

Experiments about thermal to RGB face synthesis with cycleGan and pix2pix



Reporter : 申景欣

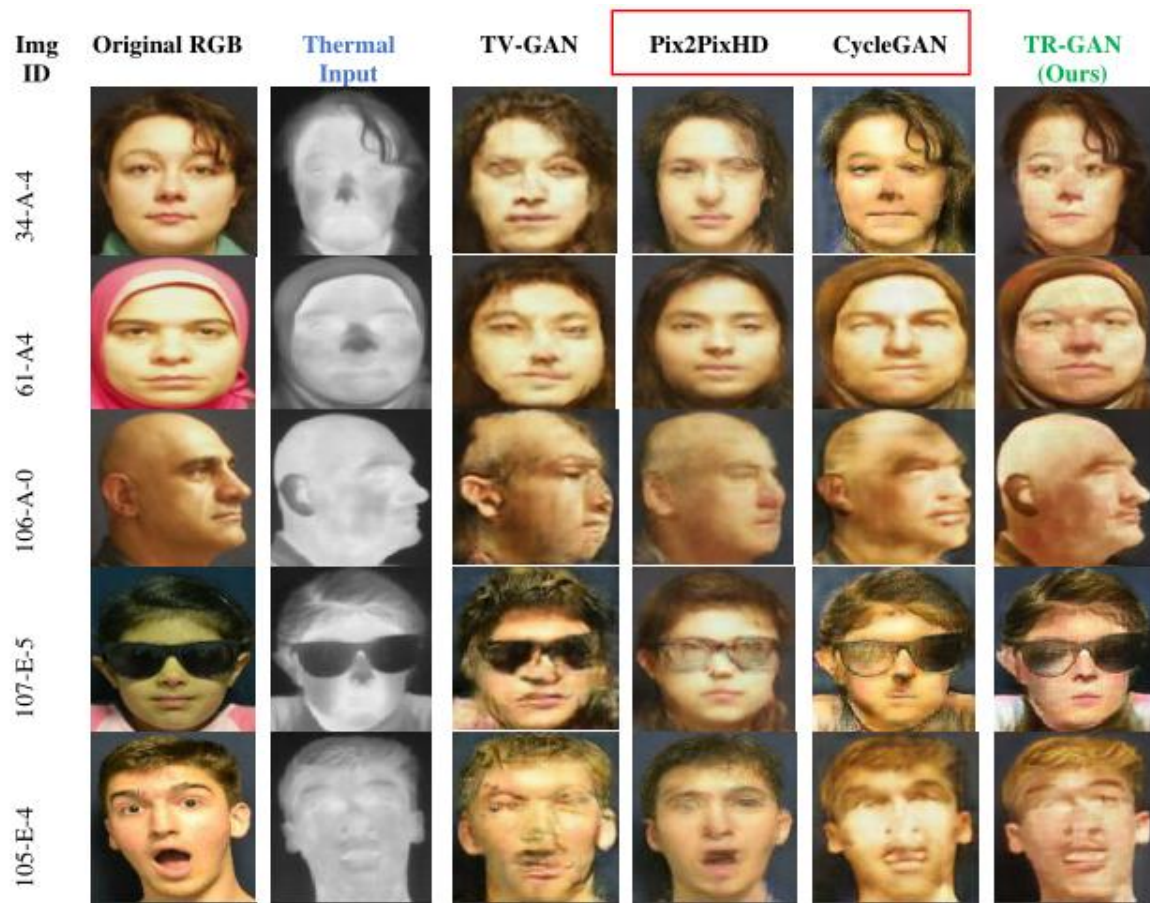
2021.07.22

实验目的

- 为解决红外图像在人脸识别系统上识别效果不佳的问题。
- 将红外图像转化成可见光，尽可能提高人脸识别准确率。



TR-GAN: Thermal to RGB face synthesis with Generative Adversarial Network for Cross-Modal Face Recognition

