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AI Powered Otoscopic Image Classification for Ear Disease Detection

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Abstract: *Otoscopy is a diagnostic procedure that involves using an otoscope to look at the tympanic membrane and the external auditory canal. With the use of this portable device, which combines a light source and a magnifying lens or camera, medical practitioners may see the eardrum and canal structures. Assessing ear health and identifying anomalies including infections, inflammation, wax accumulation, foreign bodies, structural flaws, tumors, or evidence of trauma are prominent uses for otoscopy. For patients experiencing symptoms connected to their ears, such as pain, hearing loss, or discharge, it is a crucial step in the assessment process. Tympanometry and audiometry are two additional procedures that may be used in conjunction with otoscopy to further evaluate ear function as part of a thorough ear examination. Otoscopy is an essential diagnostic tool for a variety of ear disorders, but classifying otoscopy images accurately and quickly are still a difficult process. In this work, we provide an automated otoscopy categorization method based on deep learning. We have assembled a heterogeneous collection of otoscopy pictures that includes both normal anatomy and a range of diseases, such as tumors, infections, inflammations, and structural anomalies. We employed Convolutional Neural Networks (CNNs), a powerful class of deep learning models, for feature extraction and classification. The model was trained using categorical cross-entropy loss after the dataset had undergone pre-processing to improve uniformity and increase variability. In order to maximize performance, hyperparameters were adjusted, and the model was assessed using common metrics such as F1-score, AUC-ROC, accuracy, precision, and recall. Our findings highlight the potential of the suggested method as a useful tool in clinical practice for supporting the diagnosis of ear diseases by demonstrating how well it can reliably identify otoscopy images.*

Keywords: Otoscopy

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