



**FORTE EpiDem Network Meeting, Ystad Saltsjöbad, Skåne, 14 - 15 September 2022**

## **Methodological issues in register-based research**

### **Theme: Applied AI and machine-learning methods**

Organizers: Jonas Björk, Anita Berglund, Siddartha Aradhya, Maria Brandén

#### **Wednesday 14 September 2022**

**12:00** Lunch

**13:00** Introduction to the FORTE network. Outcome of previous years and continuation.

Aim of the meeting. Procedures. Expected outcomes. Presentation of participants.

**13:15** Session I

Mattias Ohlsson, Lund and Halmstad Universities. *Introduction to Machine Learning for Healthcare Applications using Register Data.*

Gabriel Westman, Läkemedelsverket. *AI at the Swedish Medical Products Agency.*

Martin Arvidsson, Linköping. *Applications of Machine Learning in Analytical Sociology.*

**14:45** Coffee break

**15:15** Session II

Adel Daoud, Linköping. Thinking inductively, deductively, and beyond: on the hybrid modeling culture.

Farzaneh Etminani, Halmstad. *Information-Driven Care Activities at Halmstad University, a Case Study on Heart Failure Readmission Prediction.*

Jose M Peña, Linköping. *Causal Machine Learning using Normalizing Flows, with applications in Sociology*

**16:45 Break**  
**17:00 Group discussions - Introduction (Anita Berglund)**  
**17:30 Relaxation**  
**19:30 Dinner Thursday 15 September 2022**  
**09:00 Group discussions (continued)**  
**10:00 Coffee break**  
**11:00 Presentations and conclusions. Future network activities.**  
**12:30 Lunch**  
**13:30 - 15:00. Concluding visit to the spa (optional)**

## **FORTE EpiDem Network Meeting – General information**

### **Aim**

Founded in 2015, the overall aim of the FORTE EpiDem Network (<https://www.lupop.lu.se/epidem>) is to strengthening the position of Swedish register-based research, partly through increased knowledge and shared experiences regarding adequate scientific approaches and partly by forming new long-term partnerships between significant research groups in Epidemiology and Demography, both at junior and senior levels.

### **Format**

This is by no means a traditional conference where you passively listen to lectures and presentations. Instead, the format will be informal introductions followed by lively discussions, both in plenum and in smaller groups. Although only a few have been asked to prepare presentations, active preparation and participation is expected from everyone and is crucial for a successful and rewarding meeting.

### **Expected outcome**

FORTE requires that results of the network meetings are reported. New insights, methodological ideas, clarification of concepts etc. across the disciplines that merit further work, grant applications and publications as short communications or original papers are encouraged.

### **Participation**

The network funding will cover accommodation but not travelling costs (except for externally invited speakers). Please notify Anna E Larsson ([anna\\_e.larsson@med.lu.se](mailto:anna_e.larsson@med.lu.se)) about your participation by e-mail **no later than 1 July 2022**. Inform Anna about any special dietary requests that you might have.

### **Travelling to Ystad Saltsjöbad**

Please see <https://www.yzb.se/om-oss/kontakt/> for information on how to get to the meeting.

## Theme: Applied AI and machine learning methods

This year, the FORTE EpiDem Network devotes its meeting to the use of applied artificial intelligence (AI) and machine learning methods within register-based research. Applied AI and in particular deep learning methods has proved to be a very useful framework for solving well-defined problems such as image and pattern recognition, playing chess and driving cars. Within population research, machine learning methods may add predictive power in risk or classification models compared to more standard statistical approaches and may also be superior for surveillance systems and for analysing complex spatiotemporal data regarding e.g. mobility or social networks. However, the contribution of these methods to advanced understanding of causal mechanisms in populations is still quite limited. A specific question is whether these methods can aid in revealing complex interactions between hundreds of known and unknown risk factors with highly variable penetrance where more traditional methods currently fail. Applied AI and machine learning methods suffer from being less transparent than standard methods, which may limit user acceptance and thus their practical usefulness. Regarding applied AI in health care, Swedish National Board of Health and Welfare (Socialstyrelsen) published a report in 2019 showing that much research are on-going but relatively few applications have been implemented in practice. Likewise, there are relatively few practical applications based on applied AI that have come out from other areas of population research outside medicine.

During the meeting, we will through a sample of practical applications discuss the potential of these methods specifically within Demography and Epidemiology, as well as within population research more generally. We will identify the low hanging fruits (if any) as well as the more challenging tasks within our disciplines, and we will discuss this topic broadly ranging from terminology, data requirements (as these methods tend to be very “data hungry”) to causal inference and societal aspects (including attempts to overcome the “black box” nature of these applications).

As this topic might still be quite new to many of us, active preparation before the meeting will be essential for the discussions, irrespectively of whether you have been asked to present anything during the meeting.

### Some suggested readings

Wilkinson J et al. Time to reality check the promises of machine learning-powered precision medicine. *The Lancet Digital Health* 2020.

[https://www.thelancet.com/journals/landig/article/PIIS2589-7500\(20\)30200-4/fulltext](https://www.thelancet.com/journals/landig/article/PIIS2589-7500(20)30200-4/fulltext)

Athey, S. (2018). The impact of machine learning on economics. *The economics of artificial intelligence: An agenda*, 507-547. <https://www.nber.org/system/files/chapters/c14009/c14009.pdf>

Abdulkareem M, Petersen SE. The Promise of AI in Detection, Diagnosis, and Epidemiology for Combating COVID-19: Beyond the Hype. *Front. Artif. Intell* 2021.

<https://www.frontiersin.org/articles/10.3389/frai.2021.652669/full>

Salganik, M. J., Lundberg, I., Kindel, A. T., Ahearn, C. E., Al-Ghoneim, K., Almaatouq, A., ... & McLanahan, S. (2020). Measuring the predictability of life outcomes with a scientific mass collaboration. *Proceedings of the National Academy of Sciences*, 117(15), 8398-8403.

<https://www.pnas.org/doi/full/10.1073/pnas.1915006117>

Boelaert, J., & Ollion, É. (2018). The great regression. *Revue française de sociologie*, 59(3), 475-506.

<https://www.cairn.info/revue-francaise-de-sociologie-2018-3-page-475.htm>