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Batch-learning self-organizing map with quadratic unconstrained binary optimization --toward application to Ising machine --

Self-Organizing Map (SOM) is a kind of neural network trained by unsupervised learning [1]. In the framework of SOM, high-dimensional data is visualized by mapping of data on low-dimensional space. SOM has been used for many applications such as clustering [2]. Especially, batch-learning SOM is a practical application and has been studied exhaustively [3]. In algorithms of conventional batch-learning SOM, all data in a batch is used for updating weights in every epoch, on the other hand, selecting data in a batch can improve the quality of the obtained results. In our study, we propose a new algorithm, batch-learning SOM with quadratic unconstrained binary optimization (QUBO). To optimize quantization error calculated by using selected data in a batch, we formulate the batch-learning SOM by using QUBO. We apply this algorithm to some datasets and investigate the performance of this algorithm. This work was done in collaboration with Taichi Iki (Nextremer Co., Ltd.) and Shu Tanaka (Waseda University and JST, PRESTO).

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