A Survey on Face Data Augmentation

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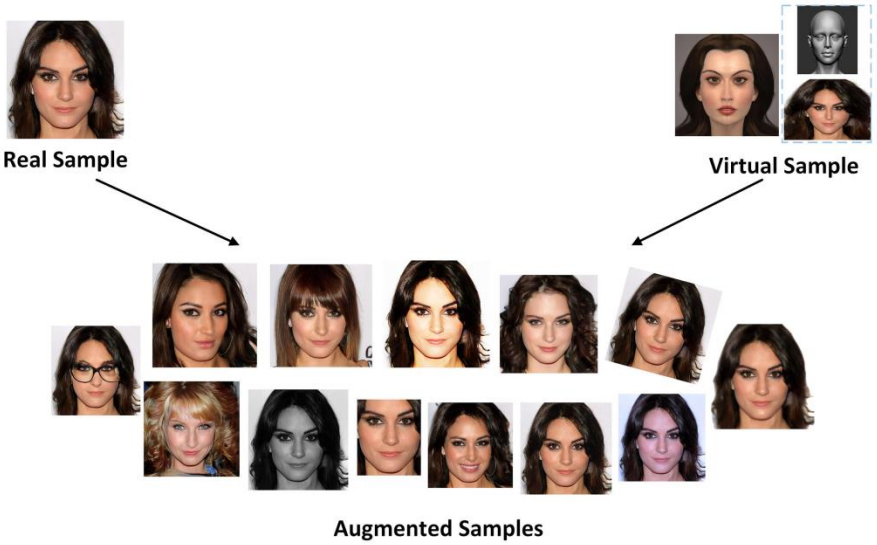
Original Paper by Wang, et al.

