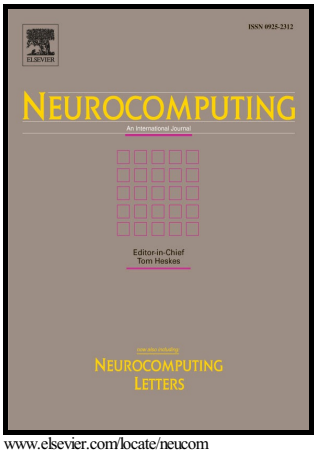

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Kernelized Product Quantization

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Abstract

There has been increasing interest in learning compact binary codes for large-scale image data representation and retrieval. In most existing hashing-based methods, high-dimensional vectors are hashed into Hamming space, and the similarity between two vectors is approximated by the Hamming distance between their binary codes. Although hashing-based binary codes generation methods were widely used, Product Quantization (PQ) has been shown to be more accurate than various hashing-based methods, largely due to its lower quantization distortions and more precise distance computation. However, it is still a challenging problem to generalize PQ to accommodate arbitrary kernels. In this paper, we demonstrate how to employ arbitrary kernel functions in a PQ scheme. First, we propose a Kernelized PQ (KPQ) method based on composite kernels, which serves as a basic framework by making the decomposition of implicit feature space possible. Furthermore, we propose a Kernelized Optimized PQ (KOPQ) method to generalize Optimized Product Quantization (OPQ) to an arbitrary implicit feature space. Finally, we propose a Supervised KPQ (SKPQ) to improve the performance of semantic neighbor search. Both methods are variations of KPQ with the incorporation of their corresponding core techniques, KPCA and KCCA respectively, to the basic KPQ framework. Experiments involving three notable datasets show that KPQ, KOPQ and SKPQ can outperform the state-of-the-art methods for a similarity search in feature space or semantic search.

Keywords:
High-dimensional Similarity Search, Compact Binary Coding, Product Quantization, Composite Kernel