Ring loss: Convex Feature Normalization for Face Recognition

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Abstract

We motivate and present Ring loss, a simple and elegant feature normalization approach for deep networks designed to augment standard loss functions such as Softmax. We argue that deep feature normalization is an important aspect of supervised classification problems where we require the model to represent each class in a multi-class problem equally well. The direct approach to feature normalization through the hard normalization operation results in a non-convex formulation. Instead, Ring loss applies soft normalization, where it gradually learns to constrain the norm to the scaled unit circle while preserving convexity leading to more robust features. We apply Ring loss to large-scale face recognition problems and present results on LFW, the challenging protocols of IJB-A Janus, Janus CS3 (a superset of IJB-A Janus), Celebrity Frontal-Profile (CFP) and MegaFace with 1 million distractors. Ring loss outperforms strong baselines, matches state-of-the-art performance on IJB-A Janus and outperforms all other results on the challenging Janus CS3 thereby achieving state-of-the-art. We also outperform strong baselines in handling extremely low resolution face matching.

1. Introduction

Deep learning has demonstrated impressive performance on a variety of tasks. Arguably the most important task, that of supervised classification, has led to many advancements. Notably, the use of deeper structures [21, 23, 7] and more powerful loss functions [6, 19, 26, 24, 15] have resulted in far more robust feature representations. There has also been more attention on obtaining better-behaved gradients through normalization of batches or weights [9, 1, 18].

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2. citation

Reference[1]

3. math formula

$$L_{SM} = -log \frac{exp \, \omega_k F(x_i)}{\sum_{k'=1}^{K} exp \, \omega_{k'} F(x_i)} F$$

4. table

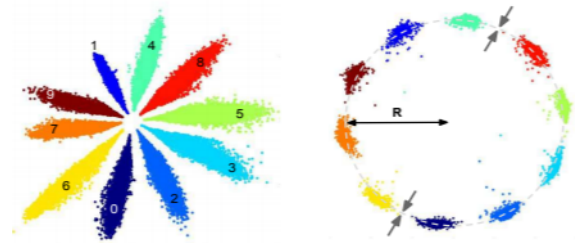| Method	MegaFace	CFP
SM	56.36	55.86

5. image

Figure 1. (a) Features trained using Softmax (b) Features trained using Ring loss

References

[1] Yutong Zheng, Dipan K Pal, and Marios Savvides. Ring loss: Convex feature normalization for face recognition. In *Proceedings of the IEEE conference on computer vision and pattern recognition*, pages 5089–5097, 2018. 1