<Inferential Wasserstein Generative Adversarial Networks>

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Abstract:
< Generative Adversarial Networks (GANs) have been impactful on many problems and applications but suffer from unstable training. The Wasserstein GAN (WGAN) leverages the Wasserstein distance to avoid the caveats in the minmax two-player training of GANs but has other defects such as mode collapse and lack of metric to detect the convergence. We introduce a novel inferential Wasserstein GAN (iWGAN) model, which is a principled framework to fuse auto-encoders and WGANs. The iWGAN model jointly learns an encoder network and a generator network motivated by the iterative primal dual optimization process. The encoder network maps the observed samples to the latent space and the generator network maps the samples from the latent space to the data space. We establish the generalization error bound of iWGANs to theoretically justify the performance of iWGANs. We further provide a rigorous probabilistic interpretation of our model under the framework of maximum likelihood estimation. The iWGAN, with a clear stopping criteria, has many advantages over other autoencoder GANs. The empirical experiments show that the iWGAN greatly mitigates the symptom of mode collapse, speeds up the convergence, and is able to provide a measurement of quality check for each individual sample. We illustrate the ability of iWGANs by obtaining competitive and stable performances for benchmark datasets.>

Keywords:
< generalization error>; < generative adversarial networks>; < latent variable models>; < primal dual optimization>; < Wasserstein distance>