

Lecture Notes in Networks and Systems 1102

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Abstract

White blood cells (WBCs), scientifically termed leukocytes, play a significant role in the immunity system. They are in charge of safeguarding the body against infection and disease by identifying and neutralizing foreign invaders, such as bacteria, viruses, and cancer cells. WBCs are produced in the bone marrow and are classified into five different types: neutrophils, lymphocytes, monocytes, eosinophils, and basophils. Each type plays a unique role in the immune response, and an imbalance of WBCs can indicate the presence of certain medical conditions. This study aims to provide a realization of an automated computer-aided diagnosis system to classify and detect WBC leukemia. A randomized over-sampling algorithm was employed to address the class imbalance problem, which improved the accuracy by an average of 13.34%. Various deep learning networks such as Inception-v3, InceptionResNet-v2, Xception, VGG16, Resnet50, MobileNetV2, and VGG19 were used on Raabin-WBC and the generalization power of these models was tested in recognizing WBCs based on the sampling technique used. Additional visualization and analysis were done using gradient-weighted class activation mapping (Grad-CAM), score-weighted class activation mapping, and Grad-CAM++ algorithms to show how effectively the sampling technique improved the detection of all the classes of WBCs.

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