Joint Detection and Identification Feature Learning for Person Search

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Github Person Search
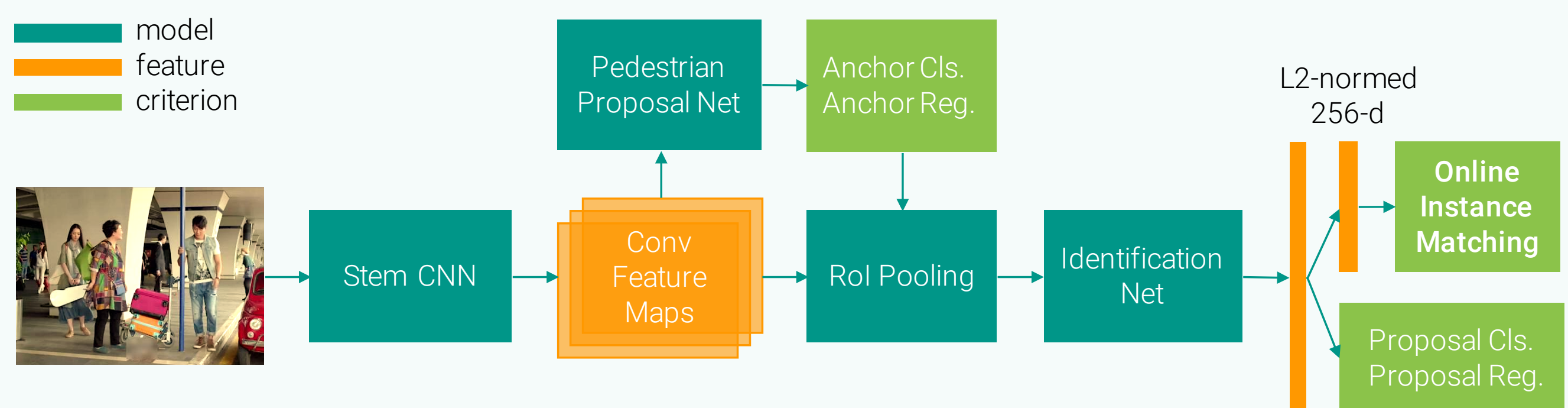
Open-ReID

Problem Settings

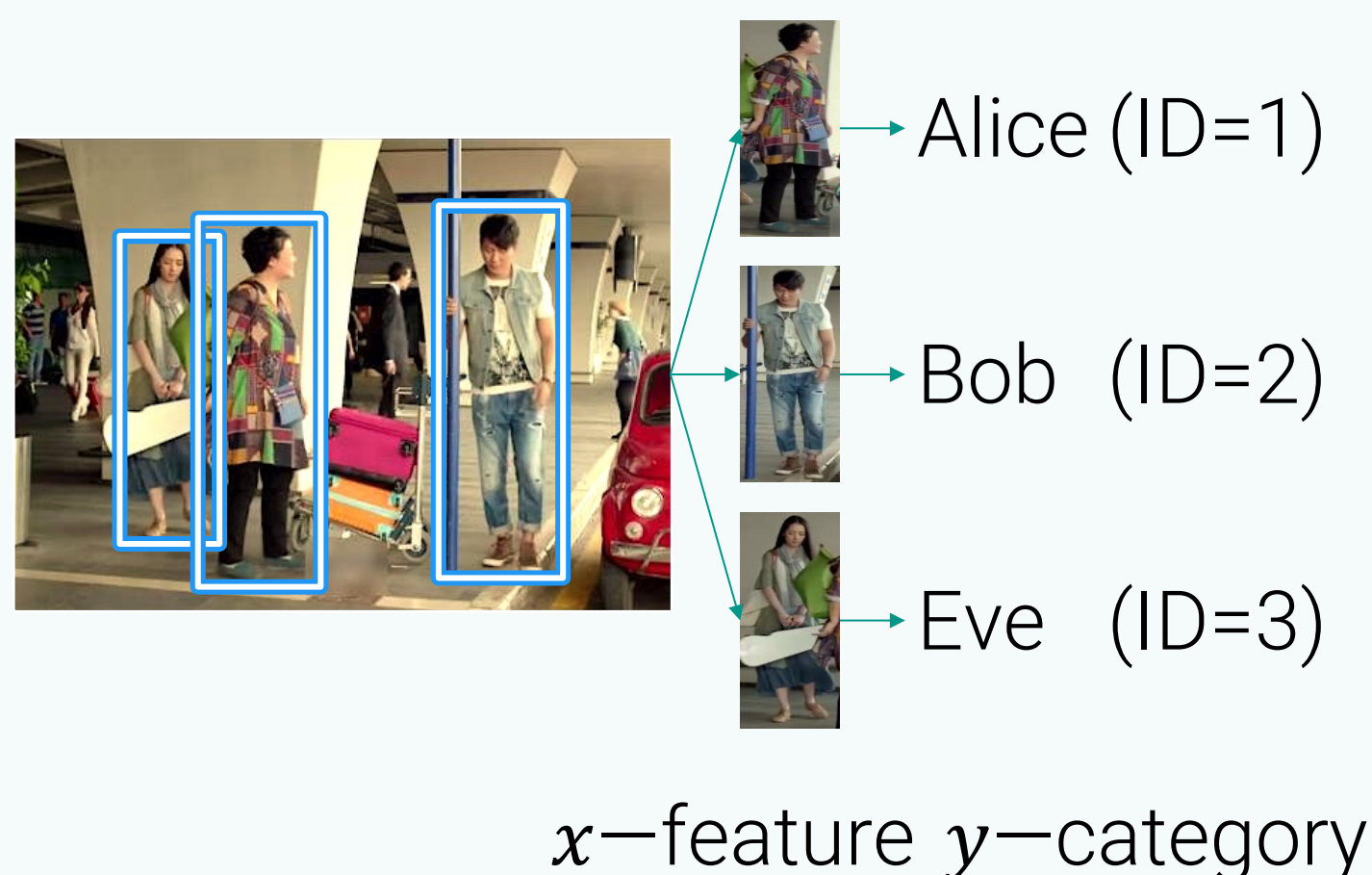Person Re-ID
- Matching
- Manually cropped