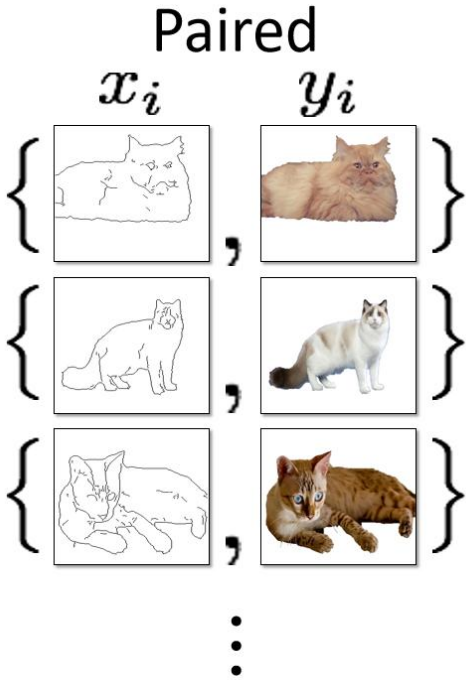


通过GAN网络的转换，把红外图像转换之后放入人脸识别model，识别效果达到明显的提升

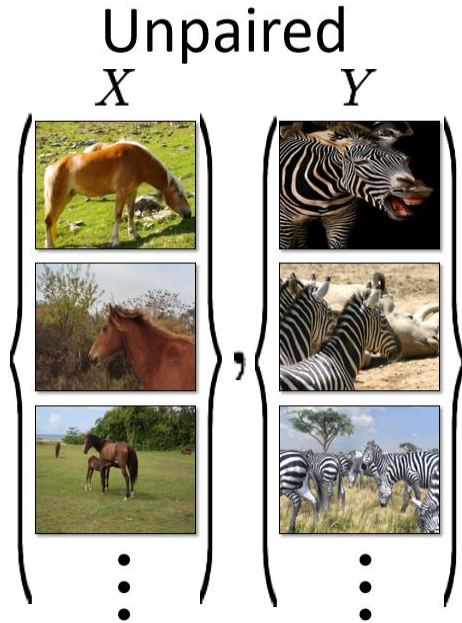
TR-GAN: Thermal to RGB face synthesis with Generative Adversarial Network for Cross-Modal Face Recognition

	Original RGB	Thermal	TV-GAN	Pix2PixHD	CycleGAN	TR-GAN (Ours)
Resnet50 accuracy (%)	100.0	47.0	42.85	44.95	75.21	80.7
VGG16 accuracy (%)	100.0	30.67	53.78	61.74	79.41	88.65

