Computer Vision

Approximate Nearest Neighbors Algorithms
Usage of GPU

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faiss

In this report, we cover results of our experiments with `faiss`[1] library [1] for the nearest neighbors search. The report includes the following:

- Timing comparison for the k-means task on SIFT2M data evaluated before;
- k-NN graph construction with various indices from `faiss` and evaluation of timings and precision on Oxford105K data set.
- Implementation of the shortest path algorithm within the k-NN graph based on (12) of [1]. Oxford105K data was utilized.

Technical Details

The respective implementation is available on our GitHub page.

[1] We utilize Fair AI Similarity Search (faiss) library with fixed parameters of the index: `nlist`= 256, m = 16, `nbits`= 8, and `nprobe`= 32 of IVFPQ index.

Description

Once again we perform naive k-means iterations on the SIFT2M data set with $k = 32000$. However, this time only exact nearest neighbors are searched for. Moreover, the search is done by means of GPU. As expected, the flat index from `faiss` on a GPU-enabled machine performs the search of nearest cluster centers more than a thousand times faster (recall that it took approx. 9K seconds before). Cluster assignment still takes relatively long, as it was not optimized for GPU by us.

Title	(AVG. | STD.) NN time, [s]	(AVG. | STD.) assignment time, [s]
Exhaustive NN search	2.58 | 0.37	136.56 | 18.36

Appendix

J. Johnson, M. Douze, and H. Jégou.
Billion-scale similarity search with gpus.
IEEE Transactions on Big Data, pages 1–1, 2019.