Person Search
- Finding
- Whole scene image

Framework Overview

- Based on Faster-RCNN
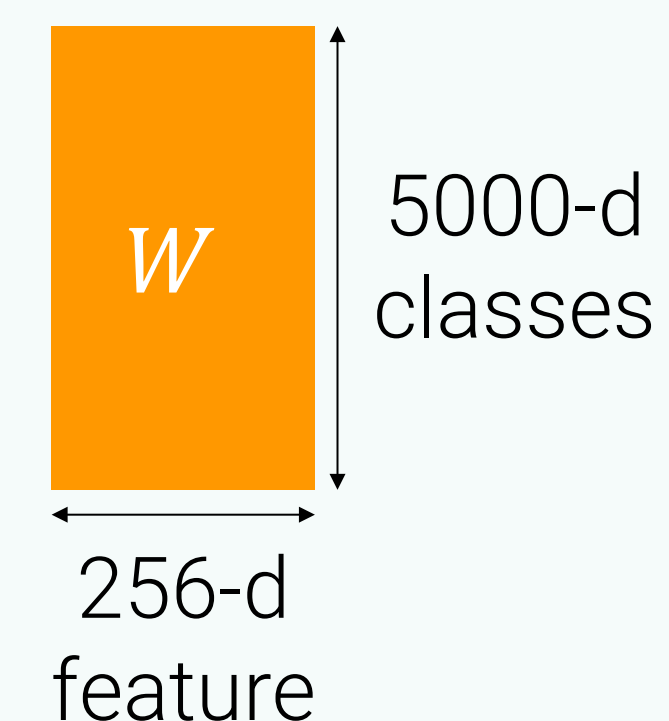- Detection + Identification
- Softmax Loss →
  Online Instance Matching