Two model



pix2pix



CycleGAN



网络结构

损失函数

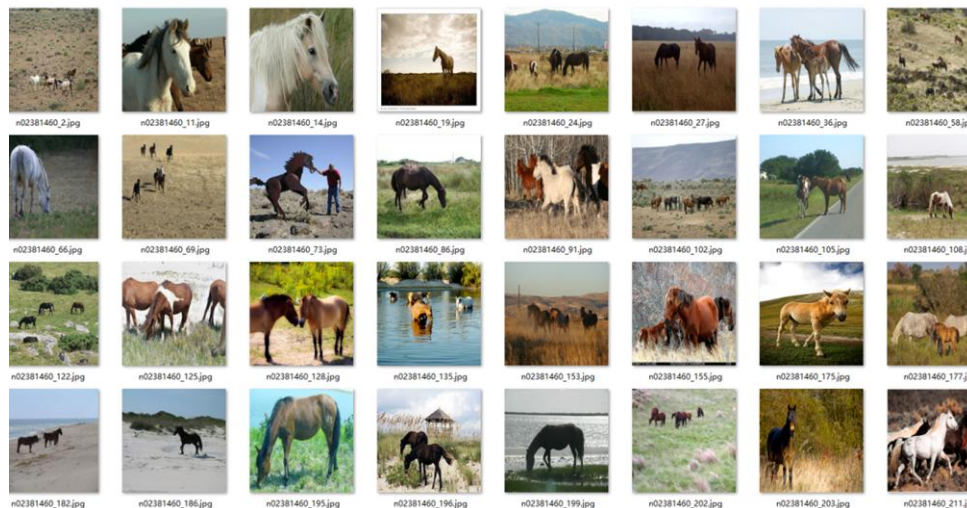
CycleGAN



DataSet

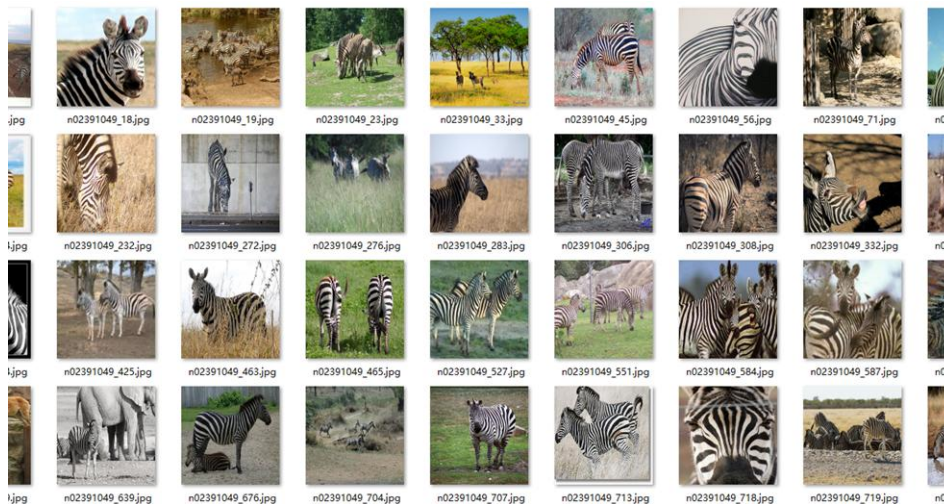
01

Training Set A
数据集大小：
1067



02

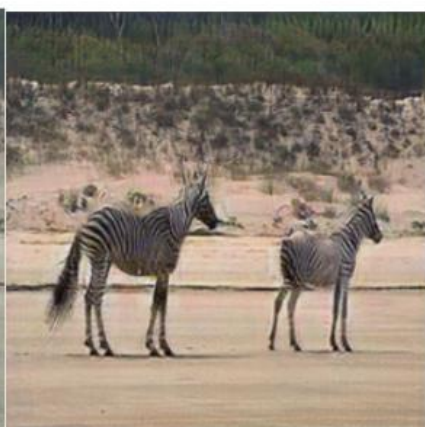
Training Set B