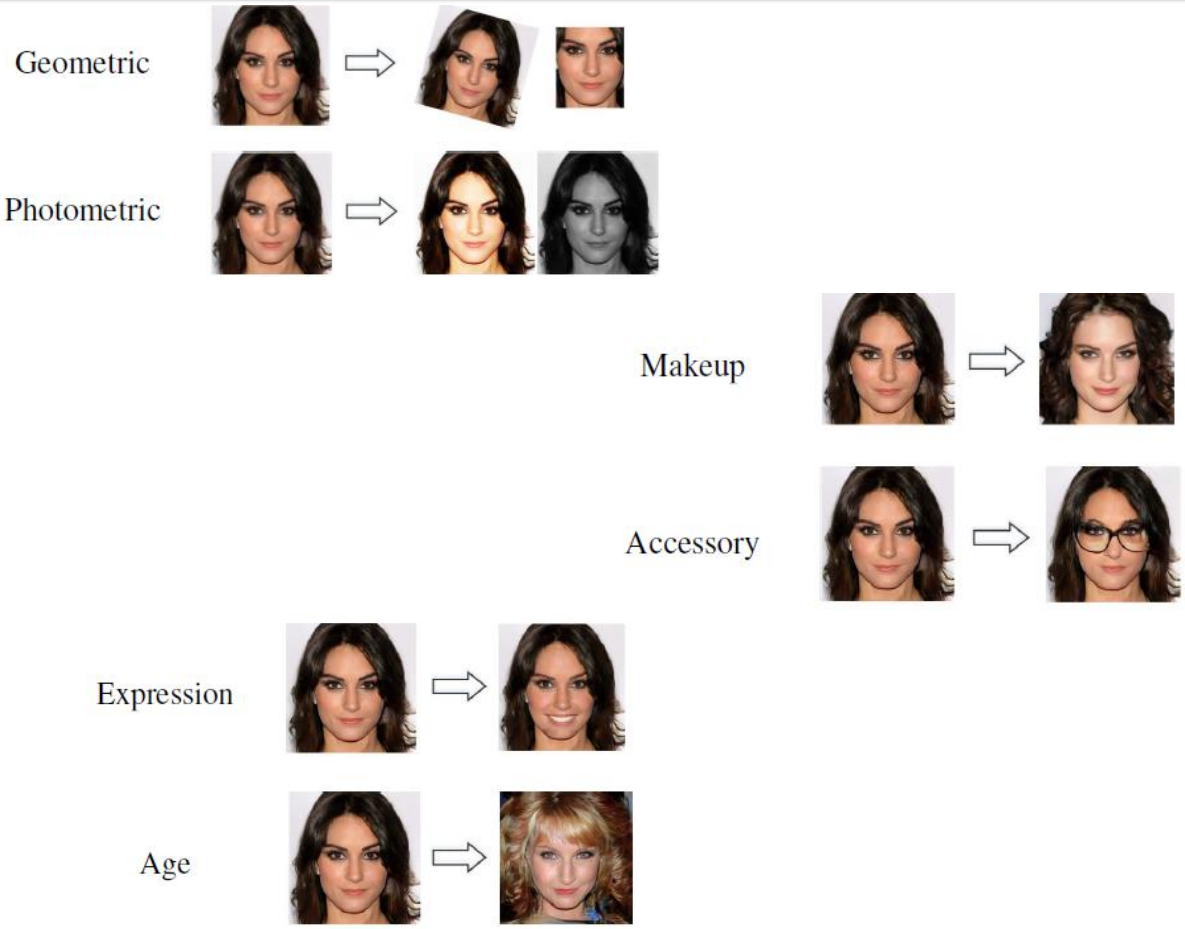
Motivation

- Overcome limitation of existing data
- Represent un-captured distributions synthetically
- Generate faces without self-occlusion
- Generate faces with more intra-class variation



Transformation Types

- Generic
  - Geometric
  - Photometric
- Component
  - Hairstyle
  - Makeup
  - Accessory
- Attribute
  - Pose
  - Expression
  - Age



Generic Transformations

- Geometric
  - Flip orientation
  - Crop and pad

- Photometric
  - Alter RGB channels
  - Edge enhancement, blurring, etc.

Component Transformations

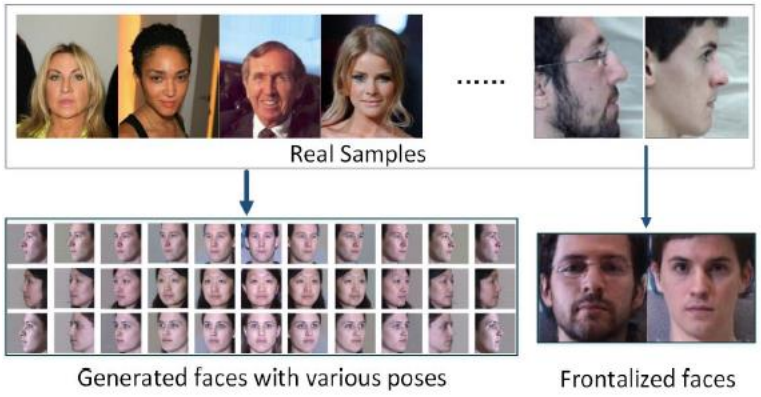
- Hairstyle Transfer
  - DiscoGAN
  - StarGAN