Alice (ID=1)
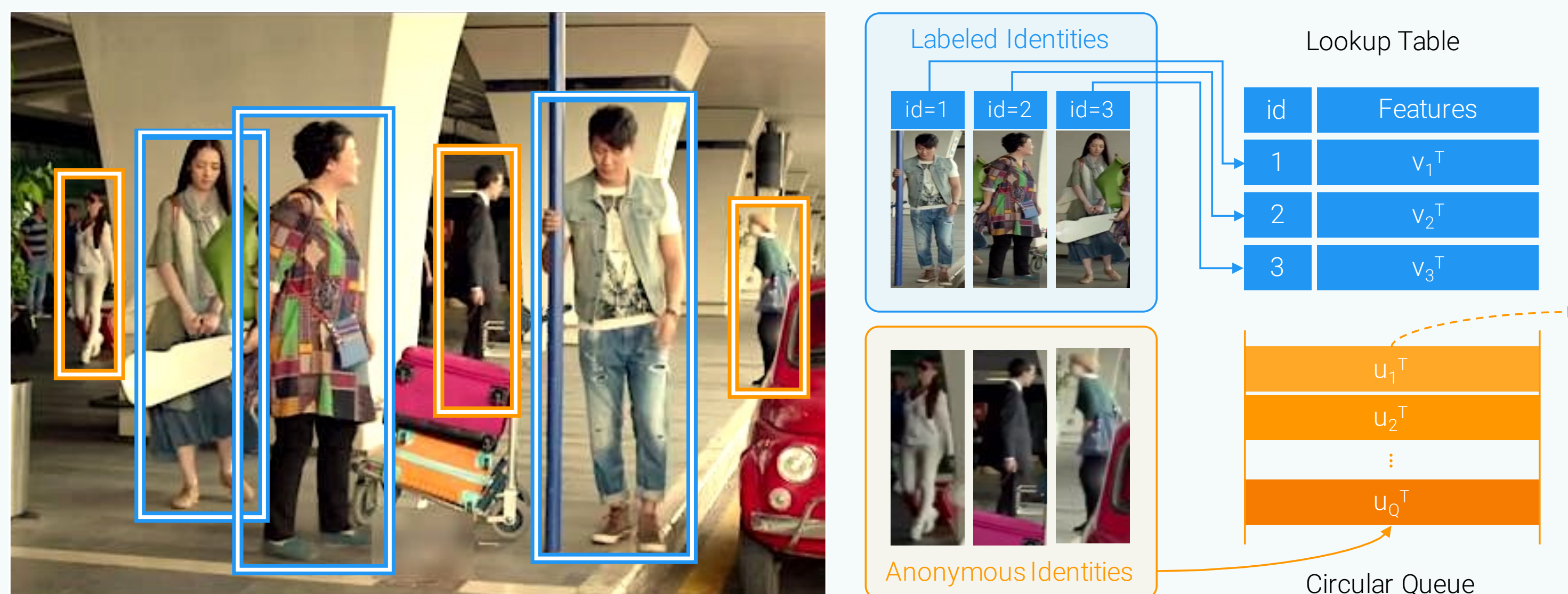Bob (ID=2)
Eve (ID=3)

x—feature y—category

Online Instance Matching (OIM)

### Problem with Softmax Loss

W 5000-d classes

256-d feature

- $p(y = i|x) = \exp(w_i^T x) / \sum_j \exp(w_j^T x)$
- # Positive classes $\leq$ batch size $\ll$ 5000
- No positive samples for most classifier vectors
- W cannot be learned effectively

OIM Operation

Labeled Identities

Lookup Table

id	Features
1	v_1^T
2	v_2^T
3	v_3^T

id=1 id=2 id=3

Anonymous Identities

u_1^T
u_2^T
$\vdots$
u_Q^T

Circular Queue

- $p(y = i|x) = \dfrac{\exp(v_i^T x/\tau)}{\sum_j \exp(v_j^T x/\tau) + \sum_k \exp(u_k^T x/\tau)}$, where τ is temperature

