Invertible Conditional GANs for image editing

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> cGANs, where the introduction of external information allows to determine specific representations of the generated images. In this work, we evaluate encoders to inverse the mapping of a cGAN, ie., mapping a real image into a latent space and a conditional representation.

Contributions

1. Proposing IcGANs, composed of two crucial parts: an encoder and a cGAN.
2. Introducing an encoder in the conditional GAN frame work to compress a real image x into a latent representation z and conditional vector y.

> This inversion would allow us to have a latent representation z from a real image x and, then, we would be able to explore the latent space by interpolating or adding variations on it, which would result in variations on the generated image x.

Generator:

$$x = G(z, y)$$

Inverted mapping:

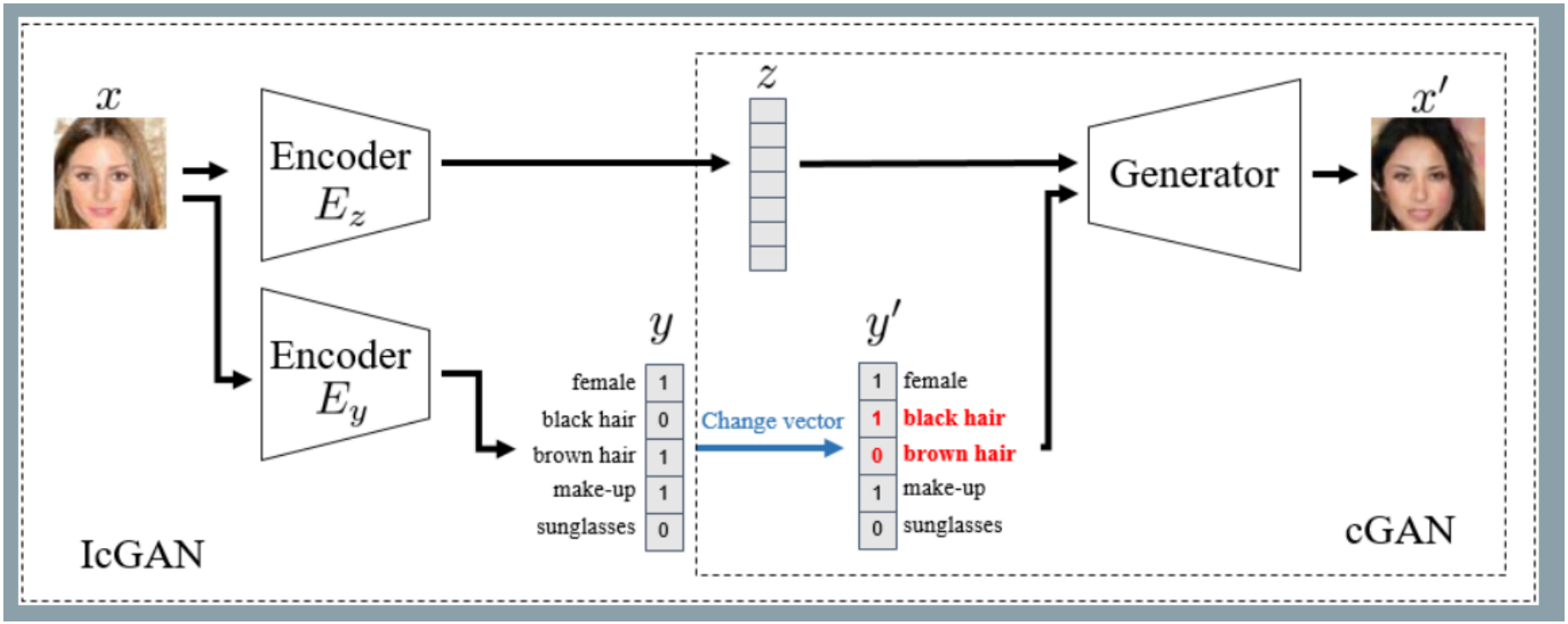
$$(z, y) = E(x)$$

> Our approach consists of training an encoder E once the cGAN has been trained. The encoder E is composed of two sub-encoders:E_z, which encodeers an image to z, and E_y, which encoders an image to y.

