

## **Improved expectation maximization algorithm for Gaussian mixed model using the kernel method**

### **ABSTRACT**

Fraud activities have contributed to heavy losses suffered by telecommunication companies. In this paper, we attempt to use Gaussian mixed model, which is a probabilistic model normally used in speech recognition to identify fraud calls in the telecommunication industry. We look at several issues encountered when calculating the maximum likelihood estimates of the Gaussian mixed model using an Expectation Maximization algorithm. Firstly, we look at a mechanism for the determination of the initial number of Gaussian components and the choice of the initial values of the algorithm using the kernel method. We show via simulation that the technique improves the performance of the algorithm. Secondly, we developed a procedure for determining the order of the Gaussian mixed model using the log-likelihood function and the Akaike information criteria. Finally, for illustration, we apply the improved algorithm to real telecommunication data. The modified method will pave the way to introduce a comprehensive method for detecting fraud calls in future work.

**Keyword:** Kernel method; Gaussian mixed model; Expectation Maximization algorithm