数学与系统科学研究院

计算数学所网络学术报告

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报告题目：

VAE-KRnet and its applications to variational Bayes

邀请人： 于海军 副研究员

报告时间：2020 年 12 月 3 日（周四）

上午 10:30-11:30

报告工具：腾讯会议（ID：261 951 509）

会议链接：

https://meeting.tencent.com/s/d6FAaD5iSTki

摘要：

In this work, we have proposed a generative model for density estimation, called VAE-KRnet, which combines the canonical variational autoencoder (VAE) with our recently developed flow-based generative model, called KRnet. VAE is used as a dimension reduction technique to capture the latent space, and KRnet is used to model the distribution of the latent variables. Using a linear model between the data and the latent variables, we show that VAE-KRnet can be more effective and robust than the canonical VAE. As an application, we apply VAE-KRnet to variational Bayes to approximate the posterior. The variational Bayes approaches are usually based on the minimization of the Kullback-Leibler (KL) divergence between the model and the posterior, which often underestimates the variance if the model capability is not sufficiently strong. However, for high-dimensional distributions, it is very challenging to construct an accurate model since extra assumptions are often needed for efficiency, e.g., the mean-field approach assumes mutual independence between dimensions. When the number of dimensions is relatively small, KRnet can be used to approximate the posterior effectively with respect to the original random variable. For high-dimensional cases, we consider VAE-KRnet to incorporate with the dimension reduction. To alleviate the underestimation of the variance, we include the maximization of the mutual information between the latent random variable and the original one when seeking an approximate distribution with respect to the KL divergence. Numerical experiments have been presented to demonstrate the effectiveness of our model.

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