A Method for Modifying Facial Features

Motivation
Facial recognition systems rely on original faces, but people’s facial features, including beard and glasses, change frequently. A system capable of reconstructing disguise will be helpful for officers recovering the original human face or assisting witnesses identify criminals with modified facial features.

Methodology
The CycleGAN by Zhu et al. [1] presents a method of learning the two mappings (original and disguised faces) given training samples \( L \), and \( R \).

\[
\begin{align*}
\text{CycleGAN} & : (L, R) \rightarrow (L', R') \\
& : (L', R') \rightarrow (L'', R'')
\end{align*}
\]

For this task, we would like to learn mapping functions \( L \rightarrow L' \) and \( R \rightarrow R' \), recovering the original human face or assisting witnesses identify criminals with modified facial features.

Results and Discussion
Images generated using a basic GAN by Goodfellow [3] perform poorly in terms of preserving non-relevant facial features. Generated images are also blurry. A simple GAN-based GAN. Also, it hides details, compared to detail reconstruction quality is higher for CycleGAN. The network architecture is presented below:

\[
\begin{align*}
\text{GAN's:} & \quad \text{Forward generator } G \rightarrow \text{Original faces to original faces,} \\
& \quad \text{Backward generator } F \rightarrow \text{Disguised faces to original faces,} \\
& \quad \text{Discriminator } D \rightarrow \text{Original and disguised faces.}
\end{align*}
\]

References