Diagnostic Accuracy of Deep Learning's Computational Photography in the Morphology of Acute Myeloid Leukemia

Sherbansky, Leah (School: Pelham Memorial High School)

Acute Myeloid Leukemia, or AML, is a malignant disorder of the bone marrow in which myeloid blasts engulf the bone marrow. To diagnose AML, physicians observe blast cell counts in the marrow. A blast cell count of 20 percent or higher indicates an AML positive-case. Without precise technology, manual diagnosis of AML can be time-consuming and inaccurate. To assist the diagnosis of AML, computational photography (a branch of deep learning) is implicated into a digital cell scanner called the Scopio Labs scanner to produce a cell count. In this study, 20 digital scans of bone marrow aspirates visualized by the Scopio LabX 100 scanner were used. The Scopio scanner provided a summary blast cell percentage along with each digital scan. All scans had blast cell counts of 20 percent or higher, thus, all cases were expected AML-positives. The student, under mentor supervision, observed the individual cases to determine if the cells counted as blasts by the scanner were indeed blast cells based on their morphologic features. The [supervised] student then formulated an official diagnosis: AML true or false positive. 18 out of the 20 cases were true positives, and 2 out of the 20 cases were false positives. A two-tailed z test for proportions was performed, garnering a statistically significant p-value of 4.21*10E-7. In addition, a positive predictive value (PPV) of 0.90 was obtained, indicating significant precision of the scanner’s cell counting ability. The main cause of the 2 false-positives spurred from the scanner’s misinterpretation of other cell subtypes for blast cells, causing an inaccurate rise in the blast cell count. Overall, the machine's performance was both precise and accurate, favoring the use of the Scopio scanner as a diagnostic tool for Acute Myeloid Leukemia.

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