A Mini-Batch Discriminative Feature Weighting Algorithm for LBP - Based Face Recognition

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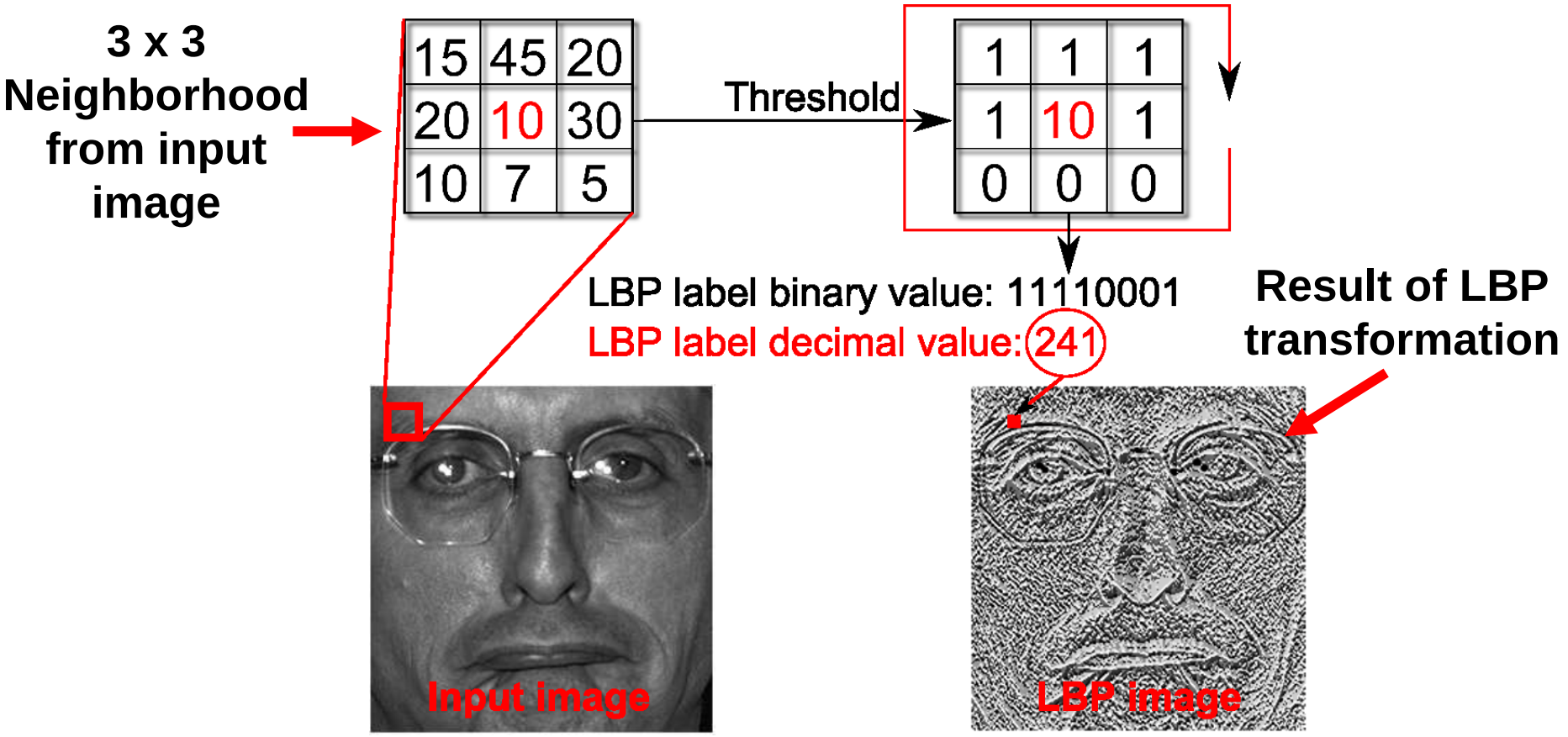
LBP – Local Binary Patterns



