Towards improved inference and generation for bidirectional generative adversarial models

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Abstract

We investigate the inference and generation process in Generative Adversarial Networks (GANs). We empirically analyze the issues in the previous approaches: a single pathway "encoder-generator-discriminator" network has many holes in the learned embedding space; while a bidirectional adversarial learning framework suffers from unstable inference mapping. We propose two strategies to address this issue:

1. In addition to the single reconstruction path, we introduce a generation sideway to maintain the completeness of the learned embedding space. 2. We let the reconstruction path to reconstruct training data as well as the data generated from the generation path.

Theoretical analysis proves that the learned encoder and decoder are mutually inverse. Strategy 1 is evaluated on a specific task: multi-view face image generation. Strategy 1+2 is evaluated on both synthetic data and real-world applications. Strong results support our theoretical analysis and prove the superior performance of our method compared with the state of the arts.