on preventive, primary, emergency, acute and chronic care processes, as well as their interaction. His earlier work focused on service chain design and hazardous materials logistics. Professor Verter's work in these four areas culminated into 80+ research articles in refereed journals and 20+ book chapters. He was Editor-in-Chief of Socio-Economic Planning Sciences, an international journal focusing on public sector decision making for ten years starting 2011. Currently, he is a Senior Editor for the Healthcare Management Department in Production and Operations Management journal. He is deeply invested in training scholars of the future, having supervised 18 PhD students and 25 post-doctoral fellows to date.

Vendredi / Friday

8 novembre 2024, 14 h
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Responsable / Organizer
Nadia Lahrichi