

White blood cell classification using convolutional neural networks

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OXFORD IMMUNE ALGORITHMICS

Oxford Immune Algorithmics

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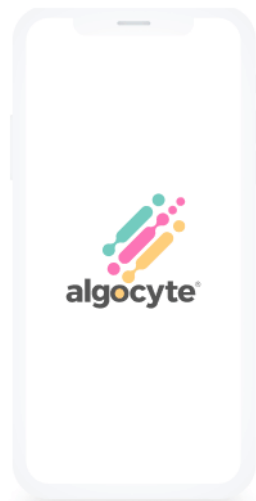
Abu Dhabi, United Arab Emirates

Reading, United Kingdom



Oxford Immune Algorithmics

Algocyte-compatible device

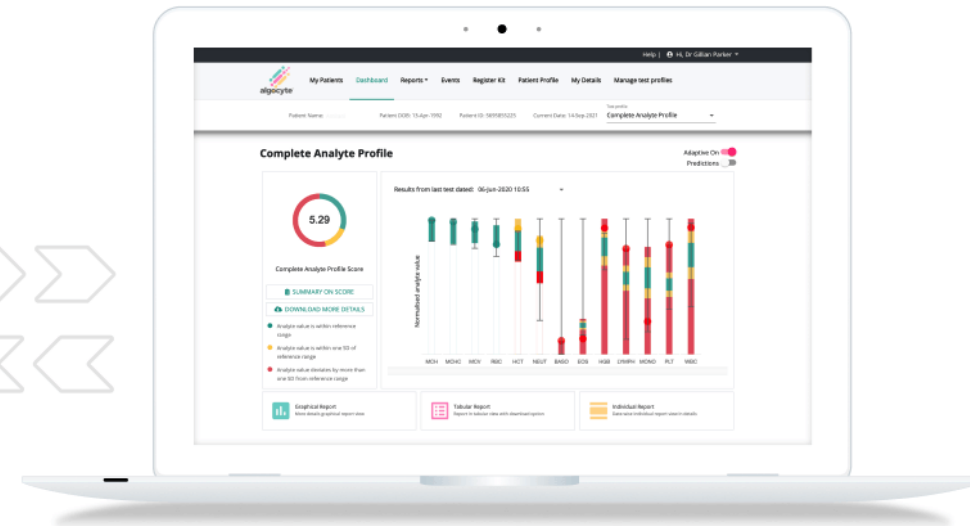


< 5 minutes

Back and forth



Clinician-driven & input/device agnostic AI platform



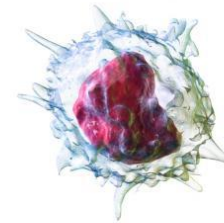
Introduction

White blood cells (leukocytes) are a very important component of the blood that forms the immune system, which is responsible for fighting foreign elements.

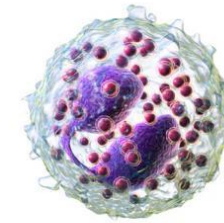
The five types of white blood cells include *neutrophils*, *eosinophils*, *lymphocytes*, *monocytes*, and *basophils*, where each type constitutes a different proportion and performs specific functions

MEDICALNEWS TODAY

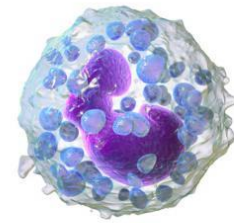
White Blood Cells



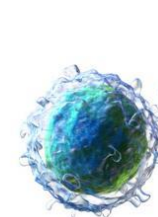
monocyte



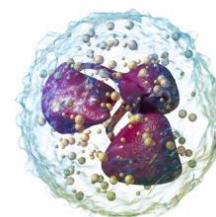
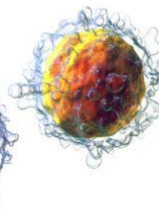
eosinophil



basophil



lymphocytes



neutrophil

Introduction

By monitoring the immune system, doctors can chose preventive treatments against diseases such as anemias and leukemias.

