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An Improved Vector Quantization Method using Deep Neural Network

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Abstract

To address the challenging problem of vector quantization (VQ) for high dimensional vector using large coding bits, this work proposes a novel deep neural network (DNN) based VQ method. This method uses a k-means based vector quantizer as an encoder and a DNN as a decoder. The decoder is initialized by the decoder network of deep auto-encoder, fed with the codes provided by the k-means based vector quantizer, and trained to minimize the coding error of VQ system. Experiments on speech spectrogram coding demonstrate that, compared with the k-means based method and a recently introduced DNN-based method, the proposed method significantly reduces the coding error. Furthermore, in the experiments of coding multi-frame speech spectrogram, the proposed method achieves about 11% relative gain over the k-means based method in terms of segmental signal to noise ratio (SegSNR).

Keywords: deep neural network, vector quantization, auto-encoder, binary coding

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