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Opinion Article

Machine Learning Based Automated Leukemia Detection

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DESCRIPTION

Leukemia is a blood cancer that affects White Blood Cells (WBC). Blood is made up of platelets, Red Blood Cells (RBC), and White Blood Cells (WBC). Platelets aid in clotting and bleeding control. Erythrocytes, or red blood cells, are responsible for transporting oxygen from the lungs to the body's tissues. While White Blood Cells (WBCs), also known as leukocytes, are in charge of battling illnesses and infections. The creation of a large number of immature WBC is referred to as leukaemia. It is a malignancy that damages the bone marrow and blood while also damaging the human immune system. Acute and chronic leukaemia are the two primary types of leukaemia based on their progression. In acute leukaemia, infected WBC grows quickly and do not function normally, but WBC in chronic leukaemia can function normally and develop more slowly. However, because it is difficult to distinguish from normal WBC, this can be dangerous. Acute Lymphocytic Leukaemia (ALL), Chronic Lymphocytic Leukaemia (CLL), Acute Myeloid Leukaemia (AML), and Chronic Myeloid Leukaemia (CML) are the two types of acute and chronic leukaemia, respectively, based on the size and shape of WBC.

The Internet of Things (IoT) is used in a variety of applications, including vehicular communications, smart cities, cloud computing, smart ecosystems, smart campus, mobile communications, smart agriculture, and healthcare (also known as the Internet of Medical Things) (IoMT). However, IoMT, or simply Healthcare IoT, attracts a sizable portion of the research community. The Internet of Medical Things (IoMT) is a collection of Wi-Fi smart medical devices and smart applications that are linked to IT health systems via computer networks. Smart medical devices have sensors or other computational resources and are solely intended for use in the body at home, in clinics, hospitals, and in the community. These smart gadgets are connected to cloud systems, which analyse the data and prepare it for further processing. Virtual care for patients with long term illnesses, portable mHealth devices for patients, medication monitoring, tracking the location of hospitalised patients, and the capacity to offer information to caregivers are all part of the IoMT technology. Patients and doctors benefit from the IoMT technology since it saves them time and effort. The load on health systems is reduced by connecting patients to their doctors and allowing medical data to be transferred through a secure network. The rapid development and adoption of IoMT opens the door to the deployment of frameworks that can quickly, safely, and precisely assess the health of patients and diagnose and treat various diseases remotely. IoMT-based frameworks abound, particularly for diseases that have a greater impact on a patient's life, such as leukaemia.

In order to avoid medical hazards and select the proper leukaemia treatment, haematologists must detect the presence of leukaemia as well as its specific form. The detection of leukaemia via optical blood smears testing under the supervision of a specialist is a critical and time-consuming procedure. Many CAD strategies for quantitative analysis of peripheral blood samples employing machine learning and deep learning technologies have been developed to overcome such difficulties. These systems, however, have some flaws and should be improved in terms of accuracy, learning process, and efficiency.

In this study, an IoMT-based framework for the automatic identification of leukaemia subtypes is suggested to address these shortcomings while keeping in mind the importance of healthcare.

An IoT-enabled microscope sends blood smear images to the leukaemia cloud in the proposed system. Deep learning models, such as ResNet-34 or DenseNet-121, are used to diagnose leukaemia based on its type(s). Deep learning is a branch of machine learning that expresses abstract concepts through multiple layers of data processing in order to find better learning algorithms and representations that are less reliant on feature engineering. Deep learning algorithms' great prediction strength and surprising ability to extract features allow them to be applied to a wide range of research topics. On the clinician's computer, the diagnostic results of leukaemia in terms of the types anticipated by the suggested models can be displayed, and medical care can then be provided to leukaemia patients.

CONCLUSION

An IoT-enabled microscope sends blood smear images to the leukaemia cloud system. The ResNet-34 or DenseNet-121 models are used to diagnose leukaemia. ResNet-34 and DenseNet-121 both process a large number of picture patterns utilising data augmentation approaches. Following diagnosis, the result is sent

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to the doctor's computer, where he or she uses the IoMT framework to provide medical therapy based on the test report. Furthermore, in pandemics such as COVID-19, the proposed framework aids patients.