数据集大小：
1334



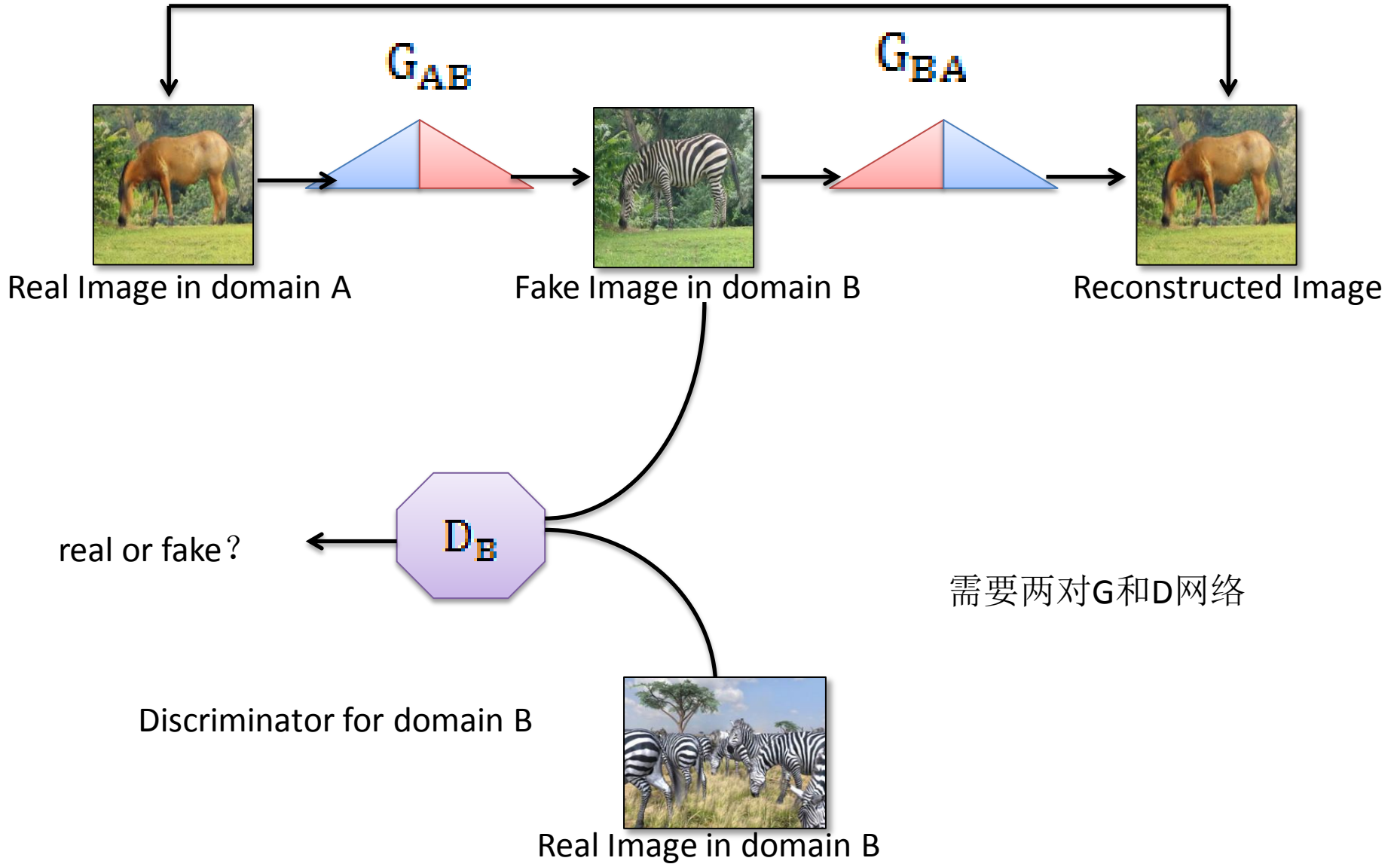
Result

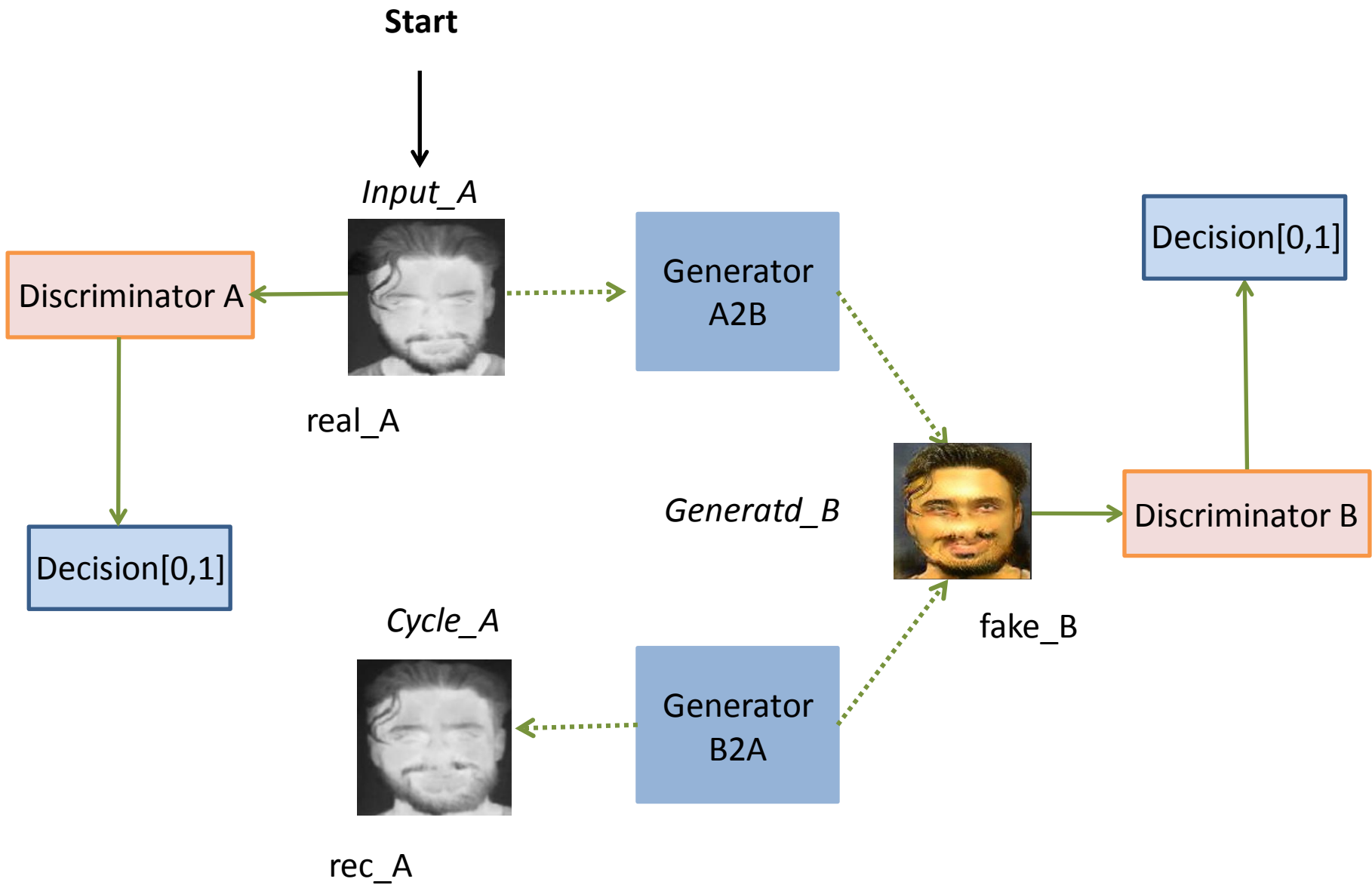
马

斑马



L1 Loss







What is D like?

为了更好的对图像的局部做判断，判别网络采用的是patchGAN结构，也就是说把图像等分成多个固定大小的patch，分别判断每个patch的真假，最后再取平均值作为D的输出。



