



# Randomized Sampling-based Fly Local Sensitive Hashing

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## Motivation

- In this paper, we investigate and improve FLSH, a newly developed biomimetic data-independent hashing, which is inspired by the information compression mechanism discovered in the odor processing system of drosophila.
- The improvement is based on the fact that the connection between neurons are established with randomness and the number of the connection among all neurons are less likely to stay fixed.

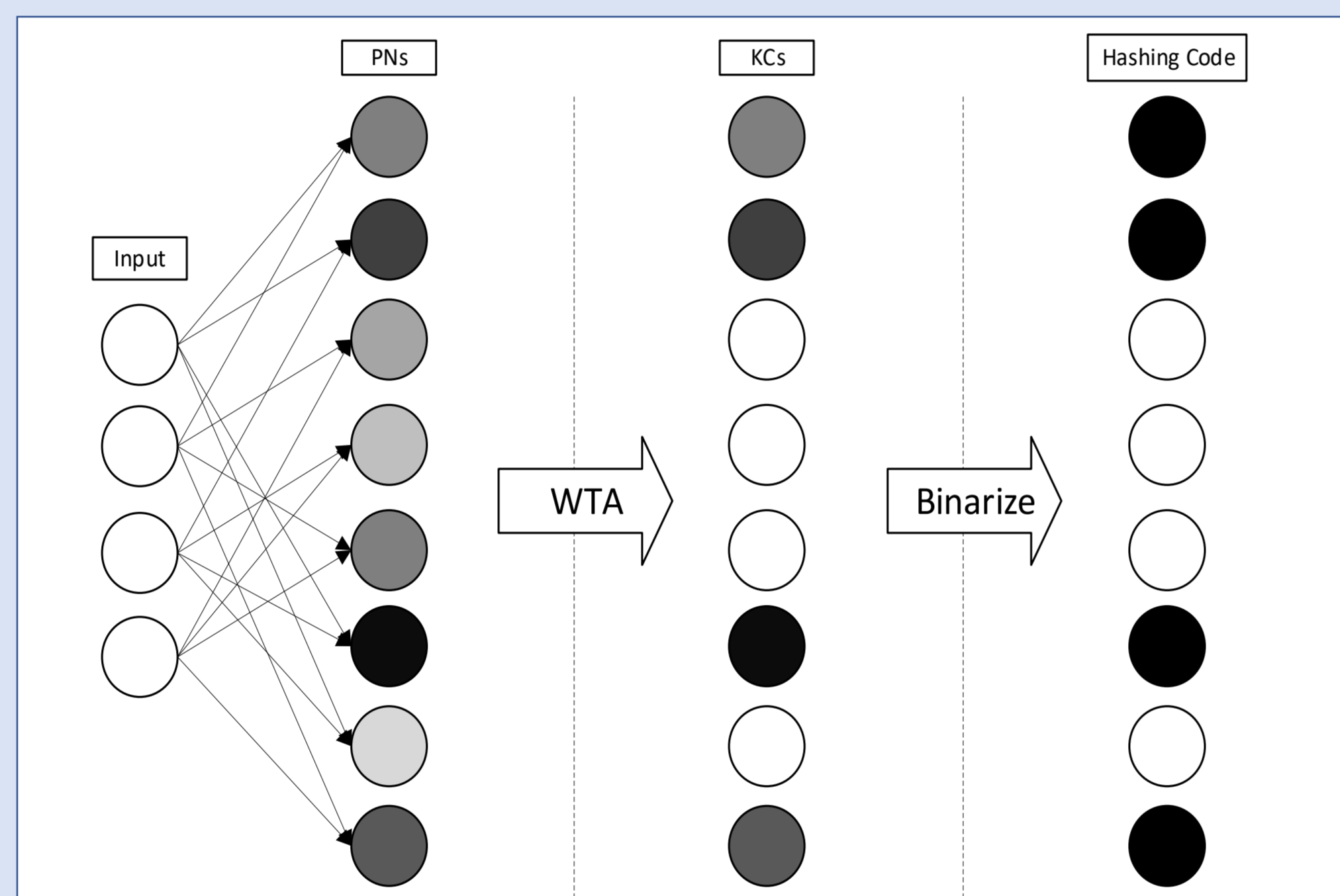
## Materials and Methods

### Original Fly LSH

- Dimension-expansional projection
- Winner-take-all operation
- Binarization

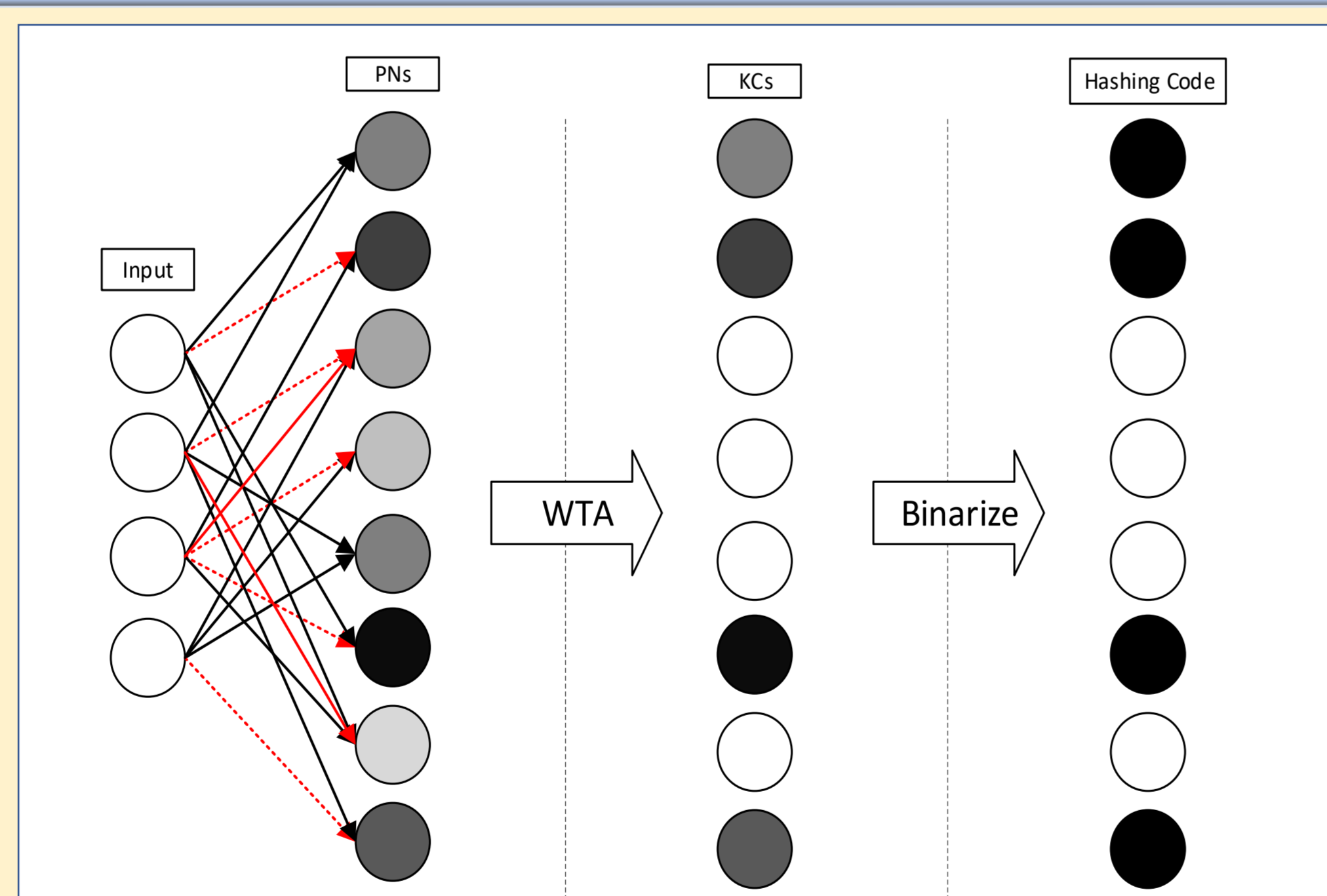
### Problems

- Input neurons tend to establish exactly the same number of synapses with output neurons.



