Learning from Synthetic Data for Crowd Counting in the Wild

Qi Wang, Junyu Gao, Wei Lin, Yuan Yuan
School of Computer Science and Center for OPTical IMagery Analysis and Learning (OPTIMAL),
Northwestern Polytechnical University, Xi'an, Shaanxi, P. R. China
{crabwq, gjy3035, elonlin24, y.yuan1.ieee}@gmail.com

合成数据集

GTA5 Crowd Counting"（"GCC" for short)

游戏插件获得数据和标签 Script Hook V is a C++ library for developing game plugins.

使用

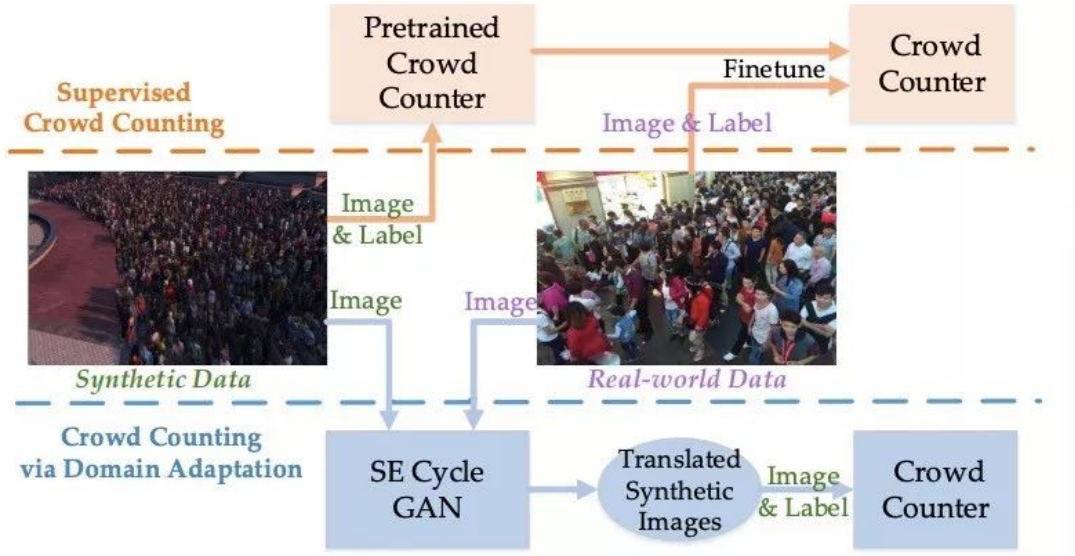
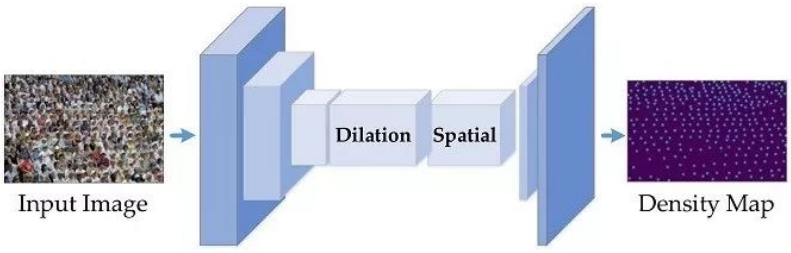


Figure 1. Two ways of using the proposed GCC dataset: supervised learning and domain adaptation.

1 监督学习 （spatial FCN (SFCN)）

使用该大型数据集预训练网络，再在实际的真实场景数据集中微调网络



After the spatial encoder,a regression layer is added, which directly outputs the density map with input' s 1/8 size.

利用 SFCN 来直接回归密度图，该密度图能够编码全局上下文信息。

Table 2. The results of our proposed SFCN and the three classic methods on GCC dataset.

Method	Random splitting				Cross-camera splitting				Cross-location splitting			
	MAE	MSE	PSNR	SSIM	MAE	MSE	PSNR	SSIM	MAE	MSE	PSNR	SSIM
MCNN [43]	100.9	217.6	24.00	0.838	110.0	221.5	23.81	0.842	154.8	340.7	24.05	0.857
CSR [19]	38.2	87.6	29.52	0.829	61.1	134.9	29.03	0.826	92.2	220.1	28.75	0.842
FCN	42.3	98.7	30.10	0.889	61.5	156.6	28.92	0.874	97.5	226.8	29.33	0.866
SFCN	**36.2**	**81.1**	**30.21**	**0.904**	**56.0**	**129.7**	**29.17**	**0.889**	**89.3**	**216.8**	**29.50**	**0.906**

PSNR 峰值信噪比，一种全参考的图像质量评价指标，数值越大表示失真越小。

2 Crowd Counting via Domain Adaptation

提出 SSIM Embedding Cycle GAN（SE Cycle GAN：绿色部分）：将合成场景转换为真实场景

原来的容易丢失细节信息、容易扭曲。

SSIM 的输入就是两张图像，我们要得到其相似性的两张图像。其中一张是未经压缩的无失真图像，另一张就是你恢复出的图像。它主要计算两张图片局部特征的相似性。（均值、方差协方差）
SSIM 是一个 0 到 1 之间的数，越大表示输出图像和无失真图像的差距越小，即图像质量越好。当两幅图像一模一样时，SSIM=1

Table 5. The performance of no adaptation (No Adpt), Cycle GAN and SE Cycle GAN (ours) on the five real-world datasets.

Method	DA	SHT A				SHT B				UCF_CC_50			
		MAE	MSE	PSNR	SSIM	MAE	MSE	PSNR	SSIM	MAE	MSE	PSNR	SSIM
NoAdpt	✗	160.0	216.5	19.01	0.359	22.8	30.6	24.66	0.715	487.2	689.0	17.27	0.386
Cycle GAN[44]	✔	143.3	204.3	**19.27**	0.379	25.4	39.7	24.60	0.763	404.6	548.2	**17.34**	0.468
SE Cycle GAN (ours)	✔	**123.4**	**193.4**	18.61	**0.407**	**19.9**	**28.3**	**24.78**	**0.765**	**373.4**	**528.8**	17.01	**0.743**

Method	DA	UCF-QNRF				WorldExpo'10 (MAE)					
		MAE	MSE	PSNR	SSIM	S1	S2	S3	S4	S5	Avg.
NoAdpt	✗	275.5	458.5	20.12	0.554	4.4	87.2	59.1	51.8	11.7	42.8
Cycle GAN[44]	✔	257.3	400.6	20.80	0.480	4.4	69.6	49.9	29.2	9.0	32.4
SE Cycle GAN (ours)	✔	**230.4**	**384.5**	**21.03**	**0.660**	**4.3**	**59.1**	**43.7**	**17.0**	**7.6**	**26.3**