

## [2A6-GS-2]Machine learning

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### [2A6-GS-2-04]Generalized hyperbolic process for machine learning

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Despite the successes of the Gaussian process in modeling highly dimensional complex dynamics, describing fluctuations of financial time series is still challenging.

The problem arises from non-Gaussian, in particular, the asymmetric and fat-tail nature of the financial time series.

In this paper, we propose a generalized hyperbolic process (GHP) as an alternative to the Gaussian process and Student's  $t$ -process to incorporate asymmetric non-Gaussian distribution into the Bayesian kernel model.

The GHP is realized by the marginalization of a mixture Gaussian process with the generalized inverse Gaussian distribution.

For prediction, we analytically derive the conditional distribution of the GHP.

To estimate the parameters of the GHP, we present an expectation-maximization algorithm. In addition, we present parameter estimation results of the GHP for synthetic and empirical market datasets.