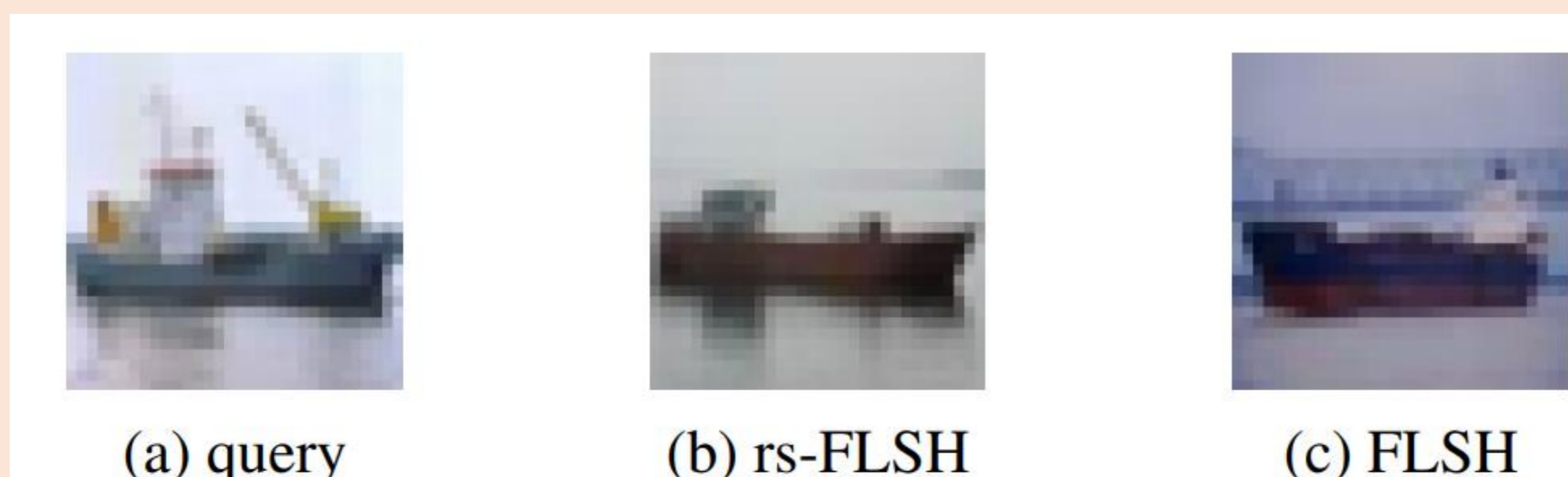
### Solution-- Randomized Sampling-based FLSH

- Introduce random sample rate for each high-dimensionality projection
- it's not the value change of sample rate, but its fluctuation that contributes to the performance improvement



### Single illustration of the Effectiveness of rs-FLSH

- rs-FLSH can preserve more Euclidean similarity
- The retrieval result of rs-FLSH is more promising under subjective visual evaluation



