

## **Parameter- and observation-driven space-time interaction in epidemiology**

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In geographical epidemiology, disease counts are typically available in discrete spatial units and at discrete time-points. For example, surveillance data on infectious diseases usually consists of weekly counts of new infections in pre-defined geographical areas. Similarly but on a different time-scale, cancer registries typically reports yearly incidence or mortality counts in administrative regions.

A major methodological challenge lies in building realistic models for space-time interactions on discrete irregular spatial graphs. In this talk we will contrast two competing approaches, a parameter-driven approach through latent Gaussian Markov random fields (Rue and Held, 2005) with spatio-temporal structure, and an observation-driven approach where past observed counts in neighboring areas enter directly as explanatory variables. The distinction into parameter- and observation-driven models is borrowed from time-series analysis (Cox, 1981). We will illustrate the different methods through examples from chronic and infectious disease epidemiology.

### References:

Cox, D (1981). Statistical analysis of time series. Some recent developments. *Scandinavian Journal of Statistics*, 8, 93-115.

Rue, H. and Held, L. (2005). *Gaussian Markov Random Fields. Theory and Applications*. CRC Press/Chapman & Hall.