



## Seminar Series in Statistics and Data Science

11.02.2020, 14:15 @ Erling Sverdrups plass, Niels H. Abels hus, 8th floor

### **Johan Pensar:** A Bayesian Approach for Estimating Causal Effects from Observational Data

**Abstract:** We present a Bayesian method for the challenging task of estimating causal effects from passively observed data when the underlying causal DAG structure is unknown. To capture the inherent uncertainty associated with the estimate, our method builds a Bayesian posterior distribution of the linear causal effect, by integrating Bayesian linear regression and averaging over DAGs. For computing the exact posterior for all cause-effect variable pairs, we give an algorithm that runs in time  $O(3^d)$  for  $d$  variables, being feasible up to 20 variables. We also give a variant that computes the posterior probabilities of all pairwise ancestor relations within the same time complexity, significantly improving the fastest previous algorithm. In simulations, our method performs favorably against previous methods in estimation accuracy, especially for small sample sizes.



**Johan Pensar**  
University of Oslo

Johan Pensar did his PhD in statistics during 2012-2016 at Åbo Akademi University (Turku, Finland) under the supervision of prof. Jukka Corander (University of Oslo). During his PhD studies, he worked on developing a new class of graphical models, along with algorithms for learning the structure of the models from data. During 2016-2019, he has been working as a postdoc at University of Helsinki, developing and applying data analysis tools for applications in computational biology. In particular, the main project has been about detecting co-evolutionary signals from bacterial population sequence data through the use of ultra-high-dimensional structure learning. More generally, his current research interests are focused around developing and applying data-driven methods for real-world

applications.

#### Next seminar

25.02.2020 @ 14:15 **Haakon Bakka**  
KAUST (KSA) → University of Oslo

#### Contact Information

Riccardo De Bin – [debin@math.uio.no](mailto:debin@math.uio.no)  
Riccardo Parviero – [riccarpa@math.uio.no](mailto:riccarpa@math.uio.no)