

Viterbi algorithm

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The **Viterbi algorithm** is a [dynamic programming algorithm](#) for finding the most [likely](#) sequence of hidden states – called the **Viterbi path** – that results in a sequence of observed events, especially in the context of [Markov information sources](#), and more generally, [hidden Markov models](#). The **forward algorithm** is a closely related algorithm for computing the probability of a sequence of observed events. These algorithms belong to the realm of [information theory](#).

The algorithm makes a number of assumptions. First, both the observed events and hidden events must be in a sequence. This sequence often corresponds to time. Second, these two sequences need to be aligned, and an instance of an observed event needs to correspond to exactly one instance of a hidden event. Third, computing the most likely hidden sequence up to a certain point t must depend only on the observed event at point t , and the most likely sequence at point $t - 1$. These assumptions are all satisfied in a first-order hidden Markov model.

The terms "Viterbi path" and "Viterbi algorithm" are also applied to related dynamic programming algorithms that discover the single most likely explanation for an observation. For example, in [statistical parsing](#) a dynamic programming algorithm can be used to discover the single most likely context-free derivation (parse) of a string, which is sometimes called the "Viterbi parse".

The Viterbi algorithm was conceived by [Andrew Viterbi](#) in 1967 as an [error-correction](#) scheme for noisy digital communication links, finding universal application in decoding the [convolutional codes](#) used in both [CDMA](#) and [GSM](#) digital cellular, [dial-up](#) modems, satellite, deep-space communications, and [802.11](#) wireless LANs. It is now also commonly used in [speech recognition](#), [keyword spotting](#), [computational linguistics](#), and [bioinformatics](#). For example, in [speech-to-text](#) (speech recognition), the acoustic signal is treated as the observed sequence of events, and a string of text is considered to be the "hidden cause" of the acoustic signal. The Viterbi algorithm finds the most likely string of text given the acoustic signal.