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CAM-SOFTMAX FOR DISCRIMINATIVE DEEP FEATURE LEARNING

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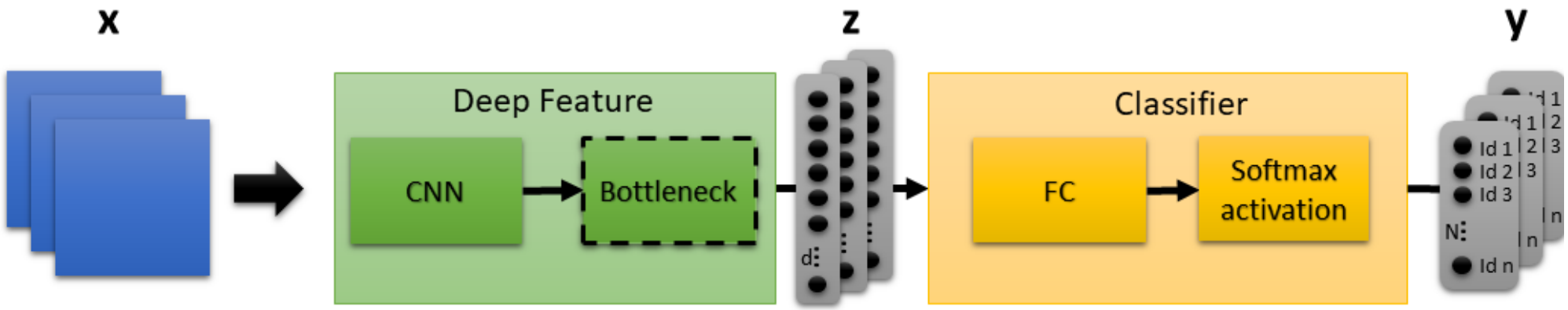
Deep learning classification pipeline



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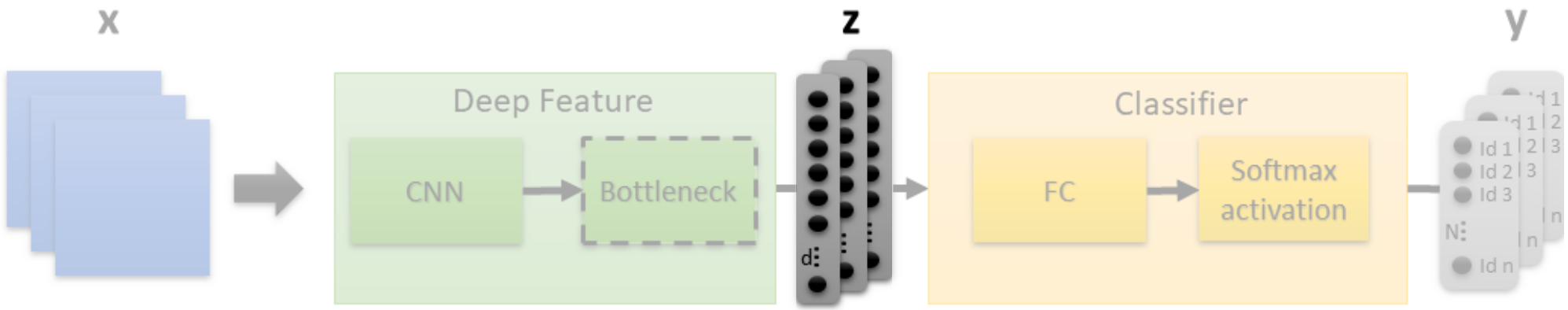
Deep learning classification pipeline



- ✓ **Good for out-of-set recognition**
- ✓ **Graceful degradation in the presence of label noise**

