Task 1 :

1. **What are the contributions of this paper?**

- It proposed a new loss function called the angular softmax (A-Softmax) loss, which enables convolutional neural networks to learn angularly discriminative features. A-Softmax outperforms traditional loss functions on several face recognition benchmarks.
- It proposed a more natural way called hypersphere embedding to map face images to hypersphere space and learn angular margin. It also introduces a new parameter m to quantitatively adjust the size of angular margin.

2. **Illustrate the three properties of the proposed A-Softmax.**

- The difficulty of a angular margin learning task is adjustable by changing m. A larger m means a more difficult task.
- The lower bound of minimal m in binary-class case is 2+√3.
- The lower bound of minimal m in multi-class case is 3.

3. **What is the evaluative metric used for the LFW dataset? How does it calculate?**

- The evaluative metric is accuracy(%). The single model is trained on WebFace dataset and the performance is evaluated on 6,000 face pairs from LFW. The SphereFace achieves 99.42% accuracy on LFW.

Task 2:

```
Evaluation starts
Current threshold: 0.0
Current accuracy: 0.5
Current threshold: 0.1
Current accuracy: 0.715
Current threshold: 0.2
Current accuracy: 0.73
Current threshold: 0.30000000000000004
Current accuracy: 0.63
Current threshold: 0.4
Current accuracy: 0.556
Current threshold: 0.5
Current accuracy: 0.527
Current threshold: 0.6000000000000001
Current accuracy: 0.505
Current threshold: 0.7000000000000001
Current accuracy: 0.502
Current threshold: 0.8
Current accuracy: 0.5
Current threshold: 0.9
Current accuracy: 0.5
Best accuracy is 0.73000, best threshold is: 0.200
```

The best accuracy of my model is 0.73 at cos-similarity threshold 0.2.

Reference:

1. I learned the implementation of Angel Loss function from this repository
https://github.com/clcarwin/sphereface_pytorch
2. I learned some philosophy of data processing and evaluation from my classmate Lecheng Zeng