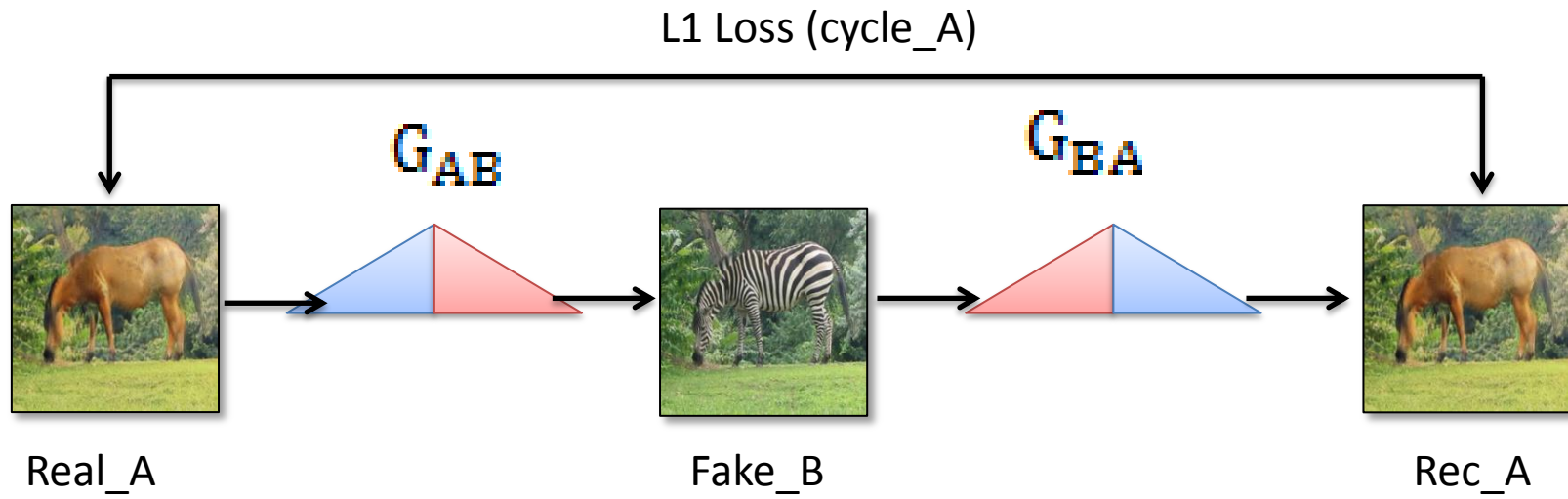
Loss

涉及4种损失函数：

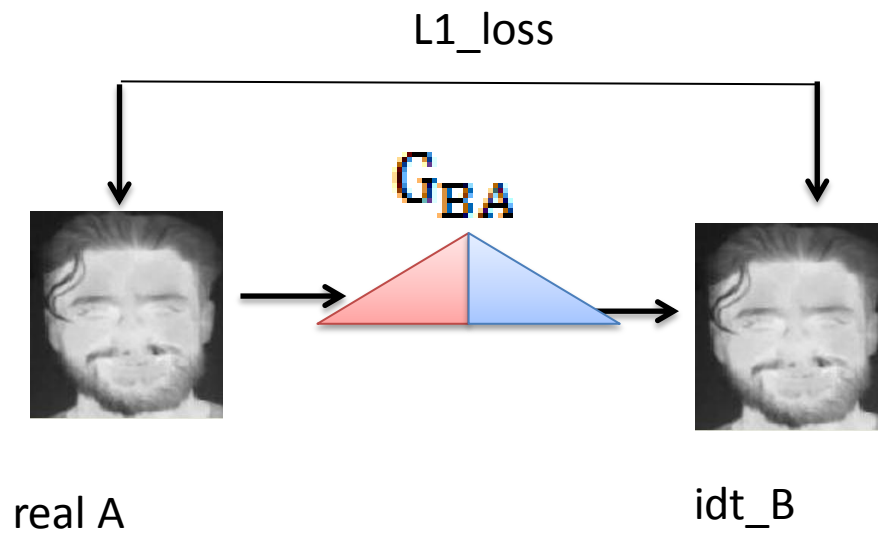
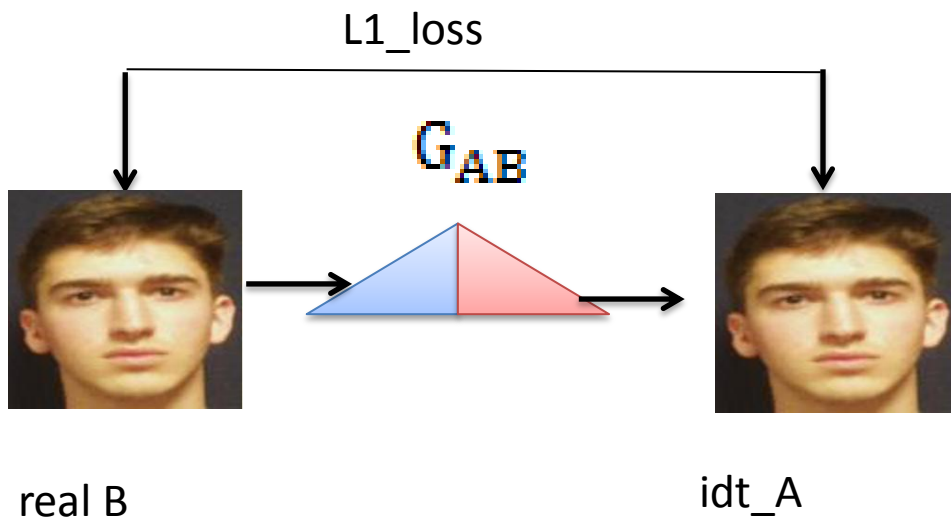
- G网络, D网络, Cycle, Identity
D网络有点特别, PatchGAN