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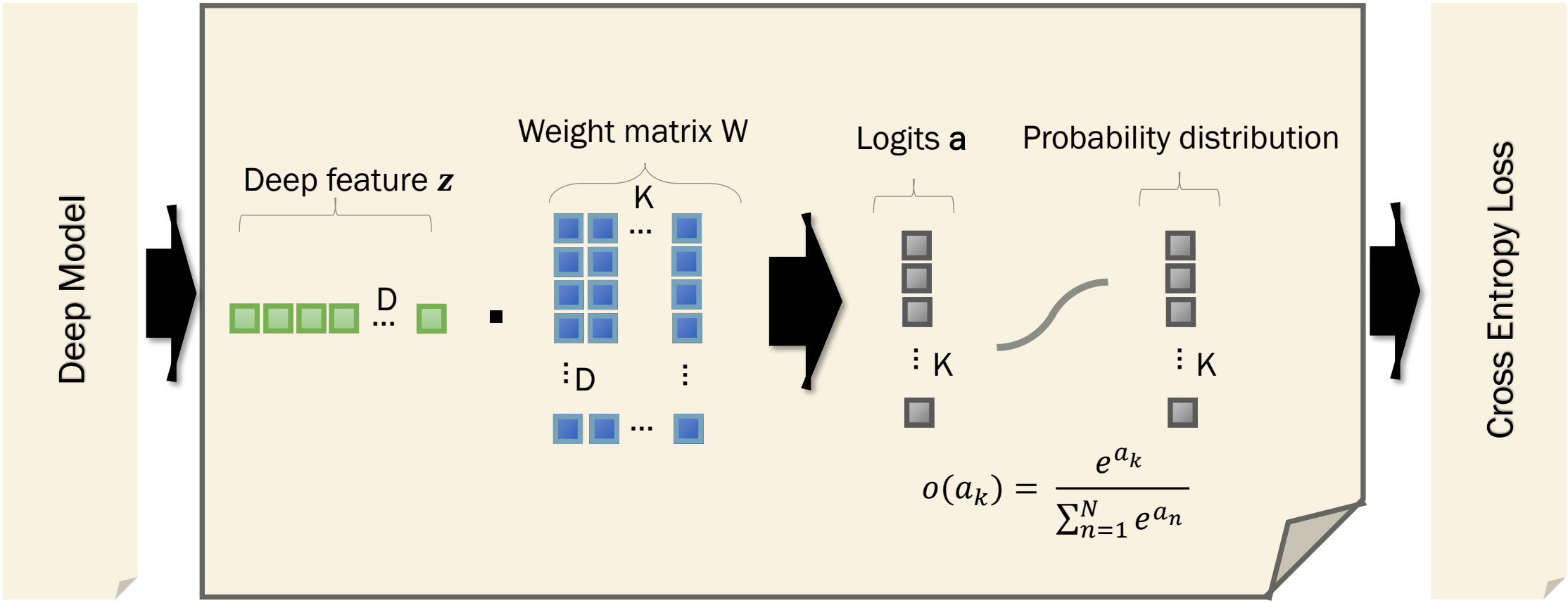
Terminating layer