- Makeup Transfer
  - Traditional image processing
  - BeautyGAN

- Accessory Transfer
  - Info-GAN

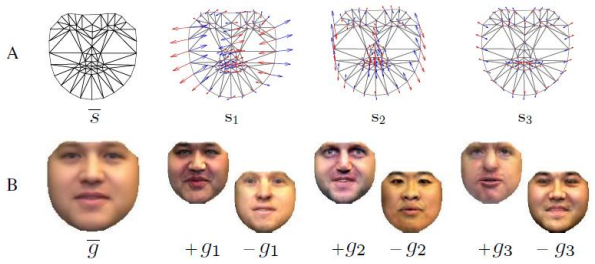
Attribute Transformations

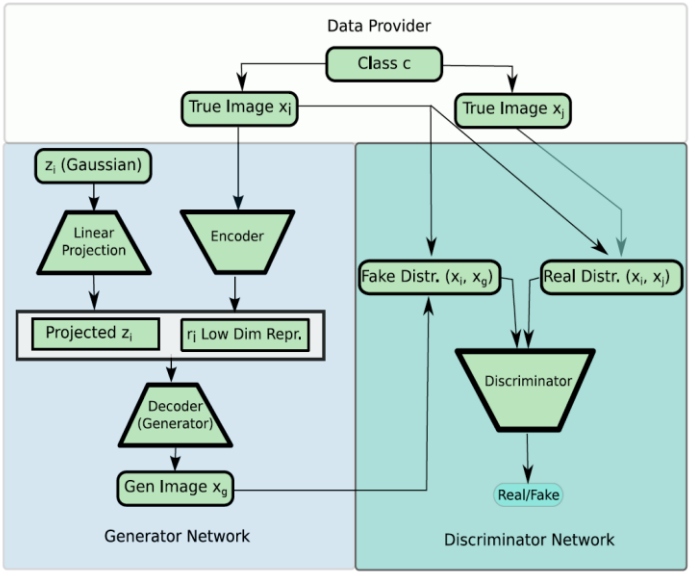
- Pose
  - PCA based 2D shape model
  - GAN based 3D models
    - UV-GAN
    - CAPG-GAN
    - Others
- Expression
  - 4 Primary GAN categories
- Age
  - Input encoded into latent vectors
  - Reconstructed with different age



Transformation Methods

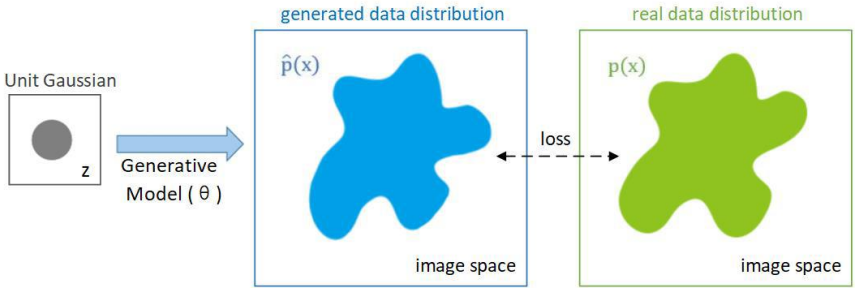
- Basic Image Processing
  - Transformations and playing with RGB channels
- Model-based Transformation
  - Fit existing model to input image
- Realism Enhancement
- Generative-based Transformation
- Augmented Reality
- Auto Augmentation

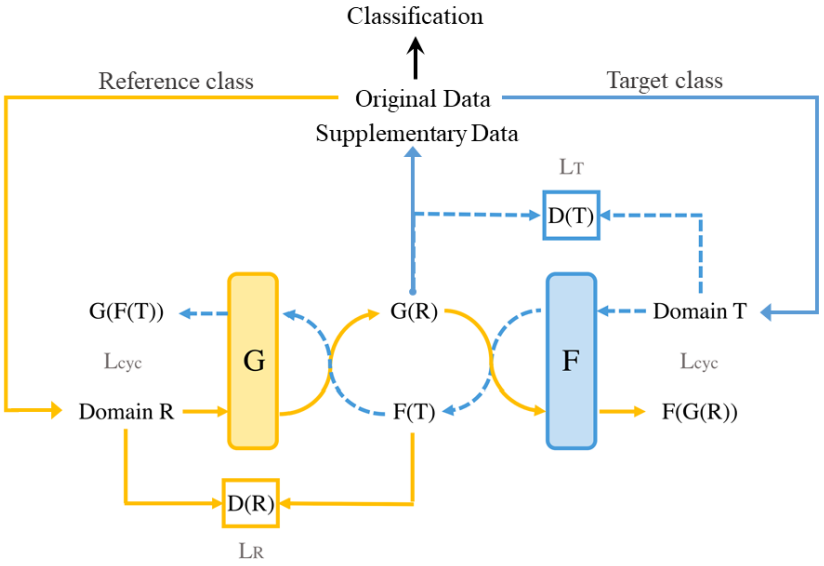




Generative Transformation

- Autoregressive Generative Models
- Variational Autoencoders
- GANs
- Flow Based Generative Models





Evaluation Metrics

- Qualitative
- Quantitative
  - Distance Measurement
    - L1 and L2 norm for color and spatial distance
  - Accuracy and Error Rate
    - Require balanced dataset
  - Inception Score
    - Relative entropy of two probability distributions
  - Frechet Inception Distance
    - Between multivariate Gaussian distributions of real and generated

Challenges and Opportunities

- Identity Preservation
  - Lack realistic variations of make-up, hair color, etc.
- Disentangled Representation
- Unsupervised Data Augmentation
- Improvement of GANs

Thank You