

1/ The main contribution of this paper is it introduces the angular softmax (A-Softmax) loss function to deal with the face recognition task. This function allows the CNNs to learn discriminative face features on the hypersphere manifold. The A-Softmax can maximize the angular margin between different classes and minimizes the angular margin within the same class. The SphereFace leads to a better performance on some benchmarks, such as LFW, YTF, and MegaFace. It improves the face recognition performance.

2/

Property 1: The A-Softmax loss function allows the control of angular margin and the difficulty of the learning task by adjusting the margin parameter 'm'. When m is larger, there's a larger angular margin between class and more difficult learning task. With the minimal m, the maximal intra-class angular distance is smaller than the minimal intra-class angular distance.

Property 2: In the binary-class case, the lower bound of the minimal m is $m_{\min} \geq 2 + \sqrt{3}$.

Property 3: In the multi-class case, the lower bound of the minimal m is $m_{\min} \geq 3$.

3/ The evaluation metric for LFW dataset is accuracy. The accuracy is the percentage of correct classification over the total number of pairs.

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Epoch: 1, Loss: 20.3252
Epoch: 2, Loss: 20.3228
Epoch: 3, Loss: 20.3207
Epoch: 4, Loss: 20.3188
Epoch: 5, Loss: 20.3173
Epoch: 6, Loss: 20.3159
Epoch: 7, Loss: 20.3148
Epoch: 8, Loss: 20.3138
Epoch: 9, Loss: 20.3123
Epoch: 10, Loss: 20.2685
Epoch: 11, Loss: 20.1605
Epoch: 12, Loss: 20.1039
Epoch: 13, Loss: 20.0935
Epoch: 14, Loss: 20.1013
Epoch: 15, Loss: 20.1067
Epoch: 16, Loss: 20.1079
Epoch: 17, Loss: 20.0980
Epoch: 18, Loss: 20.1027
Epoch: 19, Loss: 20.1035
Epoch: 20, Loss: 20.1210
Epoch: 21, Loss: 20.0990
Epoch: 22, Loss: 20.0991
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Epoch: 23, Loss: 20.1032
Epoch: 24, Loss: 20.1054
Epoch: 25, Loss: 20.1088
Epoch: 26, Loss: 20.0934
Epoch: 27, Loss: 20.1086
Epoch: 28, Loss: 20.1081
Epoch: 29, Loss: 20.0981
Epoch: 30, Loss: 20.1074
Epoch: 31, Loss: 20.0941
Epoch: 32, Loss: 20.0986
Epoch: 33, Loss: 20.1125
Epoch: 34, Loss: 20.1014
Epoch: 35, Loss: 20.0955
Epoch: 36, Loss: 20.1039
Epoch: 37, Loss: 20.1165
Epoch: 38, Loss: 20.1011
Epoch: 39, Loss: 20.1030
Epoch: 40, Loss: 20.0982
Test accuracy: 0.5000