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Generalized softmax

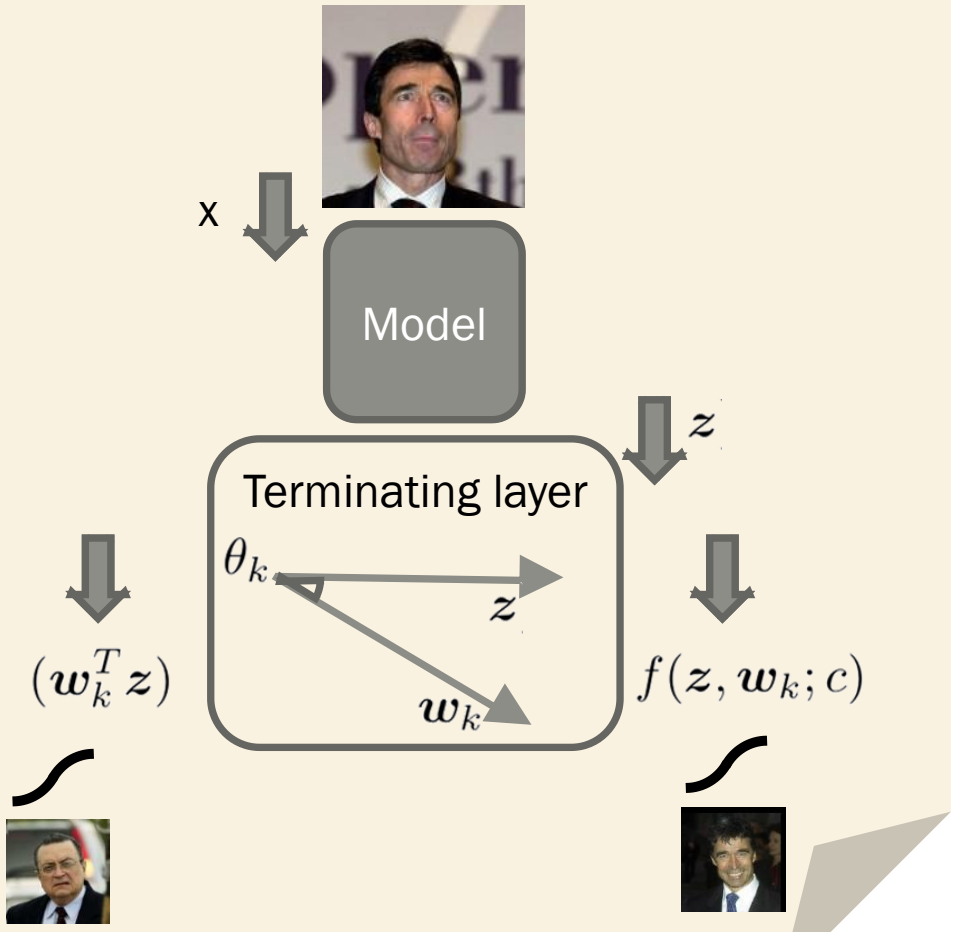
cam − softmax

$$y_k = \frac{e^{a_k}}{\sum_j e^{a_j}}$$

$$a_k = \mathbf{1}(k \neq t)(\boldsymbol{w}_k^T \boldsymbol{z}) + \mathbf{1}(k = t)(f(\boldsymbol{z}, \boldsymbol{w}_k; c))$$

$$f(\boldsymbol{z}, \boldsymbol{w}_k; c) = \frac{(\cos\theta_k + 1)^{g(c)}}{2^{(g(c)-1)}} - 1$$

Intuitive illustration



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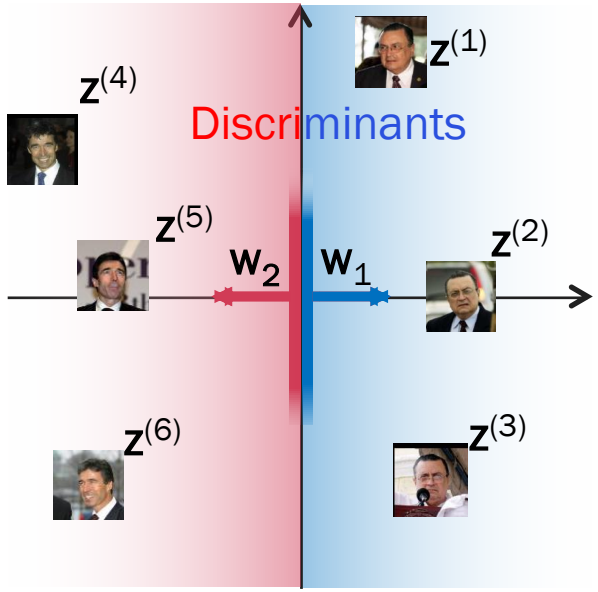
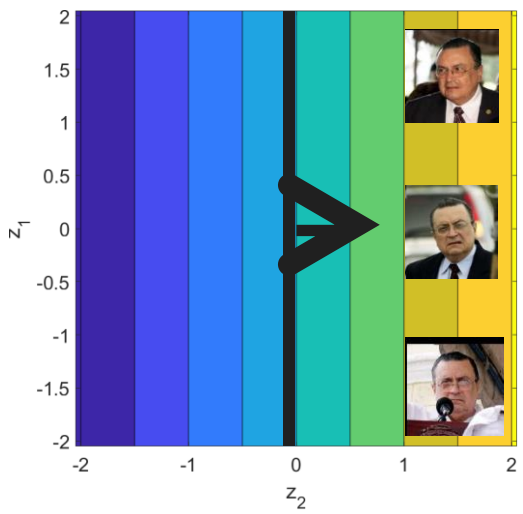
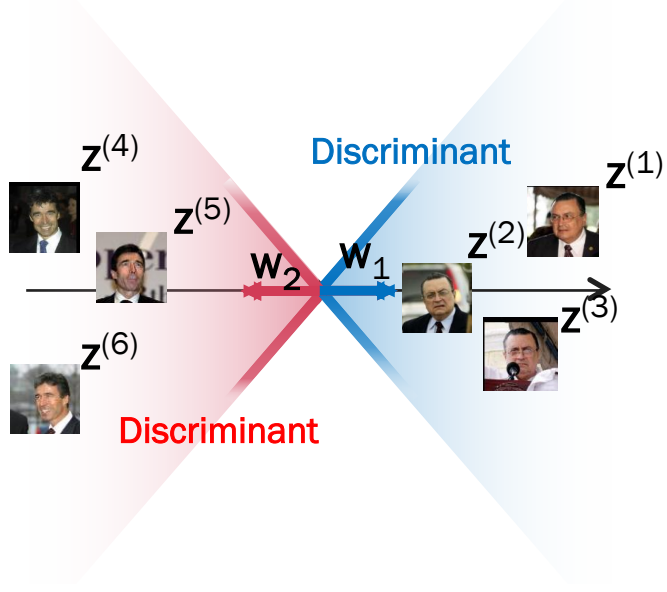
Geometrical intuition

