

Detection and Classification of Immature Leukocytes for Diagnosis of Acute Myeloid Leukemia

Purpose

To overcome the limitations of manual diagnosis of AML by developing a Random Forest algorithm capable of detecting immature leukocytes in AML cell images and classifying the immature leukocytes by myeloid cell type

Results

- **Detection of Immature Leukocytes:** 92.99% accuracy, results are on par with current state of art
- **Classification of Immature Leukocytes:** 93.45% overall accuracy, precision values above 65% for all classes, results are an improvement over current state of art
- **Most Important Features:** N:C ratio established as crucial discriminator for both detection and classification, 2 proposed nucleus color features proven to be significant

Methods

- Images of mature and immature leukocytes obtained from TCIA
- Segmentation to isolate nucleus and obtain whole cell mask
- Extracted 16 cytomorphological features
- Trained Random Forest Algorithm for binary classification (between mature and immature) and classification of immature leukocytes
- Tested model with separate testing sets
- Calculation of feature importance using Gini Importance

Analysis

- The presented algorithm can be used as an effective support tool in the clinical diagnosis of AML, especially in developing countries where diagnosis takes many weeks.
- The features calculated to be most important can serve as a basis for future researchers aiming to classify leukocytes.
- Future studies can calculate importance of more features.
- Future research will develop systems that can be completely integrated into clinical diagnosis method.