DSSV 2023 Data Science, Statistics & Visualisation
ECDA 2023 European Conference on Data Analysis

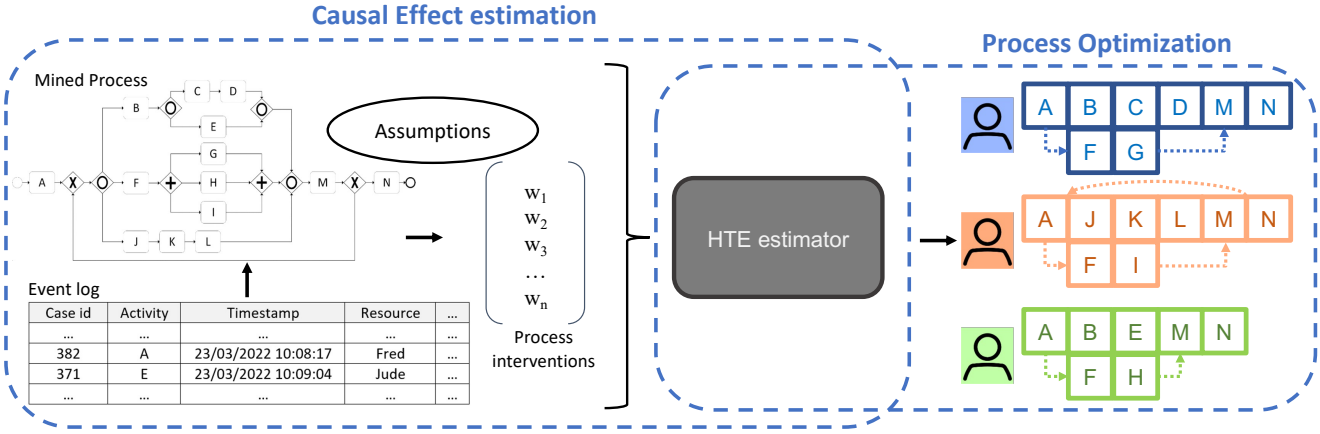
Causality and Healthcare Process Optimization

Sam Verboven[1]

[1]Vrije Universiteit Brussel, Business Technology and Operations, Pleinlaan 2, Brussels 1050, Belgium

In the healthcare domain, the patient care journey is characterized by a complex interplay between various care processes. To improve patient outcomes, it is essential to map and optimize the corresponding sequences of actions. Traditional process mining methods utilize the increasing availability of Electronic Health Records (EHR) to provide a descriptive mapping of the care processes, but do not provide policy optimization. Examples of current use cases include activity order discovery, guideline adherence assessment, and bottleneck identification. To move from description towards prescription, the field of process mining has recently started adopting causal inference methods [1]. Recent developments in causal machine learning facilitate the explicit optimization of healthcare processes. Specifically, causal effect estimation supports the optimization of intervention policies to achieve better patient outcomes more efficiently, based on data. Building on [2], causal effect estimation and process optimization are posited as integrated components that require joint design. The resulting framework (Figure 1) challenges the assumption that clinical care effectiveness solely depends on treatment selection and instead considers the effect of the full care process on operational and patient outcomes. Finally, the current state of the art is related to the basic framework components, and future avenues for causal healthcare process optimization are identified.

Figure 1: Graphical framework of causal effect estimation for personalized process optimization



[1] J. J. Koorn, X. Lu, H. Leopold, N. Martin, S. Verboven, and H. A. Reijers, "Mining statistical relations for better decision making in healthcare processes," in *2022 4th International Conference on Process Mining (ICPM)*, pp. 32–39, IEEE, 2022.

[2] S. Verboven and N. Martin, "Combining the clinical and operational perspectives in heterogeneous treatment effect inference in healthcare processes," in *Process Mining Workshops: ICPM 2021 International Workshops, Eindhoven, The Netherlands, October 31–November 4, 2021, Revised Selected Papers*, pp. 327–339, Springer, 2022.