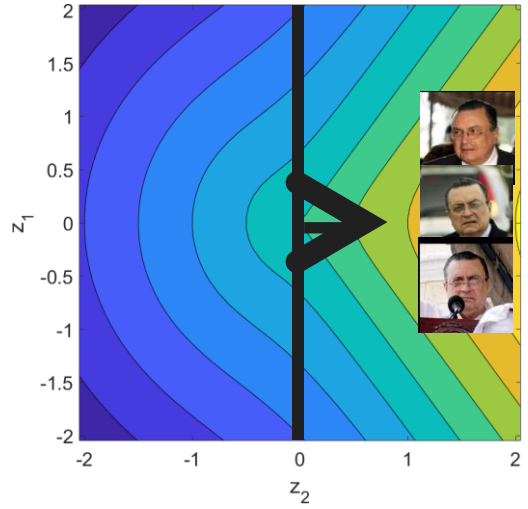
Softmax

Unnecessarily spread









Well concentrated

Cam-softmax

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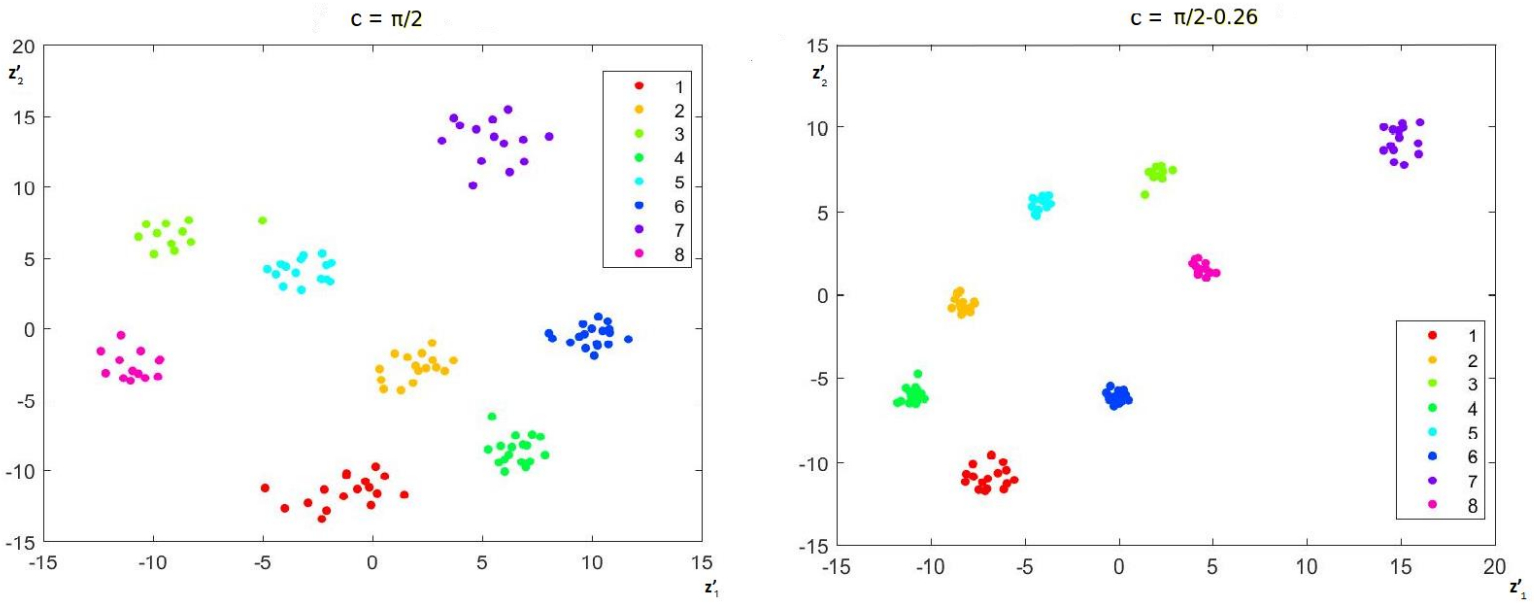
Visualization with t-SNE