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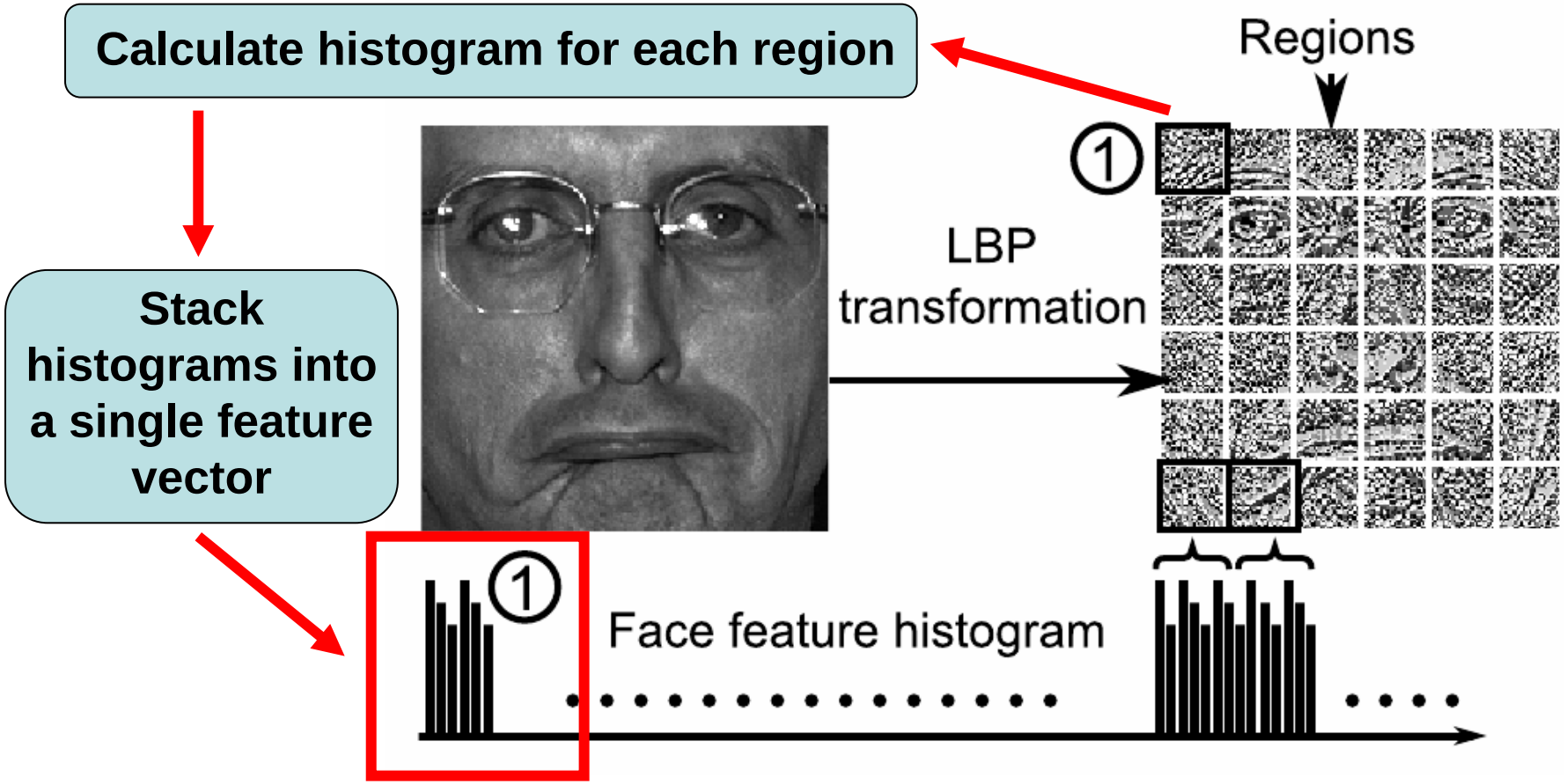

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Recognition stage:

- **compare LBP histogram of the input image with histograms from the database**
- **nearest neighbor classifier (NNC) is used (Example: Euclidean distance)**

Is Nearest Neighbor Classifier (NNC) the best solution?