- Gradients w.r.t. features:
  - Minimize distance between same person
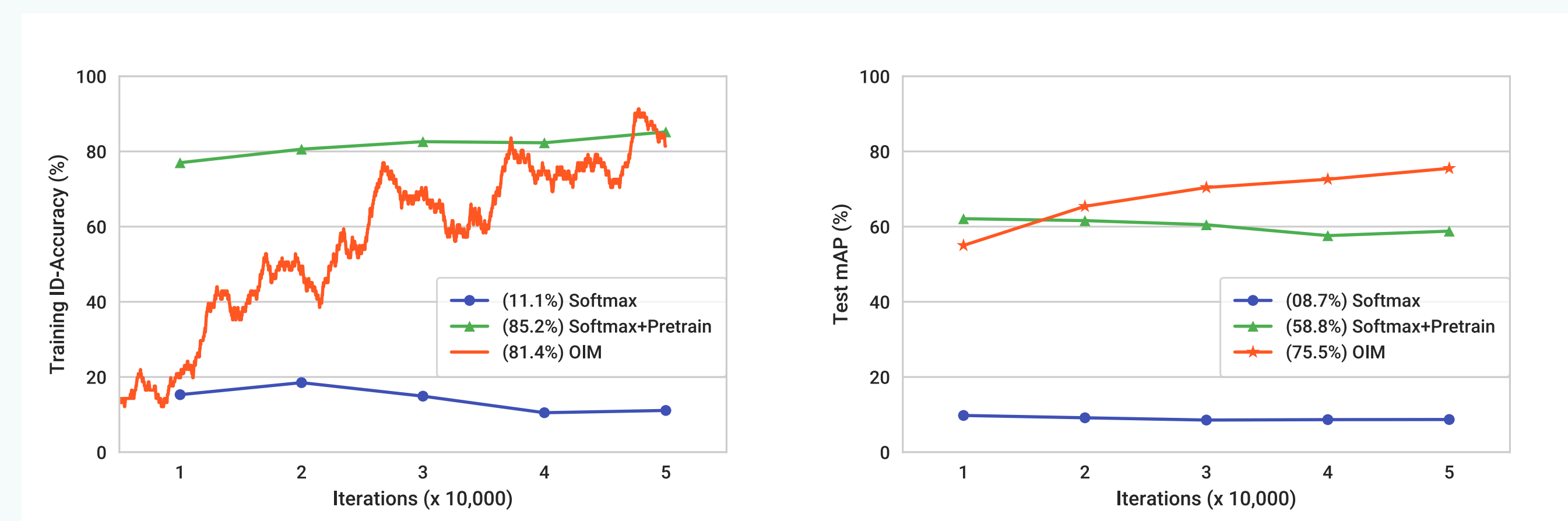 - Maximize distances among different people
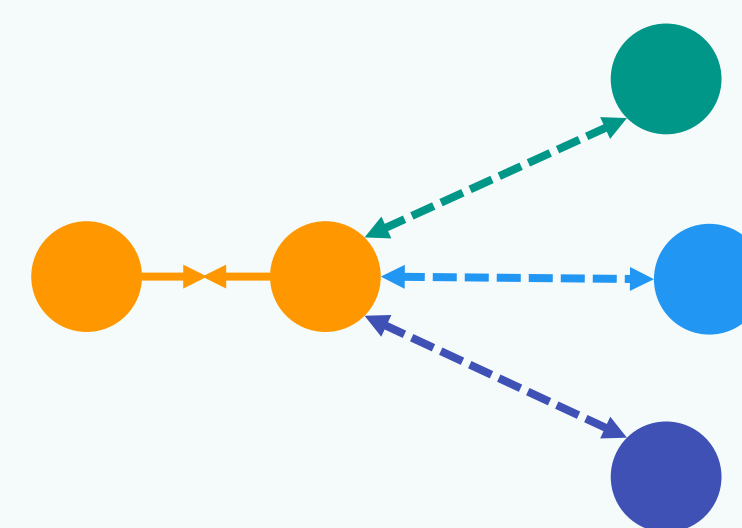
Experiments

CUHK-SYSU Person Search Dataset

8432 identities, 18184 images, 96143 pedestrians

Joint vs. Separate Detection and Identification

Identification \ Detection	CCF	ACF	CNN	GT
LOMO + XQDA	41.2	55.5	68.9	72.4
IDNet	50.9	56.5	68.6	73.1
Ours (w/o unlabeled)	—	—	72.7	75.5
Ours	—	—	**75.5**	**77.9**

OIM vs. Softmax Loss

On CUHK-SYSU Dataset for Person Search

Net Arch	Loss	CUHK03	Market1501	DukeMTMC
Inception	Softmax	73.2	75.8	54.4
Inception	OIM	**77.7**	**77.9**	**61.7**
ResNet-50	Softmax	70.8	81.4	62.5
ResNet-50	OIM	**77.5**	**82.1**	**68.1**

On Traditional Datasets for Person Re-ID