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An Introduction to Hidden Markov Models

Hidden Markov models allow us to study sets of observed data without needing to understand the underlying processes. This is useful in studying things that do not have an observable underlying process. When studying hidden Markov models there are three questions that can be solved, the evaluation problem, the decoding problem and the learning problem. The evaluation problem and the decoding problem can both be solved by using dynamic programming, which is a process of simplifying a problem to such a degree that it becomes easy to solve. The algorithms we discuss to solve these two problems are the forward-backward algorithm and the Viterbi algorithm, both of which provide analytical solutions. The learning problem is an optimization problem and thus cannot be solved analytically. Thus the learning problem can be solved either by means of an iterative process or by some other optimization technique such as a

gradient method. We discuss the Baum-Welch algorithm, which is an iterative process, as a solution to the learning process.

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