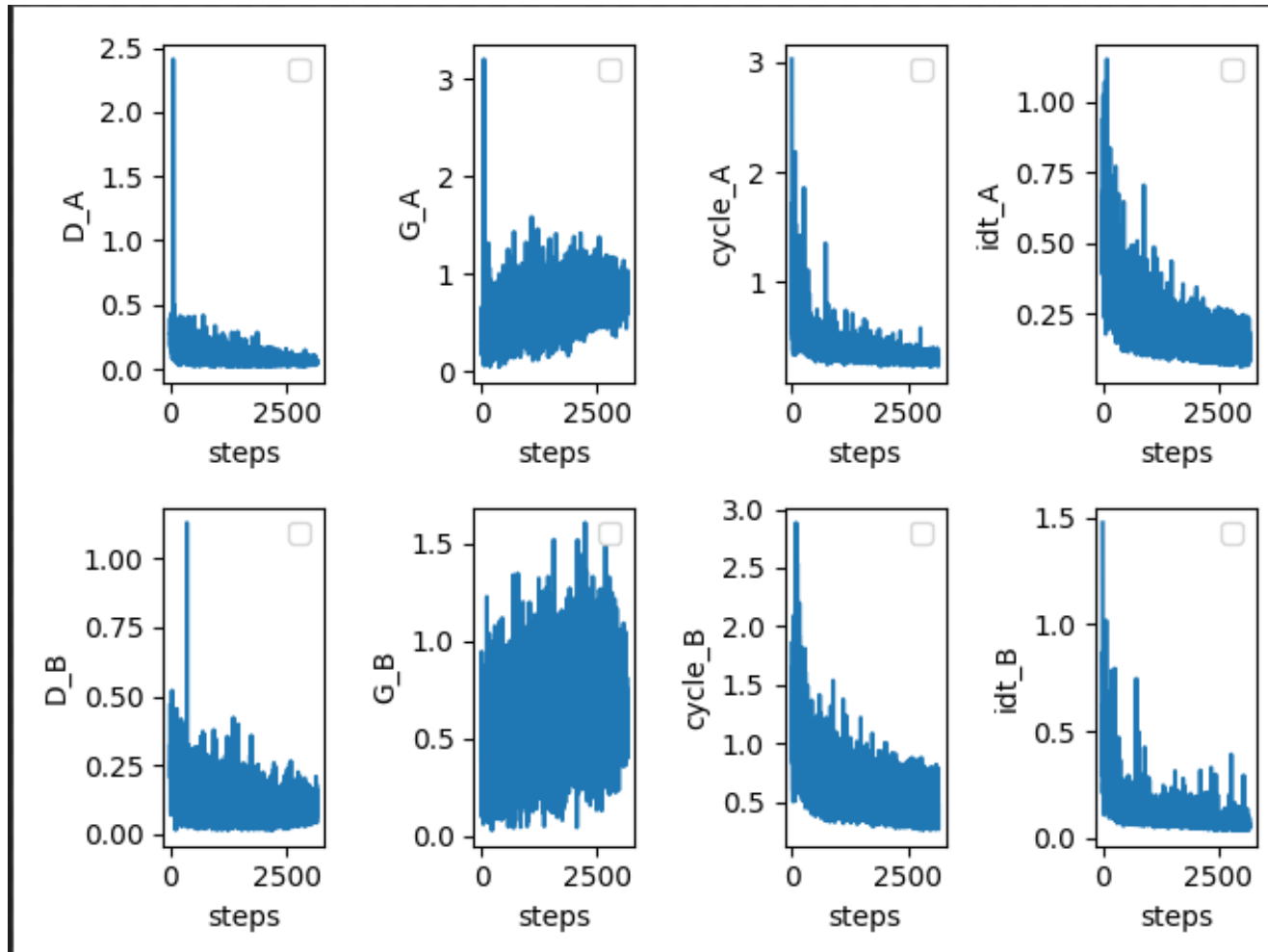
Cycle Loss



Generator中的Identity Loss



Loss



DataSet

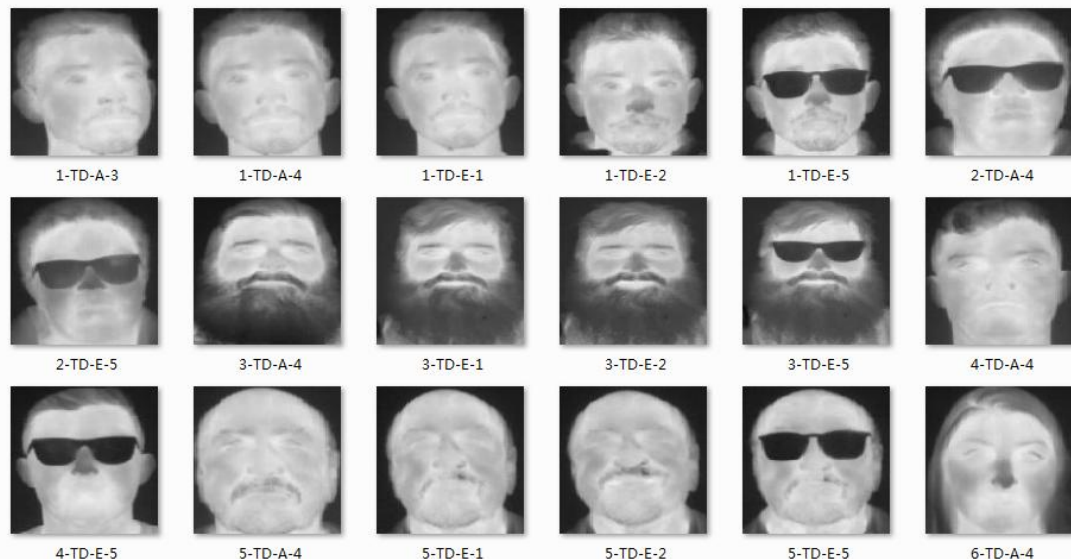
01

Training Set A

02

Training Set B

Tufts Face Database:共1582*2
(可见光和红外)张图片, 包含113个ID,每个人共14张图片, 其中9个不同的角度, 4种不同的情绪, 1张戴眼镜的。可见光与红外图像一一对应。

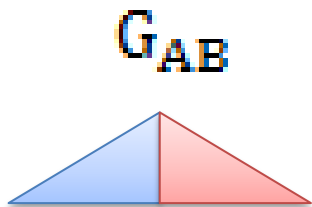


随机选取17个ID的图像共238张作为测试集, 余下的1344张图像作为训练集

Result

最终生成的，选取其中A to B做测试

```
latest_net_G_B.pth  
latest_net_G_A.pth  
latest_net_G_B.pth
```



训练过程：学习率初始为0.0002，总的epoch为200，在0-100的时候，学习率为0.0002，在100-200的时候，学习率逐渐线性减小为0，所以需要进行学习率的更新。