8 random identities from the Labelled Faces in the Wild (LFW) dataset



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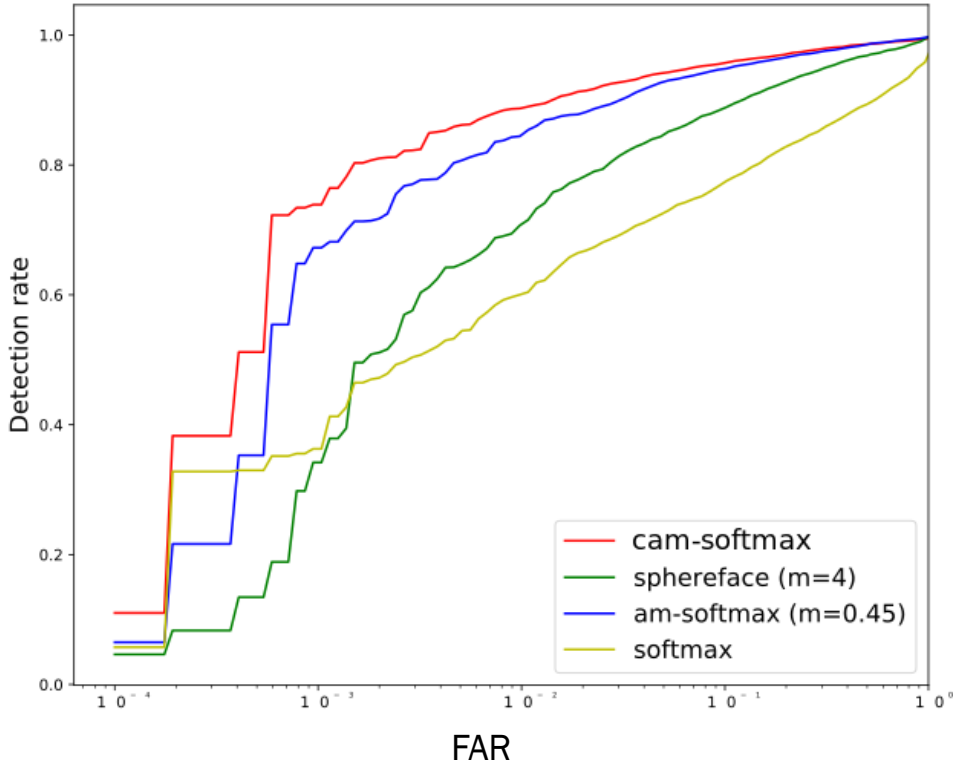
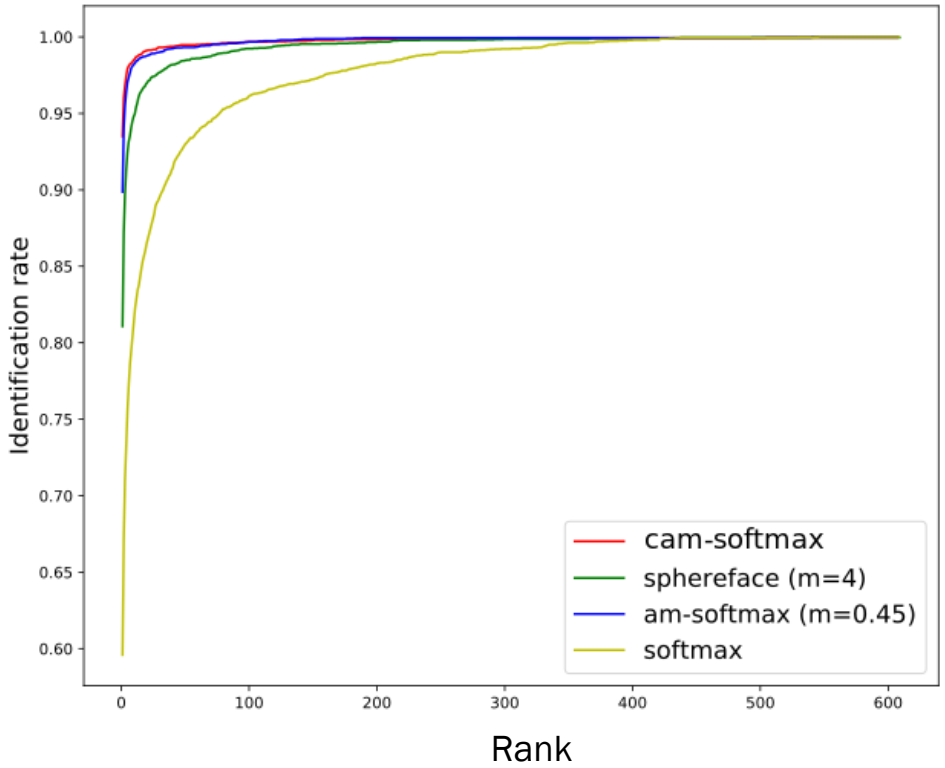
Open-set Recognition On LFW

