QUANTUM COMPUTING FOR EFFICIENT LEARNING IN PROTOTYPE-BASED VECTOR QUANTIZATION

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Prototype-based Vector Quantization (PbVQ) is one of the key methods in data processing like data compression or interpretable classification learning. Prototype vectors serve as references for data and data classes. The data are given as vectors representing objects by numerical features. Famous apporaches are the Neural Gas Vector Quantizer (NGVQ) for data compression and Learning Vector Quantizers (LVQ) for classification tasks. Frequently, training of those models is time consuming. In the contribution we discuss modifications of these algorithms adopting ideas from quantum computing. The aim for this is a least twofold: First quantum computing provides ideas for enormous speedup making use of quantum mechanical systems and inherent parallelization. Second, considering data and prototype vectors in terms of quantum systems implicit data processing is performed, which frequently provides better data separation. We will highlight respective ideas and difficulties when equipping vector quantizers with quantum computing features and explain related mathematical aspects.