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Advanced non-homogeneous dynamic Bayesian network models for statistical analyses of time series data

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Document Version

Publisher's PDF, also known as Version of record

Publication date:

2019

[Link to publication in University of Groningen/UMCG research database](#)

Citation for published version (APA):

Shafiee Kamalabad, M. (2019). *Advanced non-homogeneous dynamic Bayesian network models for statistical analyses of time series data*. University of Groningen.

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Propositions belonging to the PhD thesis

“Advanced non-homogeneous dynamic Bayesian network models for statistical analyses of time series data”

by

Mahdi Shafiee Kamalabad

1. Inferring network structures of interacting units from the data is an important challenge in many disciplines such as the topical field of system biology. **Chapter 1**
2. Dynamic Bayesian network models have a restrictive homogeneity assumption, which is often not appropriate in many real world applications. **Chapter 1**
3. For non-homogeneous regulatory processes the class of non-homogeneous dynamic Bayesian network models, which are more flexible than DBNs, leads to better network reconstruction results. **Chapter 1**
4. Lack of an effective coupling/uncoupling mechanism is one shortcoming of the uncoupled/coupled non-homogeneous dynamic Bayesian network models which can be addressed by bringing the idea of segment-wise sharing information. This leads to higher network reconstruction accuracies. **Chapter 2**
5. The sequentially coupled non-homogeneous dynamic Bayesian network models can be improved by introducing time-varying coupling strengths. **Chapter 3**
6. The concept of coupling and uncoupling can be applied edge-wise, leading to a highly flexible new model with a better network reconstruction accuracy. **Chapter 4**
7. Partitioned design matrices can be used to define partially non-homogeneous dynamic Bayesian networks, in which some parameters stay constant across conditions and other parameters are condition-specific. **Chapter 5**
8. Asymptotically (i.e. for large sample sizes) Bayesian and frequentistic models yield comparable inference results. **Chapter 6**
9. Being either a merely Bayesian or a merely frequentistic statistician would be narrow-minded. Depending on the data situation either Bayesian or frequentistic models can be more suitable. Therefore, I would recommend being open-minded to both paradigms.
..... **Mahdi Shafiee Kamalabad**
10. “All models are wrong but some are useful” **George E. P. Box**