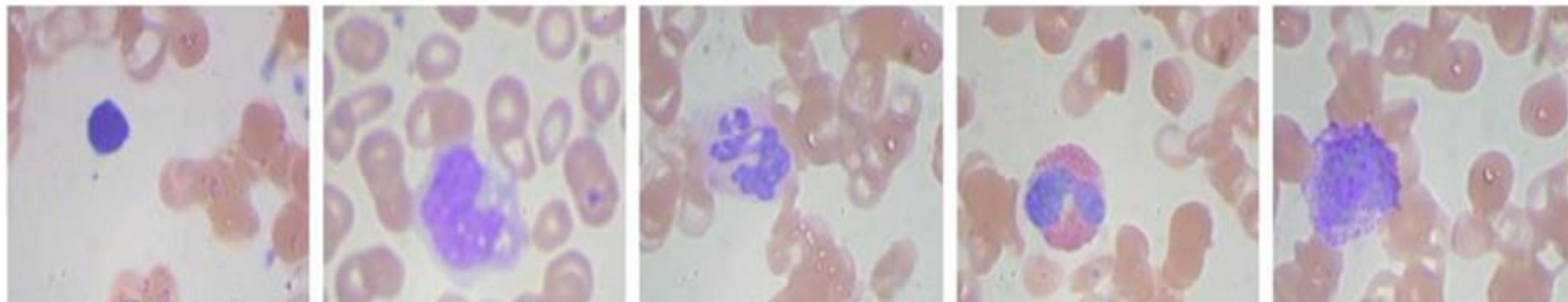
A recent study has demonstrated that Covid-19 patients have presented leucopenia (low values of leucocytes), linfocitopenia (low values of linfocytes) and citopenia (low values of eosiniphils) [6]



CBC (Complete blood count)

CBC is a routine test which provides useful information to physicians about the patient's health condition.

CBC relies on a rigorous observation on a blood smear through a microscope. The accuracy of the result depends on the expert's experience and time



a) Linfocyte

b) Monocyte

c) Neutrophil

d) Eosinophil

e) Basophil

Related works

Alexnet-Googlenet-SVM (hybrid) [3]

- CNN for feature extraction and SVM as classifier

Fast R-CNN – Mobilenet [4]

- Fast R-CNN for localization and Mobilenet for image classification

CNN and hyper spectral images [14]

- Spectral and spatial features

Improved los function and regularization [15]

WBCNet [16]

Experiments

Cell detection

Cell segmentation

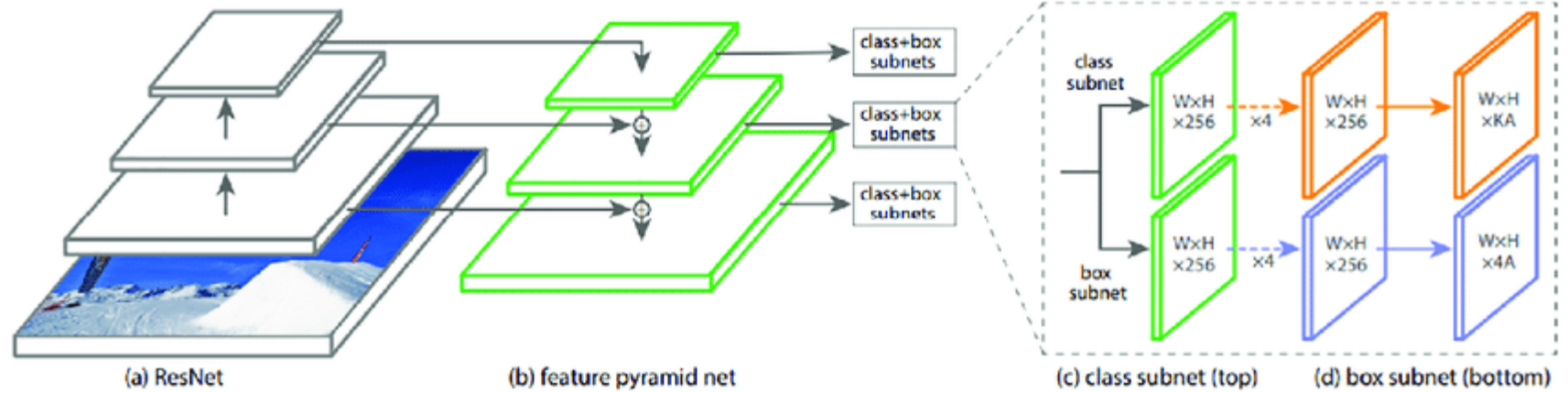
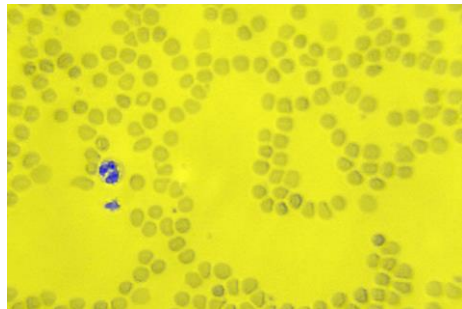
Cell classification