Result

input

output

real



Pix2Pix

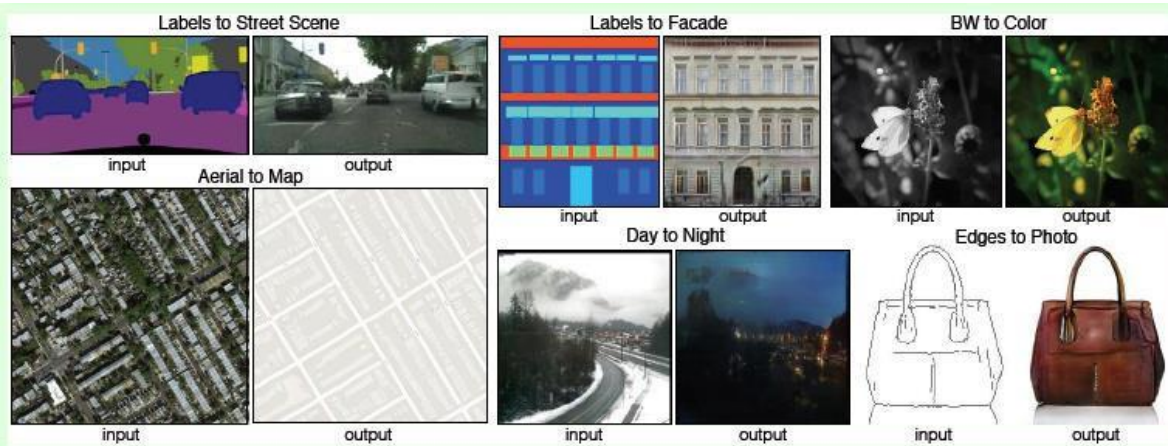
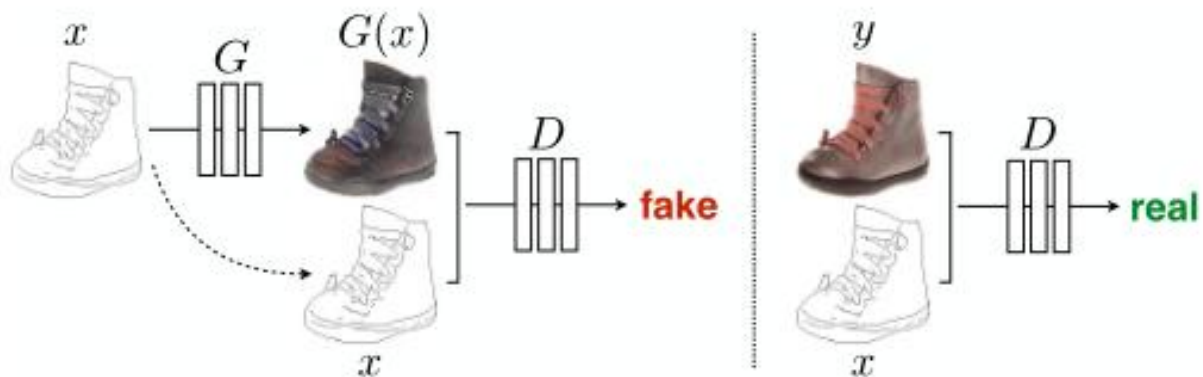


Figure 1: Many problems in image processing, graphics, and vision involve translating an input image into a corresponding output image. These problems are often treated with application-specific algorithms, even though the setting is always the same: map pixels to pixels. Conditional adversarial nets are a general-purpose solution that appears to work well on a wide variety of these problems. Here we show results of the method on several. In each case we use the same architecture and objective, and simply train on different data.

