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Fixed-Point Generative Adversarial Networks

Generative adversarial networks (GANs) are revolutionizing image-to-image translation, which is attractive to researchers in the medical imaging community. While using GANs to reveal diseased regions in a medical image is appealing, it requires a GAN to identify a minimal subset of target pixels for domain translation, also known as fixed-point translation, which is not possible with current GANs.

Researchers at Arizona State University have proposed a new GAN, called Fixed-Point GAN, which introduces fixed-point translation and proposes a new method for disease detection and localization. This new Gan is trained by (1) supervising same-domain translation through a conditional identity loss, and (2) regularizing cross-domain translation through revised adversarial, domain classification, and cycle consistency loss. Qualitative and quantitative evaluations demonstrate that the proposed method outperforms the state of the art in multi-domain image-to-image translation and that it surpasses predominant weakly-supervised localization methods in both disease detection and localization.

This fixed-point GAN dramatically reduces artifacts in image-to-image translation and introduces a novel method for disease detection and localization that outperforms the state of the art.

Potential Applications

- Computer-aided diagnoses - e.g. pulmonary embolism and brain lesion localization
- Non-medical applications – photo editing/aging/blending, game development and animation production

Benefits and Advantages

- Works with unpaired images – does not require two images with and without the attribute
- Requires only image-level annotation for training
- Same-domain translation without adding or removing attributes

- Cross-domain translation without affecting unrelated attributes
 - o E.g. removes eyeglasses from an image without affecting hair color
- Source-domain-independent translation using only image-level annotation
- Outperforms the state of the art in multi-domain image-to-image translation for both natural and medical images
- Surpasses predominant weakly-supervised localization methods in both disease detection and localization
- Dramatically reduces artifacts in image-to-image translation

For more information about this opportunity, please see

[Rahman Siddiquee et al - ICCV - 2019](#)

[GitHub - 2019](#)

For more information about the inventor(s) and their research, please see

[Dr. Liang's departmental webpage](#)