

*Welcome seminar for new faculty*

# Partially ordered sets between composite indicators and causal inference

*A seminar by Margherita Silan*

*University of Padua - ITA*

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**Room Benvenuti and live Zoom**  
**Department of Statistical Sciences**

Partially Ordered Sets (poset) is a mathematical approach to define space based only on the reciprocal order of observations. It is commonly used in chemometrics to extract information from chemical systems. This approach is able to handle ordinal and dichotomous data, allowing to use the order information contained in data.

Due to these characteristics, poset theory has been successfully exploited to aggregate variables into composite indicators where ordinal and dichotomous data are involved. We proposed a frailty indicator computed with a set of only eight variables aggregated using poset theory. Our frailty indicator boasts several strengths; among them, thanks to the use of poset theory few assumptions are needed for its construction, it is able to consider multiple health outcomes with a parsimonious set of variables and seems a valuable choice to identify frail old individuals.

Starting from the use of poset theory to synthesize information into composite indicators, we proposed also its use as a balancing tool to match observations and estimate causal effects in frameworks where the number of treatments is high, which are quite hard to handle with traditional propensity score based methods. The proposal consists in an original matching procedure for multiple treatment frameworks based on poset theory, called Matching on poset-based Average Rank for Multiple Treatments (MARMoT). The MARMoT technique was evaluated by a simulation study and empirically by a sensitivity analysis with real data. The empirical application consists in the estimation of neighbourhood effects on fractures among older people in Turin (a city in northern Italy), considering different geographical partitions.



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