PIX2PIX算法示意图



- 基于图像边缘生成图像为例

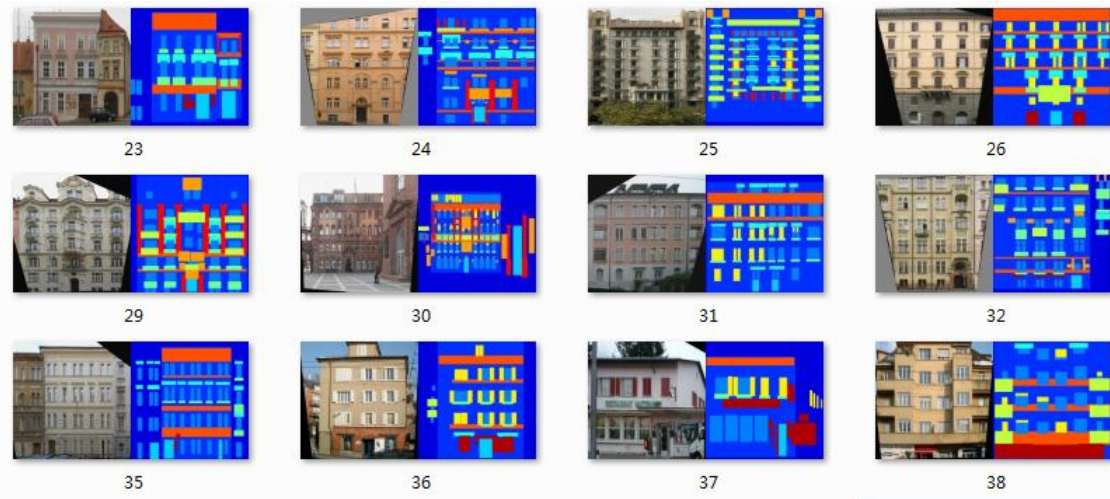


DataSet

01

Training Set

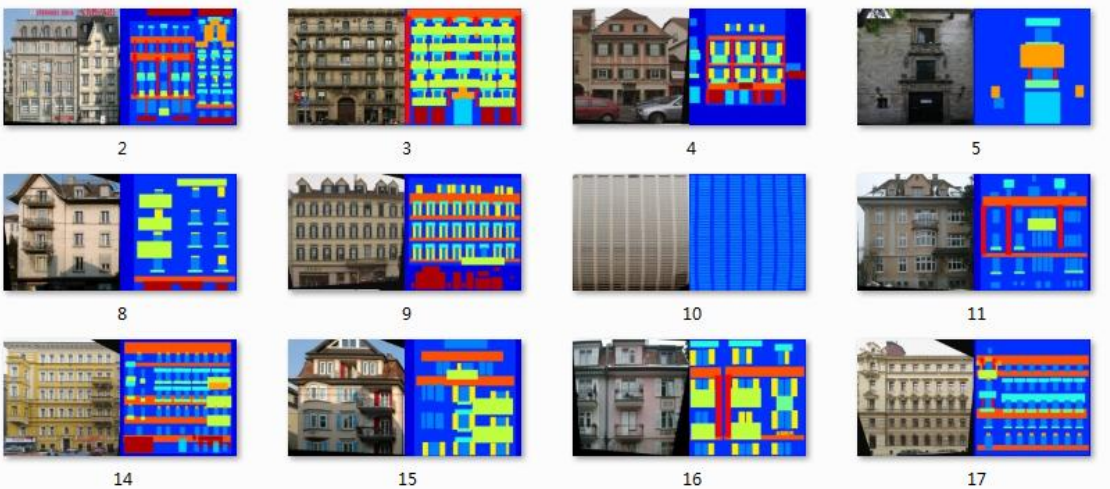
数据集大小：400张



02

Testing Set

数据集大小：100张

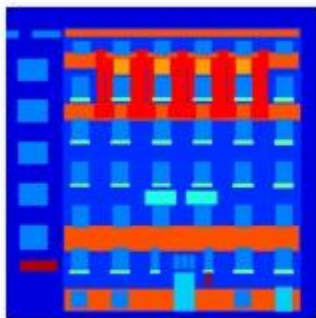


Result



Real

output



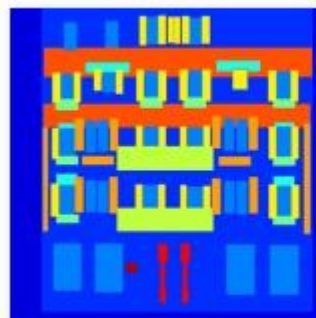
1_real_A



1_real_B



1_fake_B



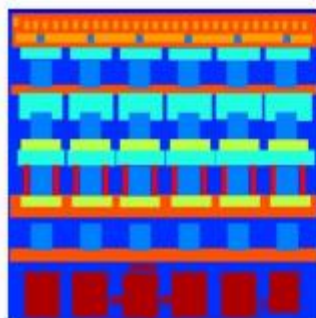
3_real_A



3_real_B



3_fake_B



10_real_A



10_real_B

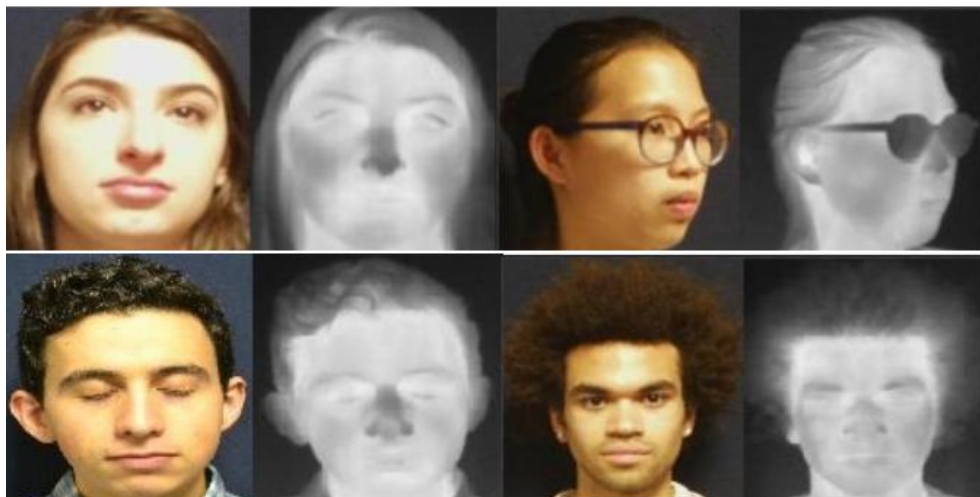


10_fake_B

DataSet

01

Training Set



02

Testing Set



数据集划分：选取77个人
(1078张图片) 用作训练，
18个人 (252张) 做测试集，
18个人 (252张) 做验证集。

Result

