

Unsupervised segmentation of hidden semi-Markov non stationary chains

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In the classical hidden Markov chain model we have a hidden chain X , which is a Markov one, and an observed chain Y . Hidden Markov chains are widely used in numerous problems; however, in some situations they have to be replaced by the more general “hidden semi-Markov chains” [1, 3], which can be seen as particular “triplet Markov chains” $T=(X, U, Y)$, where the auxiliary chain U models the fact that X is semi-Markov [5]. Otherwise, it has been showed that a non stationary classical hidden Markov chain can also be considered as a triplet Markov stationary chain with, as a consequence, the possibility of parameters estimation [2].

The aim of this paper is to use the both properties simultaneously. We first consider a triplet Markov chain $T1=(X, U1, Y)$, which is equivalent to a hidden semi-Markov chain. We then consider that $T1$ is not stationary, which is modelled by another stationary triplet Markov chain $T2=(X, U1, U2, Y)$ (in $T2$ the auxiliary chain is $U=(U1, U2)$). Finally, $T2$ is used to estimate the hidden semi-Markov non stationary chain in an unsupervised manner. “Unsupervised” means that all the model parameters are estimated from the only observed data by an original estimator, which is a new variant of the general “iterative conditional estimation” (ICE) method [5].

We present different experiments showing the interest of the new model and related processing with respect to the classical stationary hidden semi-Markov chains.

References

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