How well the model can differentiate between known identities and the unknowns?



How well the model can recognize identities in the gallery from the probe set?



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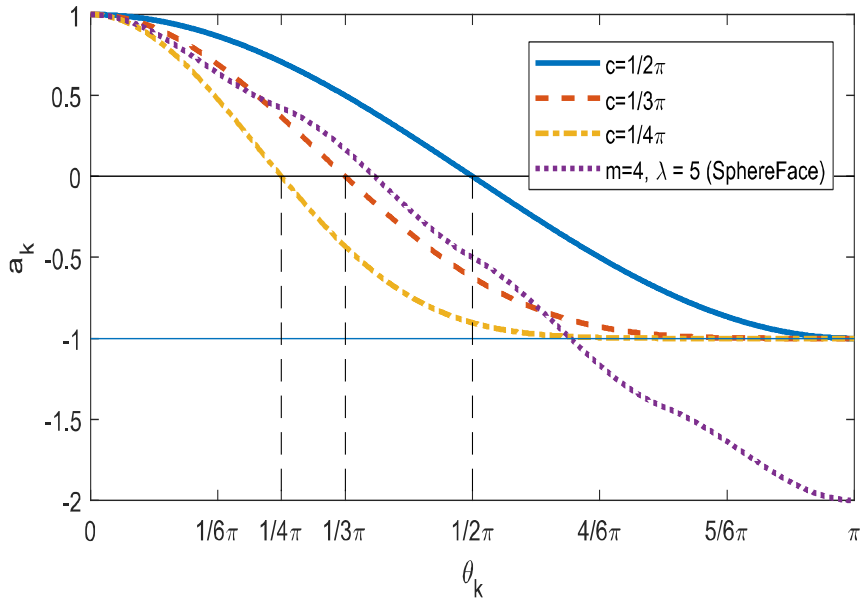
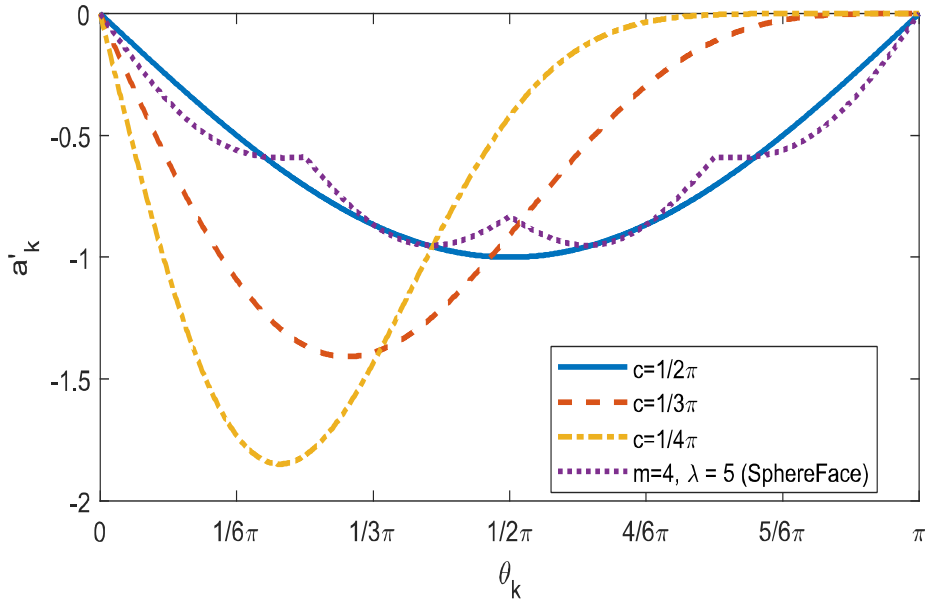
Intuition for noisy labels