Why NNC is usually used? Problem:

- Having plenty of classes / persons
- Only a few training examples per class / person

Possible improvement

~~**Artificial Neural Networks**~~
~~**Support Vector Machines**~~
~~**...**~~

Weighted Nearest Neighbor Classifier (WNNC)
Utilize statistical information from all classes

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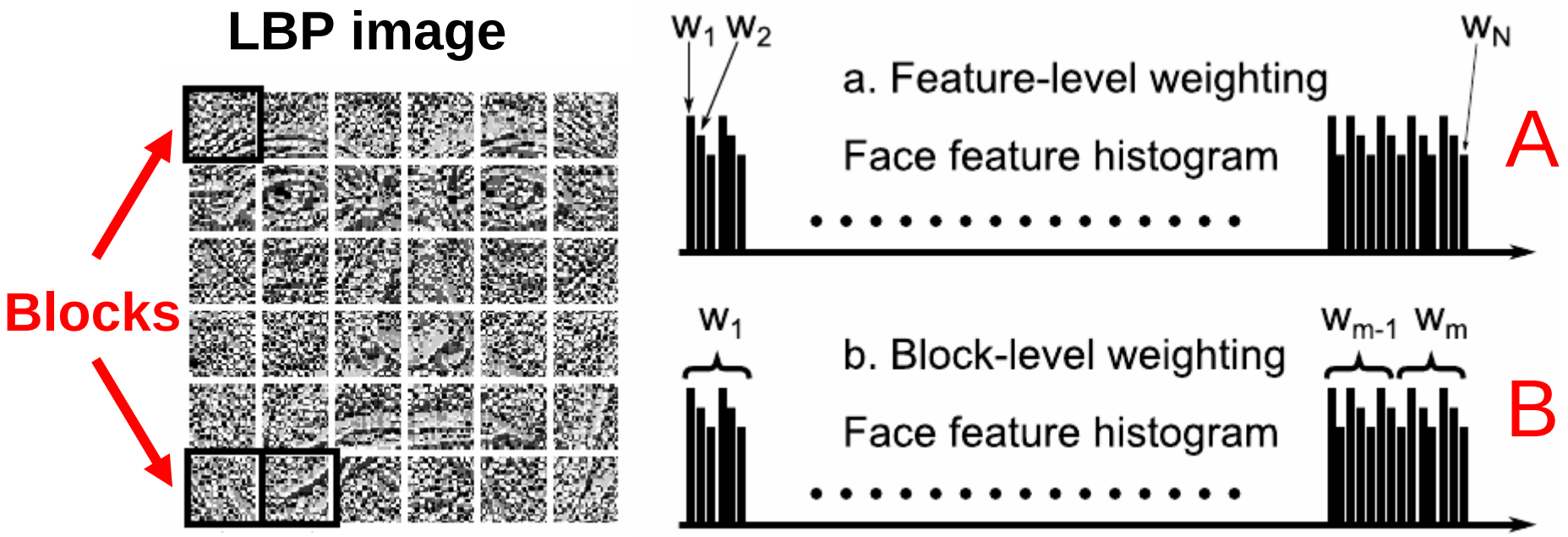
Proposed in two levels: feature and block weighting:



Presented approach amplifies the features/blocks, which are more relevant for the recognition by adjusting the weights.

Weights are determined in the learning process.

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Only TWO training examples per class are needed (Photo 1 & 2)

d – Euclidean distance between weighted histograms		Person 1	Person 2	Person 3…	Person M
		Photo 2	Photo 2	Photo 2	Photo 2
Person 1	Photo 1				
Person 2	Photo 1				
Person 3…	Photo 1				
Person M	Photo 1				

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Only two training examples per class are needed (Photo 1 & 2)

d – Euclidean distance between weighted histograms		Person 1	Person 2	Person 3…	Person M
		Photo 2	Photo 2	Photo 2	Photo 2
Person 1	Photo 1	d_{11} ← **intra-class distance**			
Person 2	Photo 1		d_{22}		
Person 3…	Photo 1			d_{33}	
Person M	Photo 1				d_{MM}

