

Deep Learning for Paired Chest X-Ray Image Analysis: Classification and Generation

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Abstract

Longitudinal analysis of chest X-ray (CXR) images is crucial for monitoring disease progression and treatment response, but manual comparison of these images is challenging. Deep learning offers promising avenues for automating this process. This thesis investigates the application of deep learning to paired CXR images on two tasks: (1) multi-class classification of treatment responses and (2) predictive generation of post-treatment images. For classification, we proposed a Siamese network with a novel correlation-based feature fusion module. For predictive generation, a conditional generative adversarial network (cGAN) based on the Pix2PixHD framework was implemented. Experimental results showed that the Siamese network effectively categorized treatment outcomes and the cGAN model can produce anatomically coherent outputs.

Keyword: Chest X-rays, Deep learning, Longitudinal analysis, Siamese network, Conditional generative adversarial networks