Abstract: Extracting and Leveraging Nodule Features with Lung Inpainting for Local Feature Augmentation

Sebastian Gündel[1,3], Arnaud A. A. Setio[1], Sasa Grbic[2], Andreas Maier[3], Dorin Comaniciu[2]

[1]Digital Technology and Innovation, Siemens Healthineers, Erlangen, Germany
[2]Digital Technology and Innovation, Siemens Healthineers, Princeton, NJ, USA
[3]Pattern Recognition Lab, Friedrich-Alexander-Universität Erlangen, Germany
sebastian.guendel@fau.de

Chest X-ray (CXR) is the most common examination for fast detection of pulmonary abnormalities. Recently, automated algorithms have been developed to classify multiple diseases and abnormalities in CXR scans. However, because of the limited availability of scans containing nodules and the subtle properties of nodules in CXRs, state-of-the-art methods do not perform well on nodule classification. To create additional data for the training process, standard augmentation techniques are applied. However, the variance introduced by these methods are limited as the images are typically modified globally. In this paper [1], we propose a method for local feature augmentation by extracting local nodule features using a generative inpainting network. The network is applied to generate realistic, healthy tissue and structures in patches containing nodules. The nodules are entirely removed in the inpainted representation. The extraction of the nodule features is processed by subtraction of the inpainted patch from the nodule patch. With arbitrary displacement of the extracted nodules in the lung area across different CXR scans and further local modifications during training, we significantly increase the nodule classification performance and outperform state-of-the-art augmentation methods.

References

1. Gündel S, Setio AAA, Grbic S, et al. Extracting and leveraging nodule features with lung inpainting for local feature augmentation. In: Liu M, Yan P, Lian C, et al., editors. Machine Learning in Medical Imaging. Cham: Springer International Publishing; 2020. p. 504–512.

C. Palm et al. (Hrsg.), *Bildverarbeitung für die Medizin 2021*,
Informatik aktuell, https://doi.org/10.1007/978-3-658-33198-6_68