

# Deep variational auto-encoders: A promising tool for dimensionality reduction and ball bearing elements fault diagnosis

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© The Author(s) 2018. One of the main challenges that the industry faces when dealing with massive data for failure diagnosis is high dimensionality of such data. This can be tackled by dimensionality reduction method such as principal components analysis, which usually results in an improved fault diagnosis. Other available techniques include auto-encoders and its variants denoising auto-encoders and sparse auto-encoders. Most recently, variational auto-encoders are one of the most promising techniques for unsupervised learning with successful applications in image processing and speech recognition. Differently from other auto-encoder methods, variational auto-encoders use variational inference to generate a latent representation of the data and impose a distribution over the latent variables and the data itself. In this article, we propose a fully unsupervised deep variational auto-encoder-based approach for dimensionality reduction in fault diagnosis and explore the variational auto-