Dataset

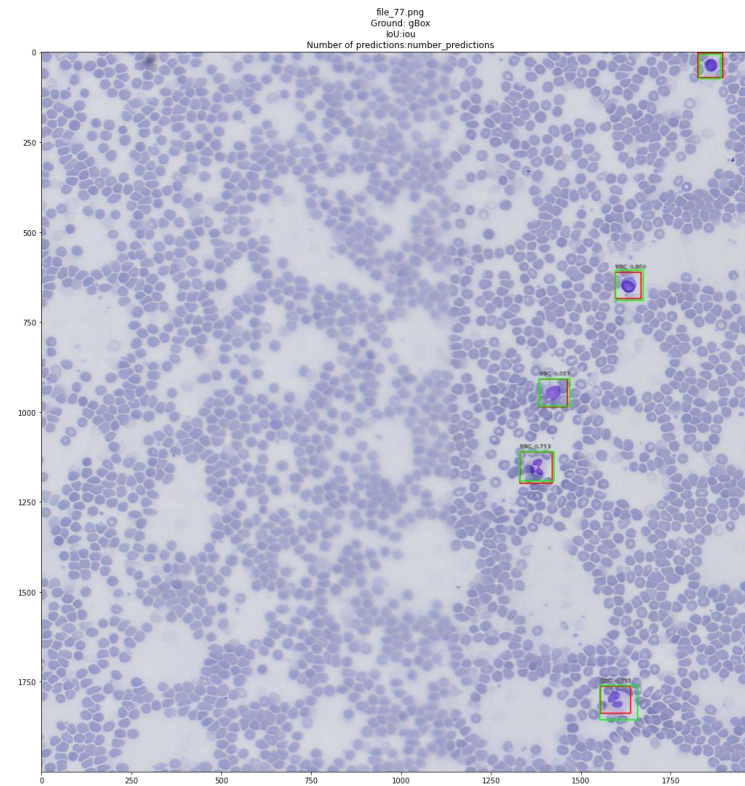
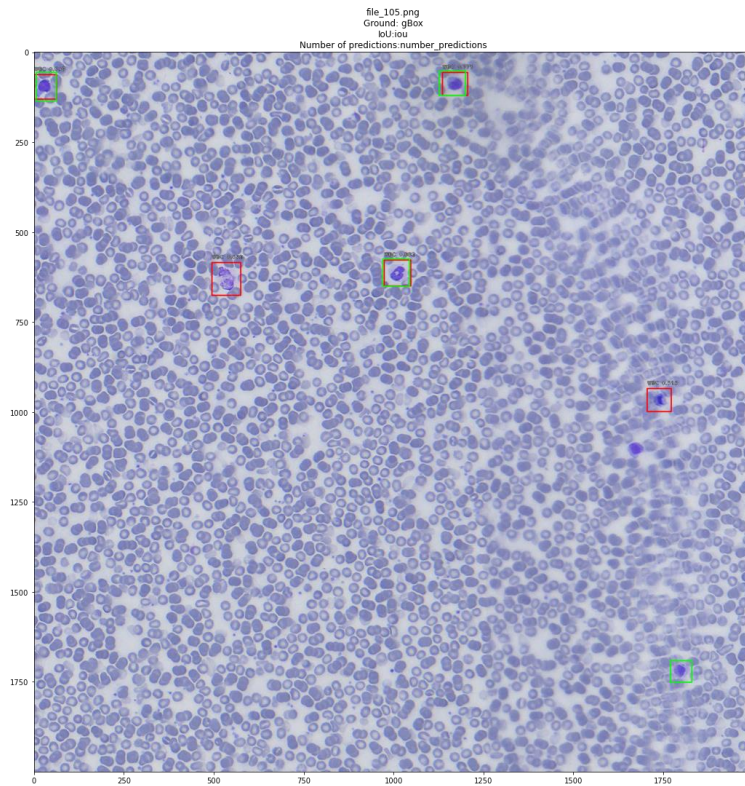
OIA's own dataset obtained by the Analyzer device