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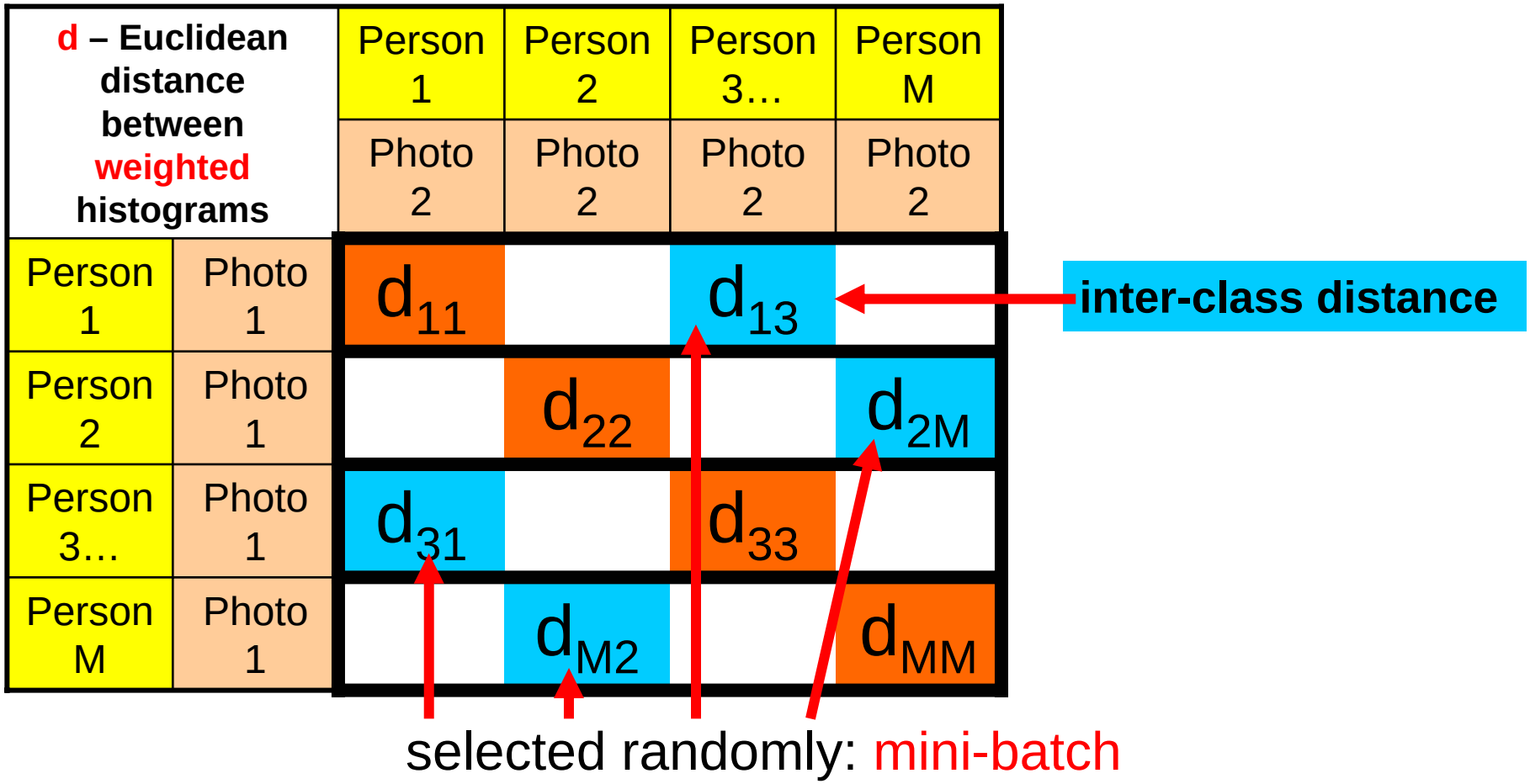