Hashing Methods	rs-FLSH	FLSH
Euclidean	0.1485	0.1957

## Experiments

### A. Precision comparison

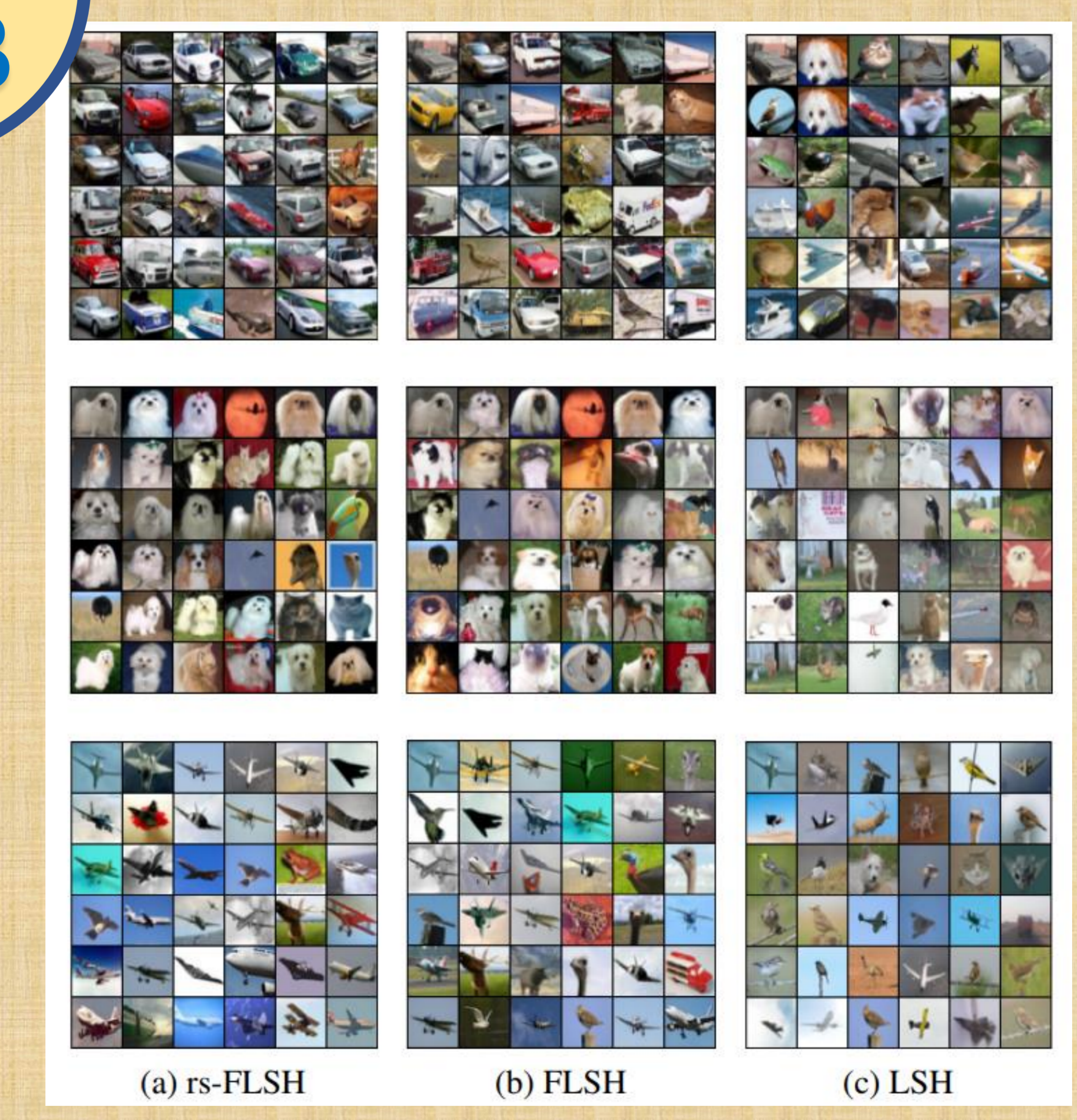
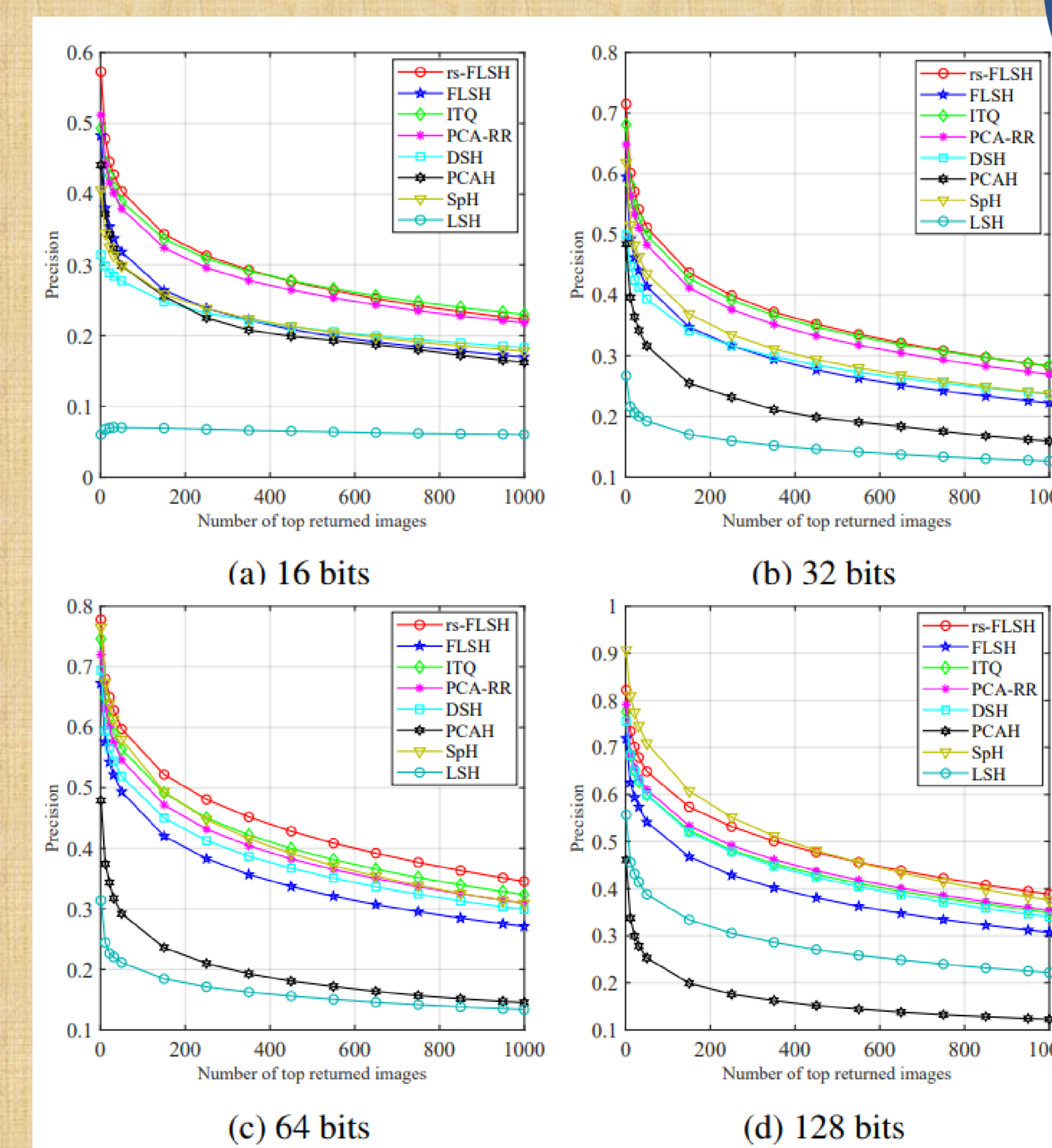
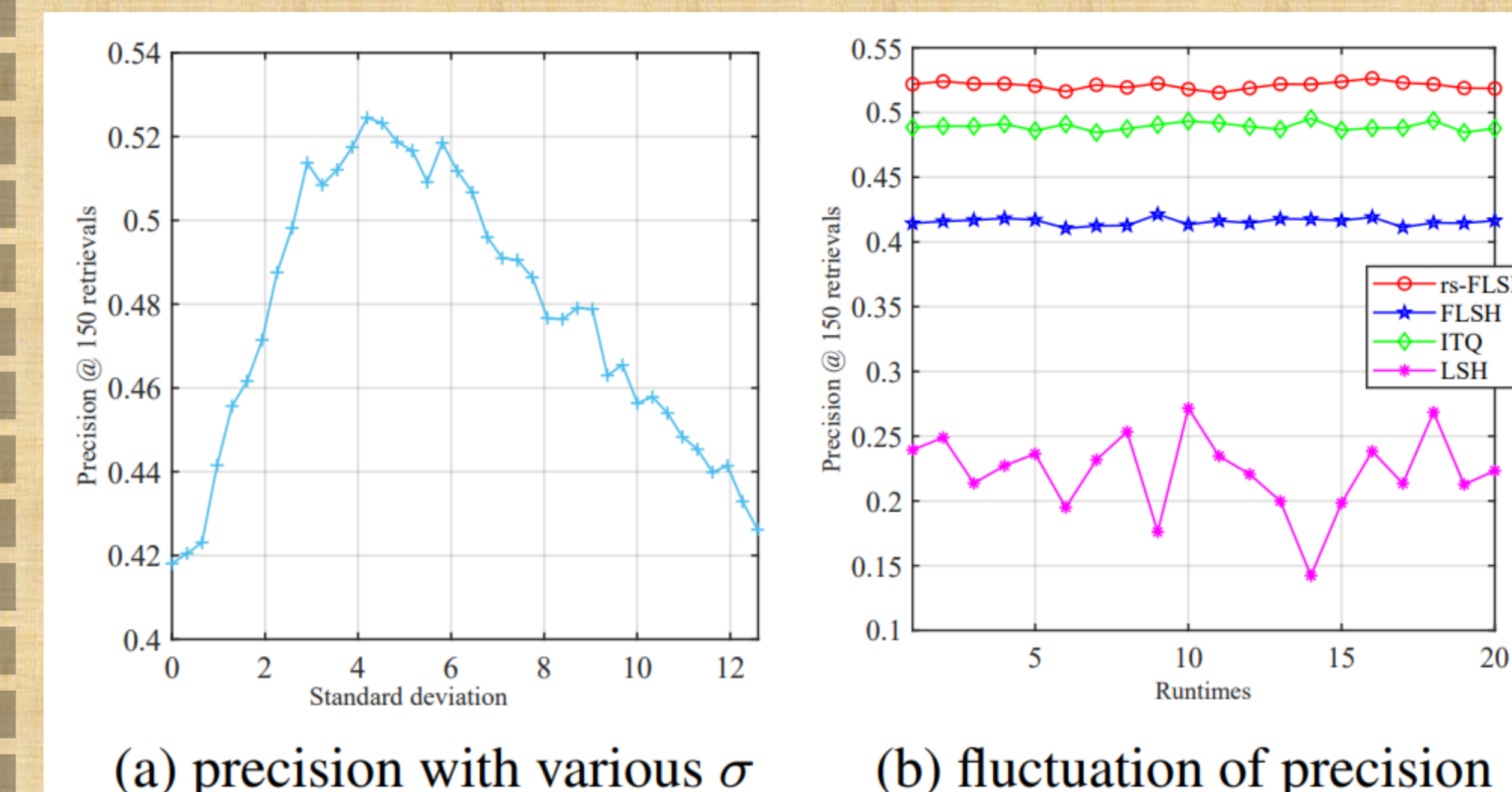
- Precision comparison with different hash code length, i.e., 16 bits, 32 bits, 64 bits, 128 bits

### B. Subjective evaluation of retrieval results

- Comparison of retrieval result for rs-FLSH, FLSH and LSH. The upper left image of each group is the query image

### C. Parameter selection and stability analysis

- (a) presents the variation in precision of rs-FLSH with the increasing of various  $\sigma$
- (b) demonstrates the results of the stability examination, i.e., the fluctuation in precision over 20 times test repetition.



## Conclusion

We propose a novel randomized sampling scheme to improve the performance of FLSH. The basic idea of rs-FLSH is that the connection probability between neurons is not a fixed scalar, and the analogy of this randomness may lead to better result. The results demonstrate our improvements.