Hidden Markov models and dynamical systems

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Abstrak

Hidden Markov models (HMMs) are discrete-state, discrete-time, stochastic dynamical systems. They are often used to approximate systems with continuous state spaces operating in continuous time. In addition to introducing the basic ideas of HMMs and algorithms for using them, this book explains the derivations of the algorithms with enough supporting theory to enable readers to develop their own variants. The book also presents Kalman filtering as an extension of ideas from basic HMMs to models with continuous state spaces. Although applications of HMMs have become numerous (396,000 Google hits) since they emerged as the key technology for speech recognition in the 1980s, no introductory book on HMMs in general is available. This text aims to fill that gap.
Hidden Markov Models and Dynamical Systems features illustrations that use the Lorenz system, laser data, and natural language data. The concluding chapter presents the application of HMMs to detecting sleep apnea in experimentally measured electrocardiograms. Algorithms are given in pseudocode in the text, and a working implementation of each algorithm is available on the accompanying website.