Cell detection

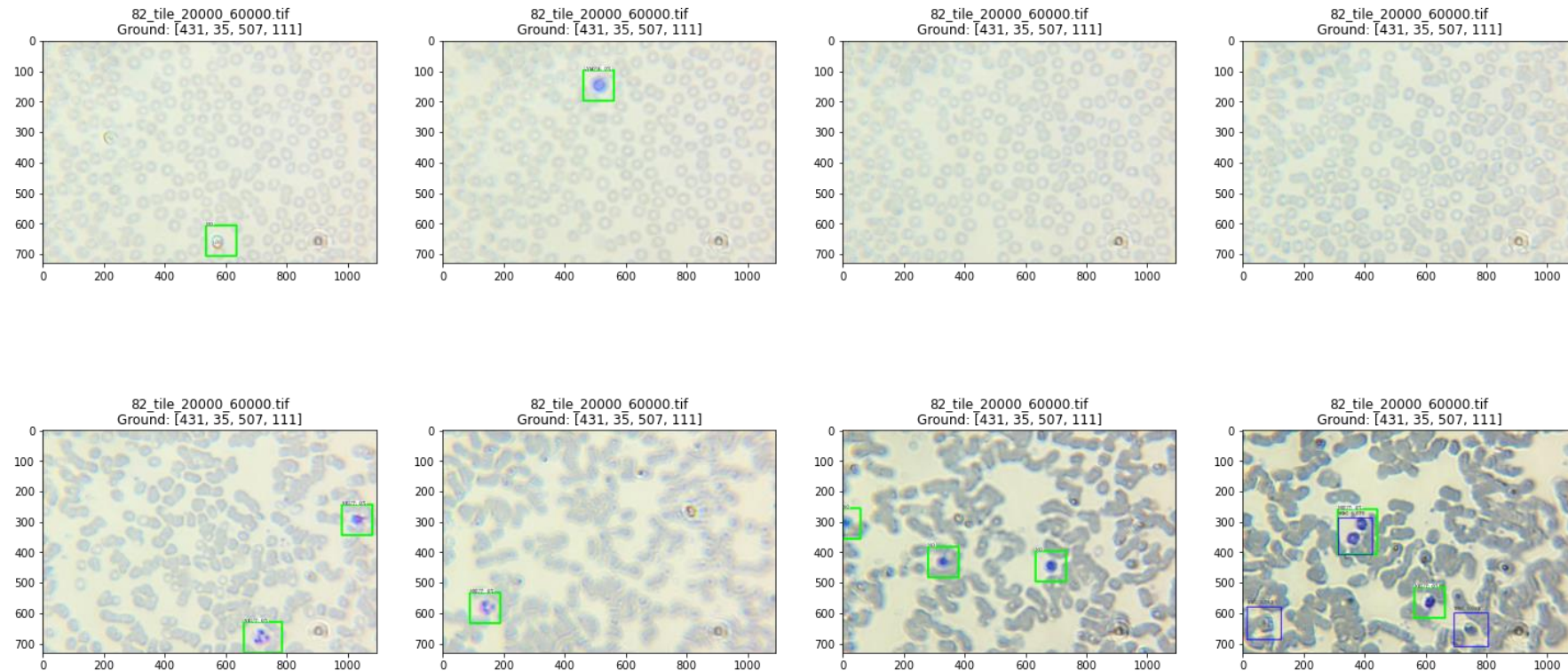
Retinanet (resnet)