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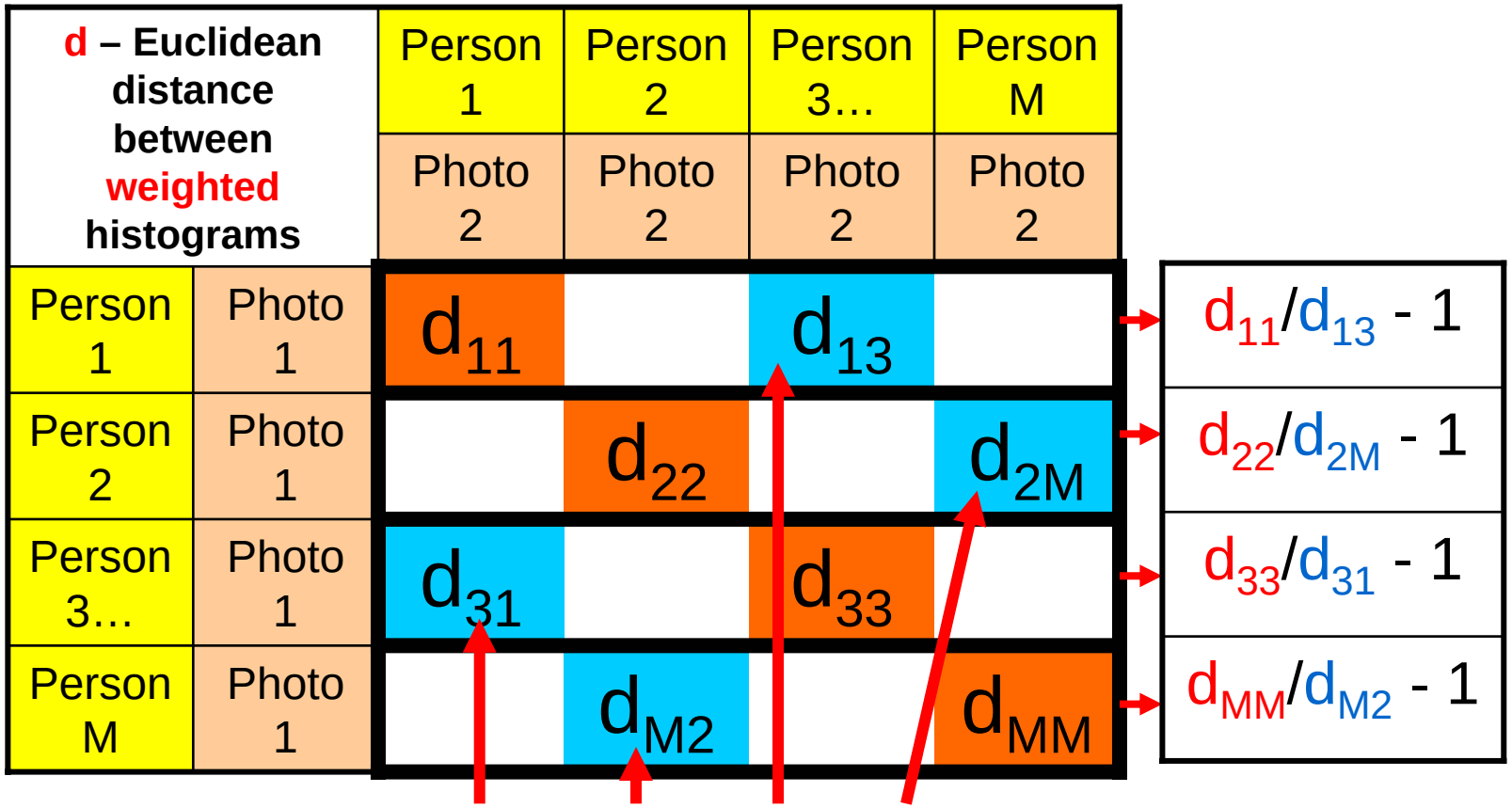

