Machine Learning Algorithms Summary

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Abstract

A K-nearest-neighbour (Knn) algorithm was created in the R programming language successfully predicting

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this is the introduction...

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A. Background

A Markov chains is a stochastic model in which future events can be predicted due to the fact that the probability of an event depends only on the state attained in the previous event. Schematically, a hidden Markov model (HMM) can be seen in Fig.1 where $H_1, H_2, ..., H_T$ follow a (first-order stationary) Markov process, the state space is $s_1, s_2, ..., s_N$ and the transition probabilities $p_{i,j}$ form the $N \,\mathrm{x}\, N$ transition matrix M. Thus the initial probabilities are defined as $p_i = \Pr(H_1 = s_i), i = 1, 2, ..., N$. We observe $V_1 V_2, ...$ and given the value of H_t, the variable V_t is the observable, independent of everything else. The possible values of V_t are defined as $x_1, x_2, ...x_k$ where the distribution is given by emission probabilities. $b_{i,k} = \Pr(V_t = x_k | H_t = s_i)$ that form the $N \,\mathrm{x}\, K$ emission matrix B. This is what is known as a HMM.

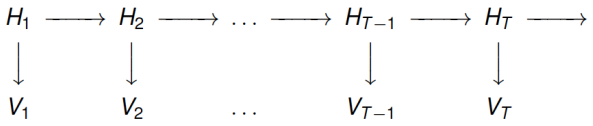

Figure 1: Schematic representation of a (first-order stationary) hidden Markov Model.

B. Algorithm

Suppose the parameters of a HMM are known and we have observed $v_1, v_2, ..., v_T$, now we can calculate

$$\Pr(H_t = s_i | v_1, ..., v_T). \tag{1}$$

The Forward-Backward Algorithm is an implementation of dynamic programming used to calculate Eq.1 with computational time $O(N^2 T)$