Encoder:

$$L_{ez} = E_{z \sim p_z, y \sim p_y} ||z - E_z(G(z, y))||_2^2$$

$$L_{ey} = E_{x, y \sim p_{data}} ||y - E_y(x)||_2^2$$



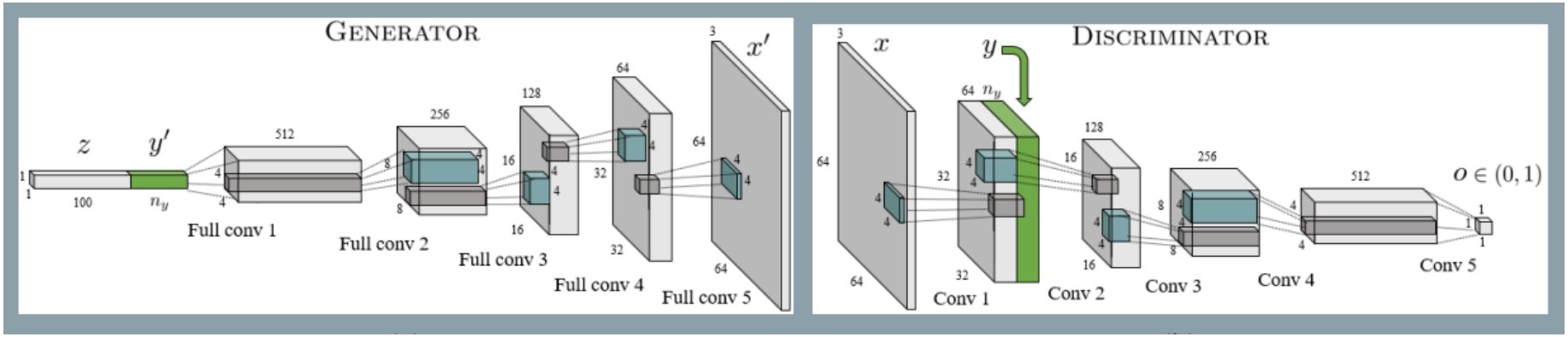
Conditional position

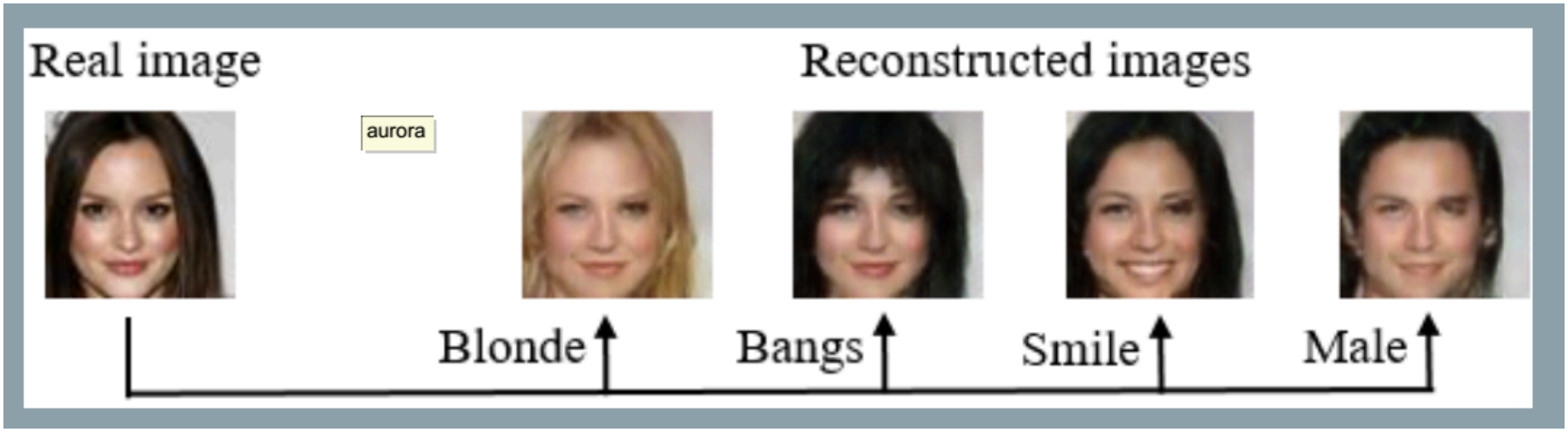
> The conditional information vector y are always concatenated in the filter dimension at the input level in generator. As for the discriminator, different authors insert y in different parts of the model. **We expect that the earlier y is positioned in the model the better since the model is allowed to have more learning interactions with y**.

Conditional sampling

> There are two types of conditional information, y and y'. The first one is trivially sampled from $(x, y) \sim p_{data}$ and is used for training the discriminator D(x,y) with a real image x and its associated label y. The second one is sampled from $y' \sim p_y$ and serves as input to the generator $G(z, y')$ along with a latent vector $z \sim p_z$ to generate an image x'. We will directly sample y from p_data.

Model architecture




Real image
Reconstructed images
aurora
Blonde
Bangs
Smile
Male