

A Simple Domain Shifting Network for Generating Low Quality Images

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Presentation for ICPR 2020

- Problem of Domain Adaptation
 - Divergences between source and target domain.
 - Common approach: Divergence-based, adversarial training etc..
- Our problem setting
 - Training images are high quality images.
 - Test images are low quality images captured by Cozmo robot.
 - Standard training yields low accuracy.

Example images



Standard: 1.0 dog
Adapted: 1.0 dog

1) High-quality



Standard: 0.007 dog
Adapted: 1.0 dog

2) Cozmo recorded

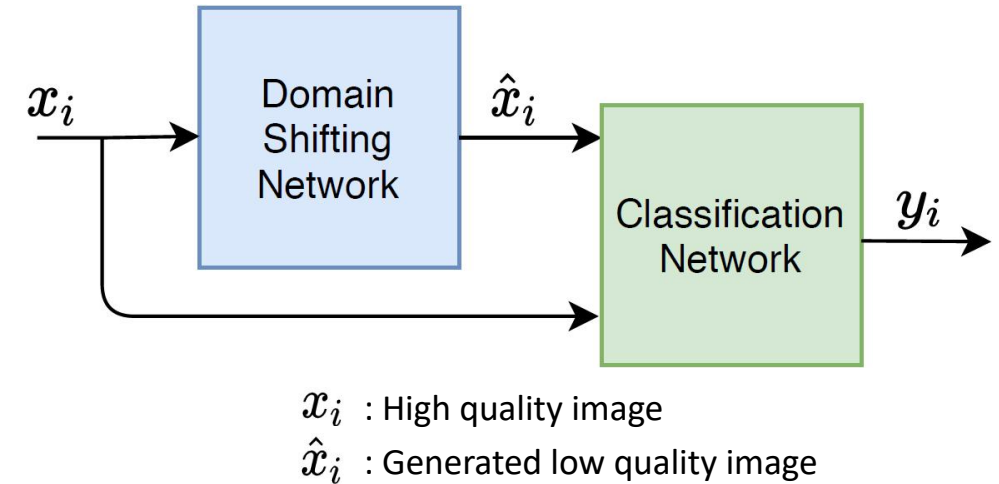


Standard: 0.038 dog
Adapted: 1.0 dog

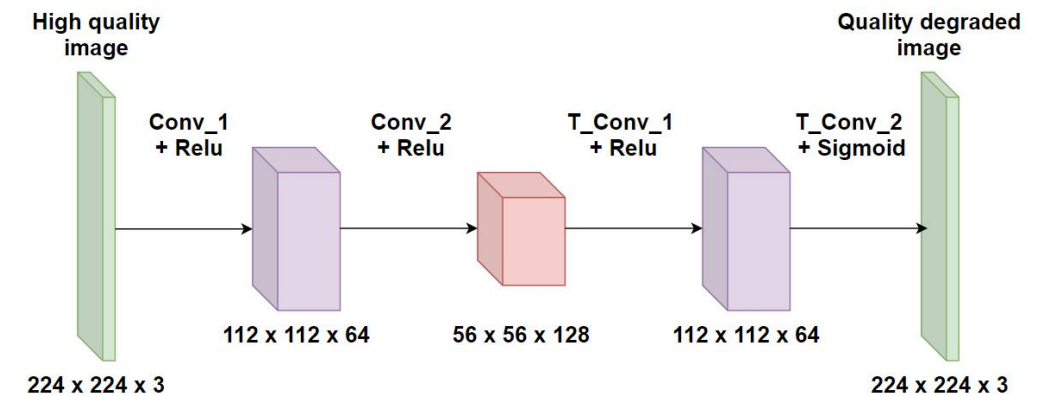
Generated low quality

Main Idea

- Train a simple convolutional regression network to mimic low quality camera.
- Generate low quality training images for classification using this network.
- Train the classification network using high quality images along with the generated images.



- Training data generation for simple domain adaptation network.
- The network is trained with high quality images as input.
- The reconstruction error between output and the corresponding low quality image is minimized.



- Unsupervised Domain adaptation:
 - A small subset of unlabeled target domain images relevant to classification task are utilized.
- Zero Shot Domain Adaptation:
 - No target domain images relevant to classification task are utilized.

Approach	Standard	Cozmo	Cozmo in wild
Source Supervised	97.86%	86.97%	90.13%
Ours Unsupervised	98.76%	94.67%	91.27%
Ours zero-shot	98.60%	94.24%	95.28 %
Cozmo Supervised (Oracle)	97.40%	95.00%	92.27%

PERFORMANCE COMPARISON FOR 2-WAY CLASSIFICATION

Approach	Standard	Cozmo
Source Supervised	92.87%	73.49%
Ours Unsupervised	91.66%	77.56%
Ours zero-shot	92.09%	76.39%
Cozmo Supervised (Oracle)	84.88%	80.15%

PERFORMANCE COMPARISON FOR 5-WAY CLASSIFICATION

- Our Domain adaptation framework:
 - Maps high-quality to low-quality images.
 - Supports zero-shot approach.
 - Proposes effective way of utilizing the synthetic low-quality images.