Learning Deep Representation for Imbalanced Classification

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Imbalanced Example

Face attribute example

Triplet to Quintuplet

(a) Class-level triplet (x_i, x_i^p, x_i^n)

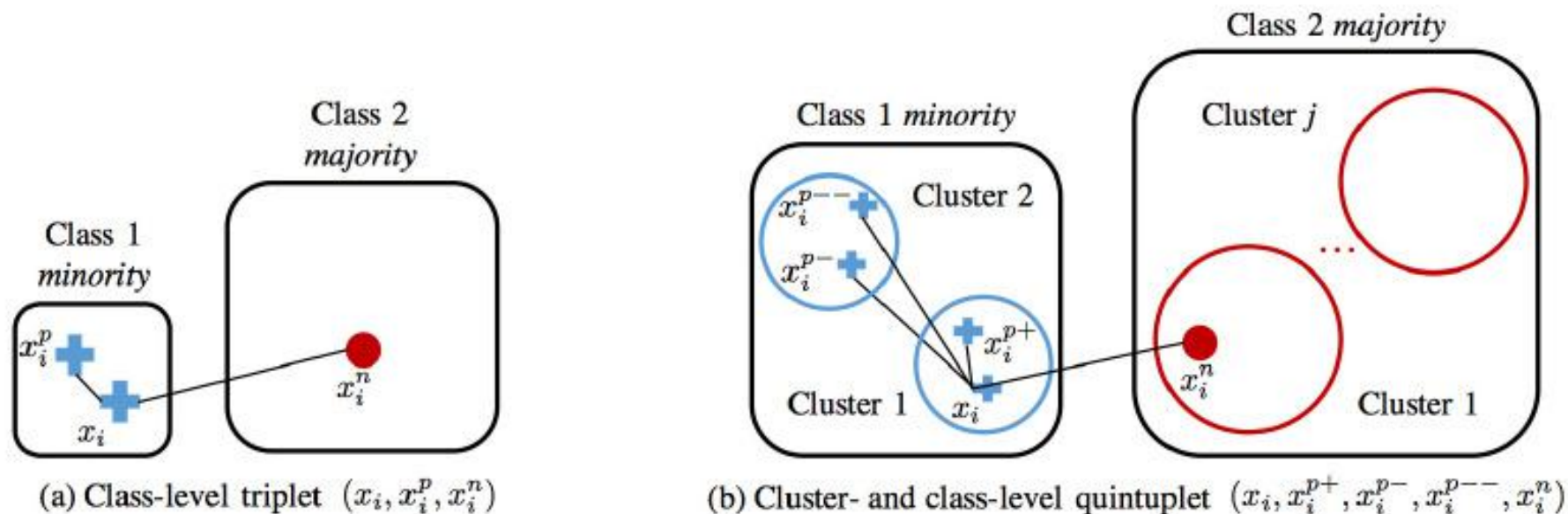(b) Cluster- and class-level quintuplet $(x_i, x_i^{p+}, x_i^{p-}, x_i^{p--}, x_i^n)$