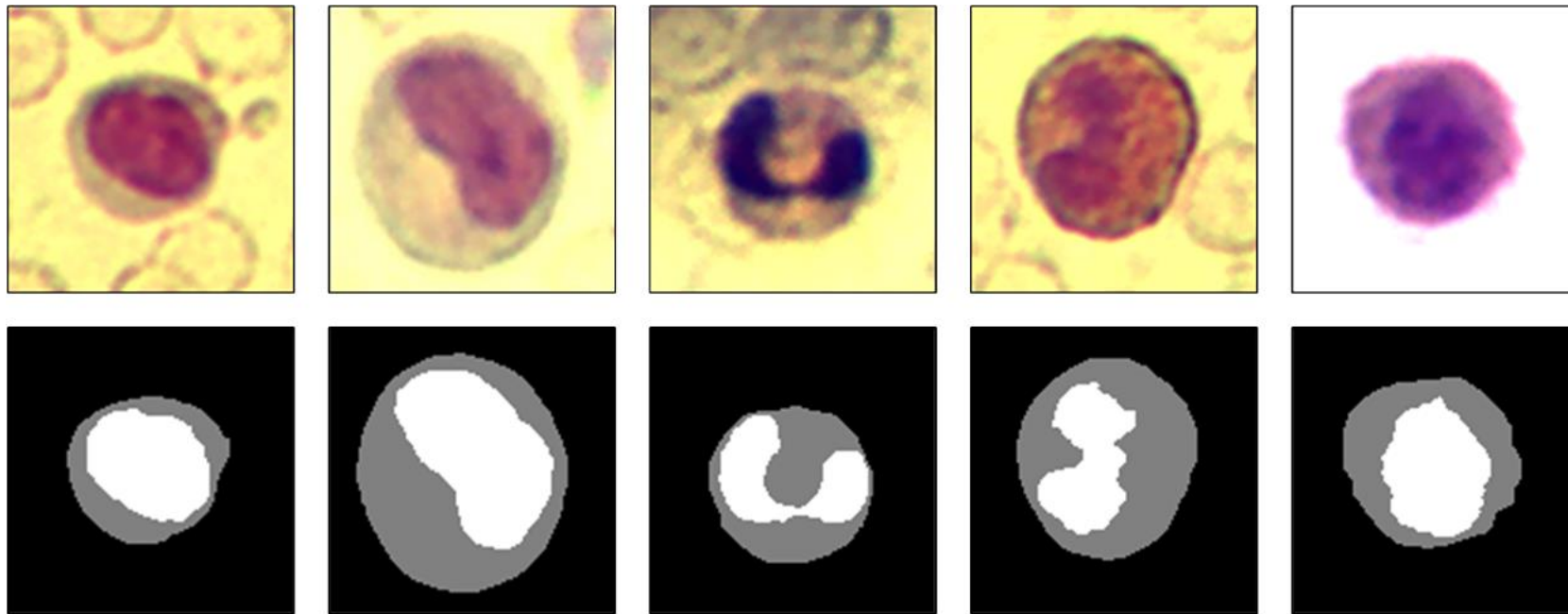
Cell detection



Cell detection



Cell segmentation



Lymphocyte

Monocyte

Neutrophil

Eosinophil

Basophil

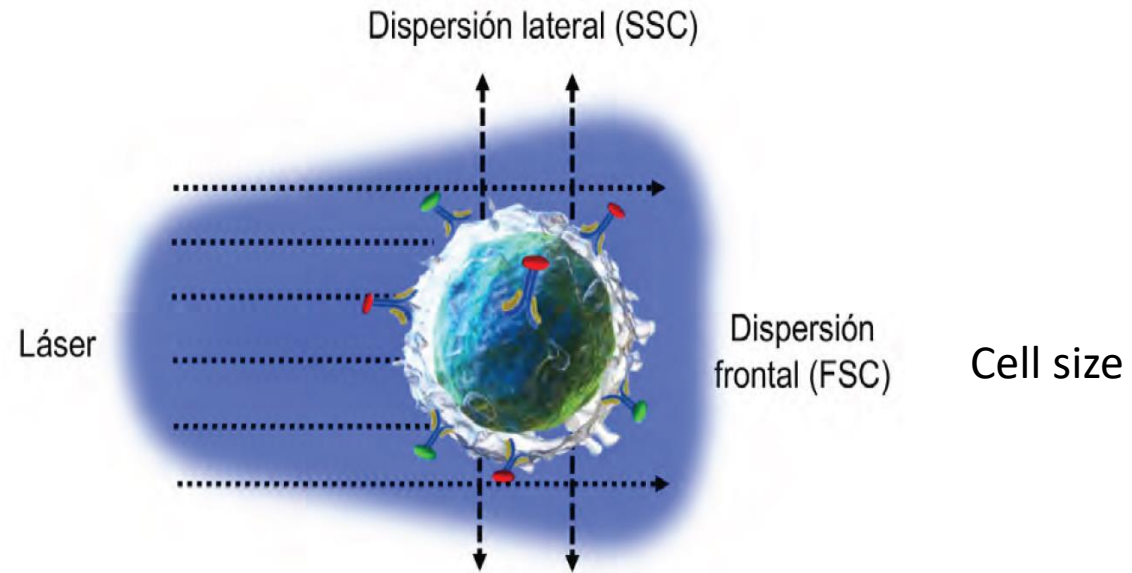
Cell classification

Non-Machine Learning approach

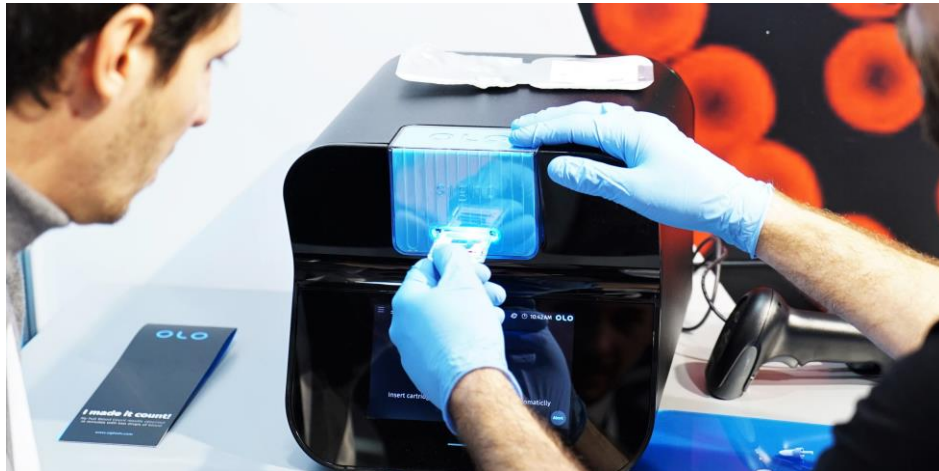
OLO Machine

Láser and fluorescent dye

Cell complexity (granularity)



Results comparisson



$\pm 12\%$



Conclusions

White blood cell classification using only Convolutional Neural Networks

References

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