selected randomly: mini-batch

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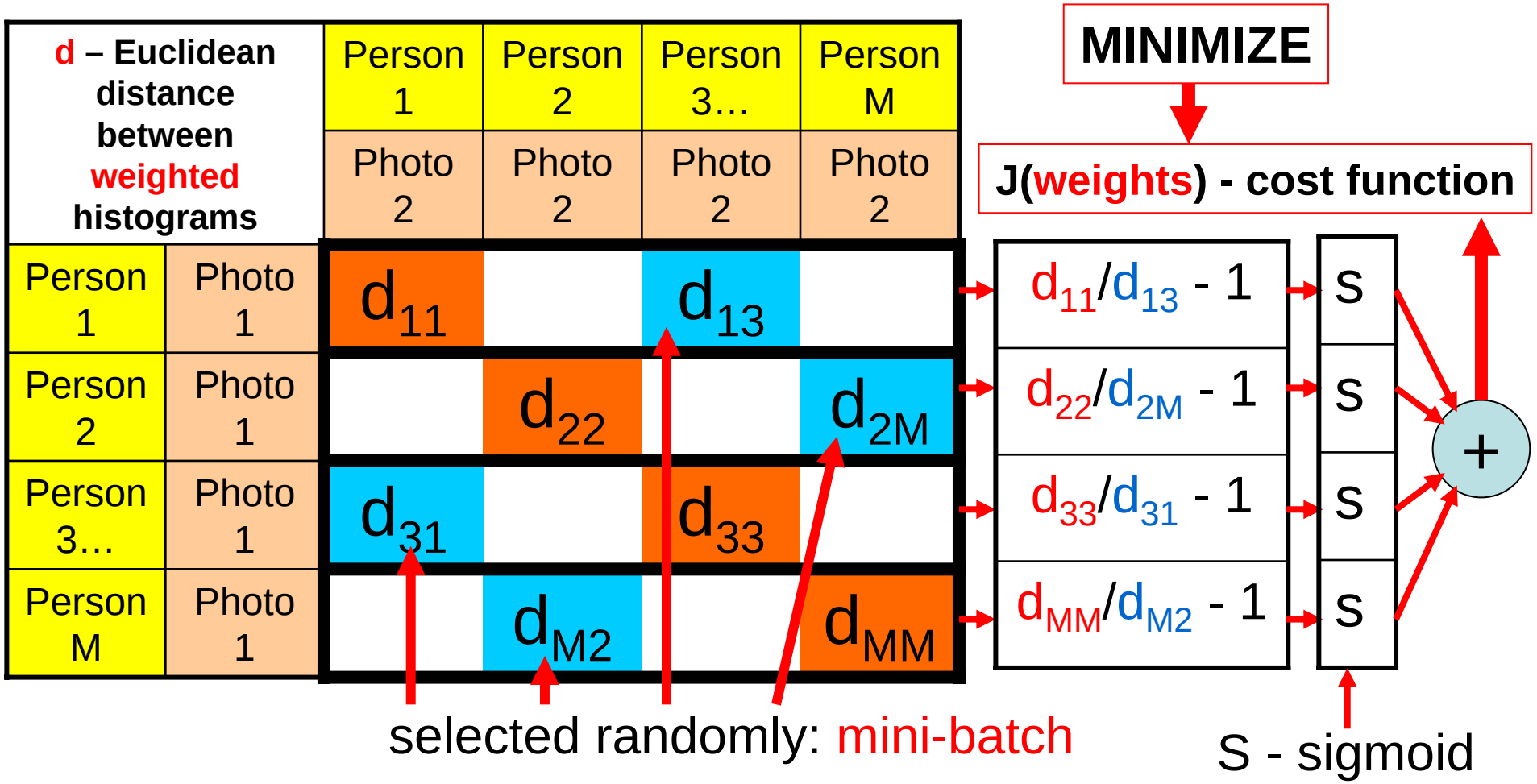

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d – Euclidean distance between weighted histograms		Person 1	Person 2	Person 3…	Person M
		Photo 2	Photo 2	Photo 2	Photo 2
Person 1	Photo 1	d_{11}		d_{13}	d_{1M}
Person 2	Photo 1		d_{22}	d_{23}	d_{2M}
Person 3…	Photo 1	d_{31}	d_{32}	d_{33}	
Person M	Photo 1		d_{M2}	d_{M3}	d_{MM}

Learning data selection:

1. Selected randomly at each iteration
2. Select smallest inter-class distances for all persons after each N iterations

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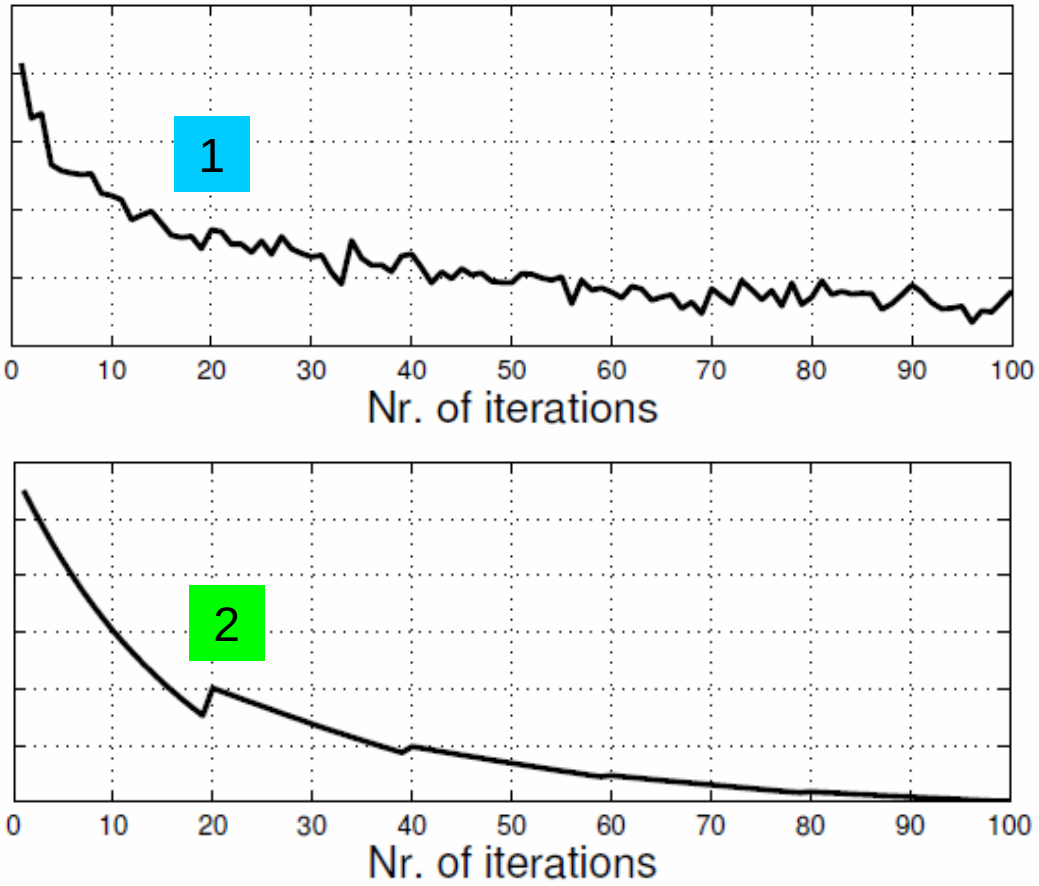

Learning data selection:

1 Selected randomly at each iteration

2 Select smallest inter-class distances for all persons after each N=20 iterations

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Results on FERET face database

fa and **fb** sets	LBP	LBP + feature weighting	LBP + block weighting
Random learning data	95,8 %	97.1 %	98.0 %
"Optimal" learning data	95,8 %	97.6 %	**98.9 %**