Figure 1. Embeddings by (a) triplet vs. by (b) quintuplet. We exemplify the class imbalance by two different sized classes, where the clusters are formed by k-means. Our quintuplets enforce both inter-cluster and inter-class margins, while triplets only enforce inter-class margins irrespective of different class sizes and variations. This difference leads the unique capability of quintuplets in preserving discrimination in any local neighborhood, and forming a local classification boundary that is insensitive to imbalanced class size.
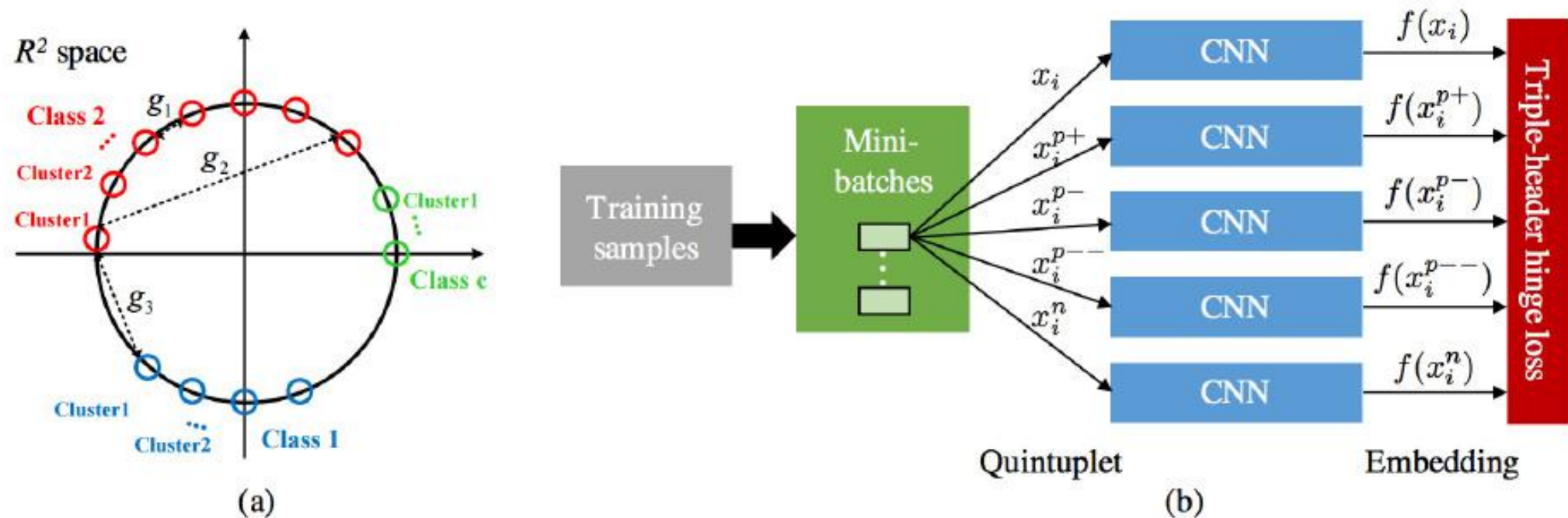
Process

Figure 2. (a) Feature distribution in 2D space and the geometric intuition of margins. (b) Our learning network architecture.

Result

Face attribute prediction on CelebA dataset

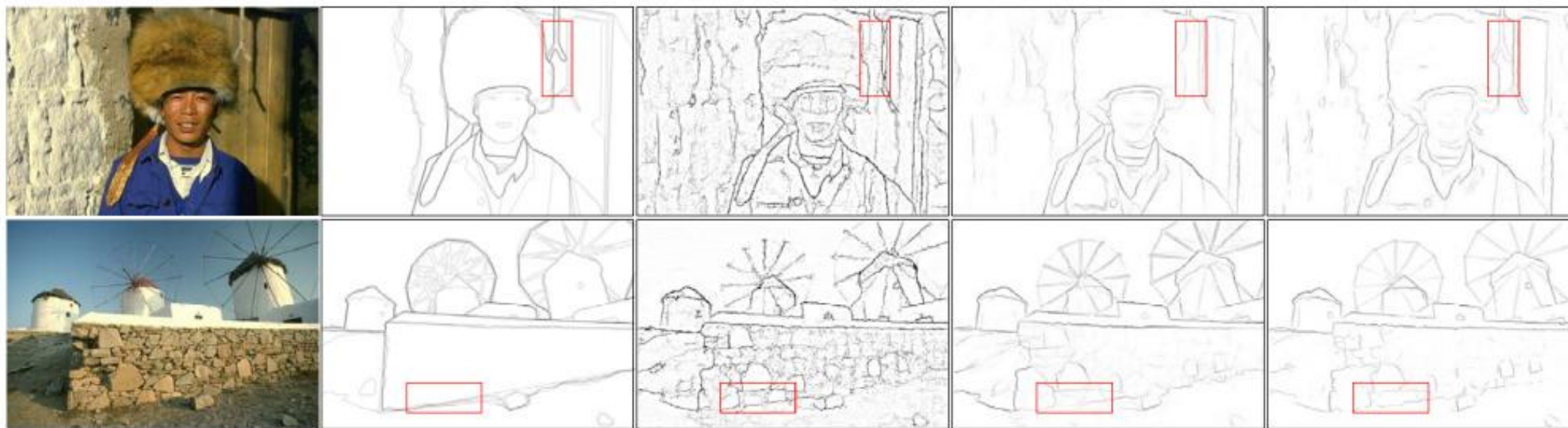| %	Total acc.	Balanced acc.
Triplet-kNN	83.12	72.35
Anet	87.24	80.02
LMLE-kNN	**90.35**	**84.26**

Result

Figure 5. Edge detection examples on BSDS500 [1]. From left to right: input image, ground truth, Sketch Token [27], DeepContour [35], LMLE-kNN. Note the visual differences in the red box.

THANK YOU!