

Dual-Channel Reliable Breast Ultrasound Image Classification Based on Explainable Attribution and Uncertainty Quantification

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Abstract : This paper focuses on the classification task of breast ultrasound images and conducts research on the reliability measurement of classification results. A dual-channel evaluation framework was developed based on the proposed inference reliability and predictive reliability scores. For the inference reliability evaluation, human-aligned and doctor-agreed inference rationals based on the improved feature attribution algorithm SP-RISA are gracefully applied. Uncertainty quantification is used to evaluate the predictive reliability via the test time enhancement. The effectiveness of this reliability evaluation framework has been verified on the breast ultrasound clinical dataset YBUS, and its robustness is verified on the public dataset BUSI. The expected calibration errors on both datasets are significantly lower than traditional evaluation methods, which proves the effectiveness of the proposed reliability measurement.

Keywords : medical imaging, ultrasound imaging, XAI, uncertainty measurement, trustworthy AI

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