

Extending the hidden Markov model to analyze complex ecological and environmental data

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Abstract

Hidden Markov models (HMMs), and more generally Markov-switching models, are popular frameworks in the analysis of ecological and environmental data collected over time and space as HMMs work on the assumption that what we observe is a result of an underlying latent state. For example, in ecology, animal movement data is collected with the intention to infer behavioral states of the animal (such as foraging or resting), and in environmental sciences, wind turbines collect wind speed data as different wind speed states relate to different amounts of energy production.

However, much of the popularity associated with HMMs is due to the ease with which its framework can be extended. Here I present two projects that modify the basic HMM structure to model complex ecological and environmental data: multi-scale HMMs for modeling of animal movement and spatially-coupled HMMs for short-term wind speed forecasting.