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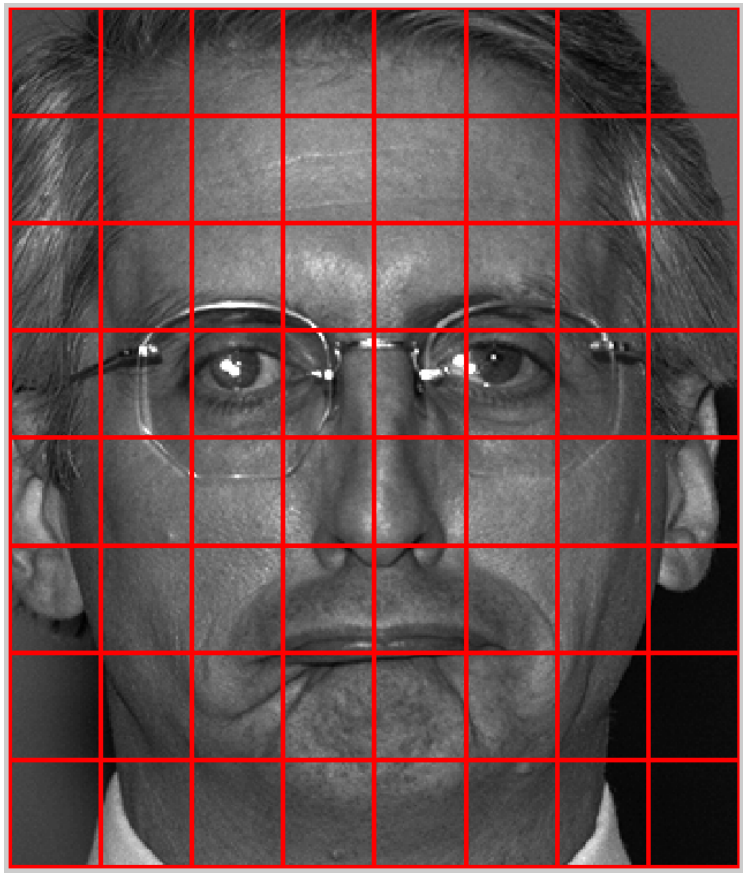
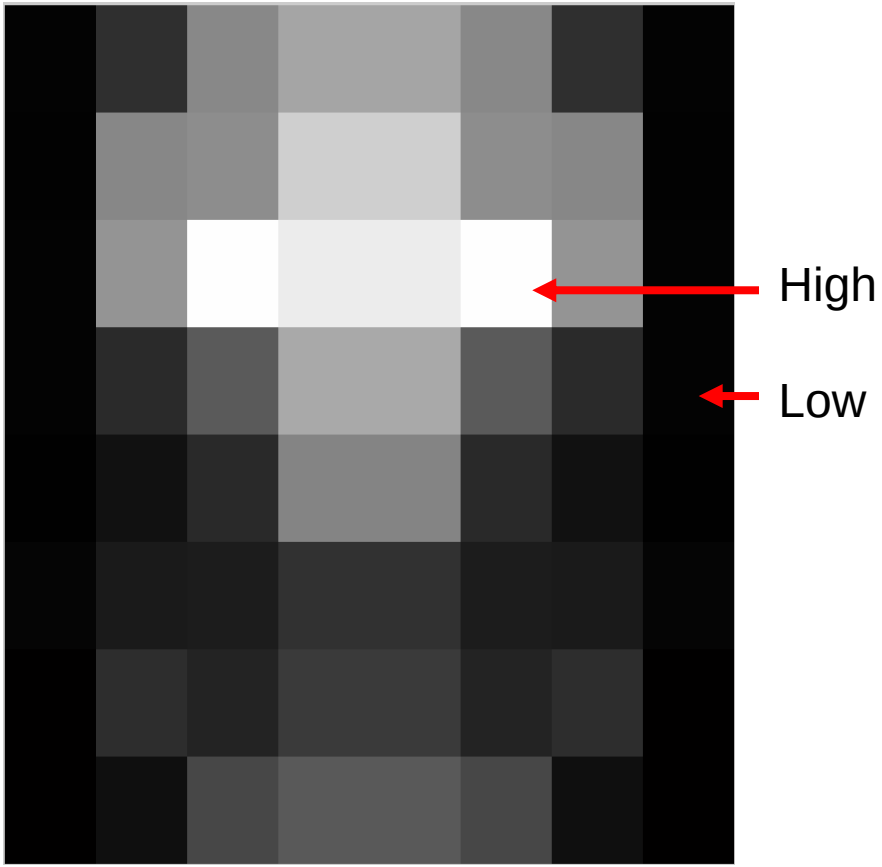
Results on FERET face database

Input face



Block weights



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Thank You!

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