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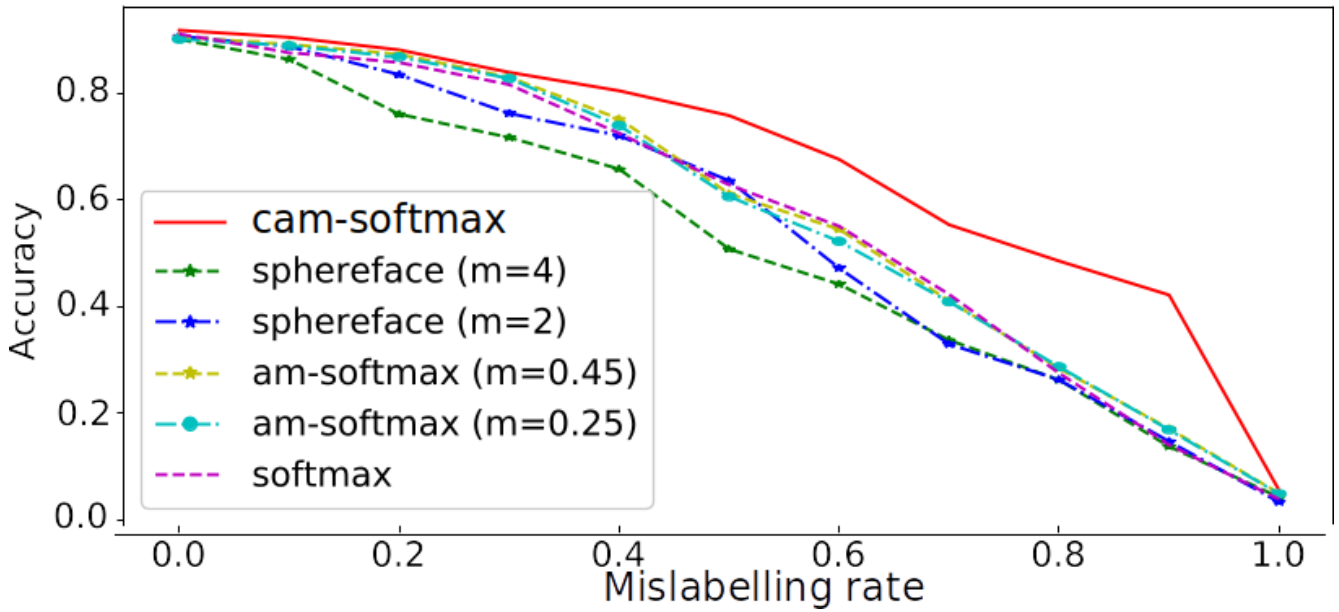
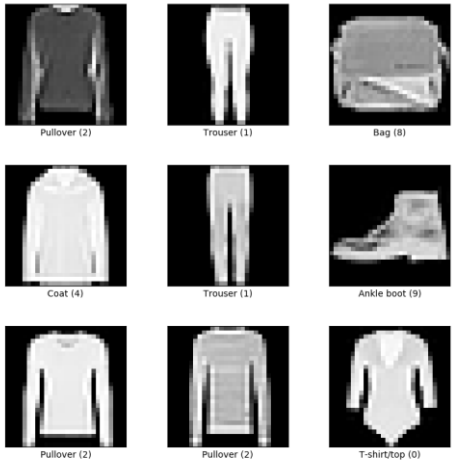
Accuracy versus mislabelling rate on the Fashion-MNIST dataset



Fashion-MNIST examples



(The mislabelling is not uniformly random)

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Conclusion

- Better representation learning.
- Good for open-set recognition.
- Graceful degradation in the presence of label noise.