CytoSPACE – Beyond the Blood Count

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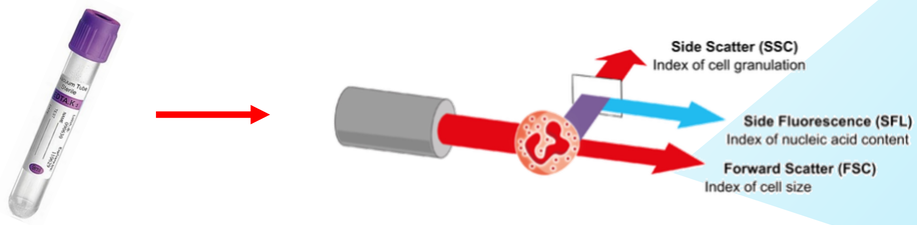
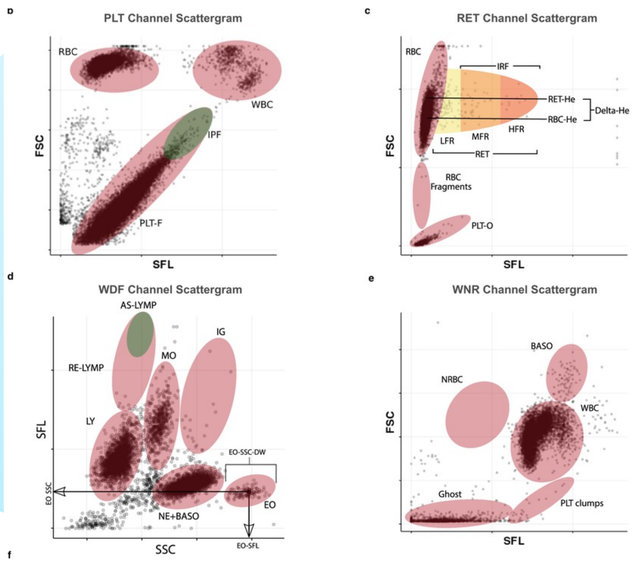
Is there more to the FBC?

Clinical FBC results are derived from spatial analysis of flow cytometry.





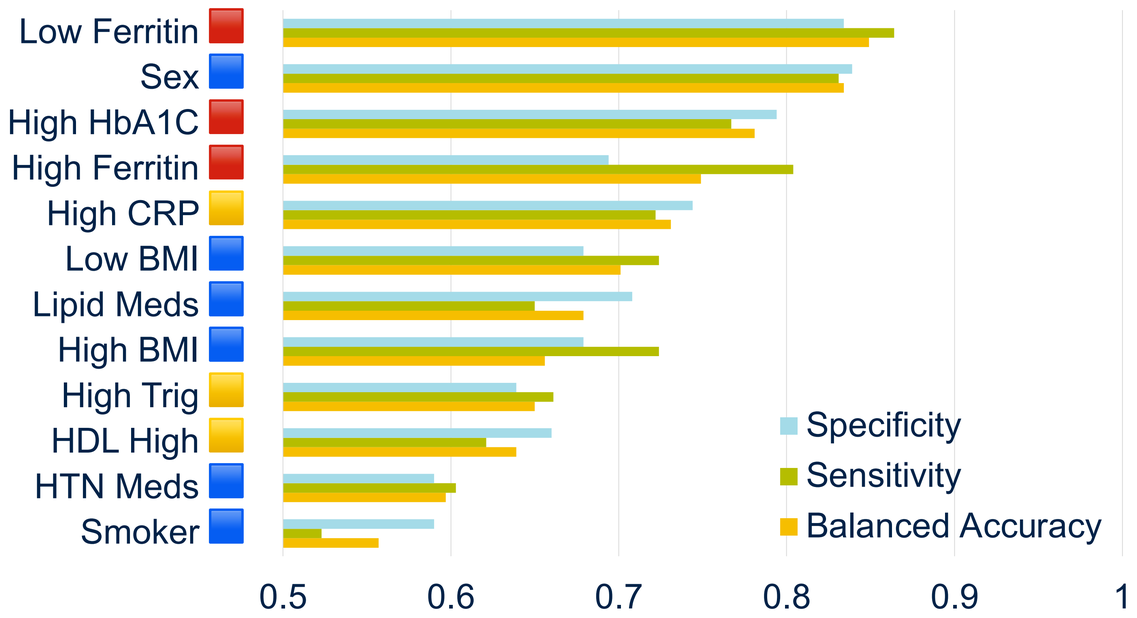
FULL BLOOD COUNT	
Haemoglobin (g/L)	116
MCV	93.6
HCT	0.334
White cell count	5.18
Neutrophils	1.97
Lymphocytes	1.59
Monocytes	1.49
Eosinophils	0.09
Basophils	0.04
Platelet count	316
MPV	11.0
MCH	32.5
MCHC (g/L)	347
Red cell count	3.57
RDW	14.6
XE Nucleated RBCs %	0.2
XE Nucleated RBCs abs	0.01

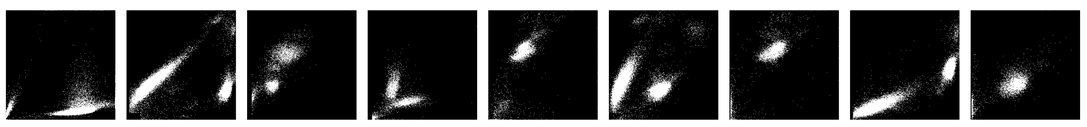
Adapted from Sysmex Corporation XN manual via Akbari et al Nature 2023

Each stage from sampling to analysis and derivation of reported parameters reduces data complexity. Can we learn more from data extracted earlier in this pipeline?

Reducing dimensionality

Spatial flow cytometry data encodes haematological, biochemical and biophysical outcomes



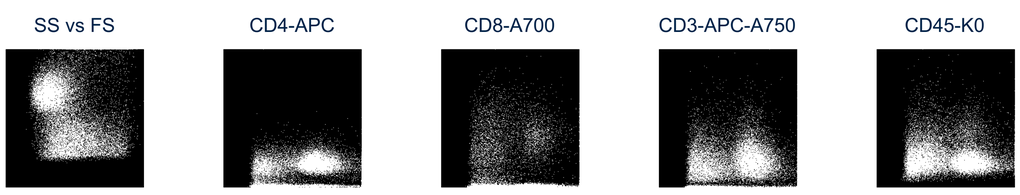


Tabular description of flow cytometry cell populations → **Basic Models**

Multichannel flow cytometry images → **Neural Networks**

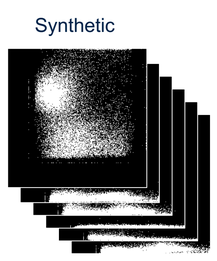
Dataset: COMPARE Study (NHS Blood and Transplant) **healthy** blood donors with biochemical and biophysical parameters collected. *n* samples = 25,278

The techniques can be applied to non-FBC cytometry: Long COVID

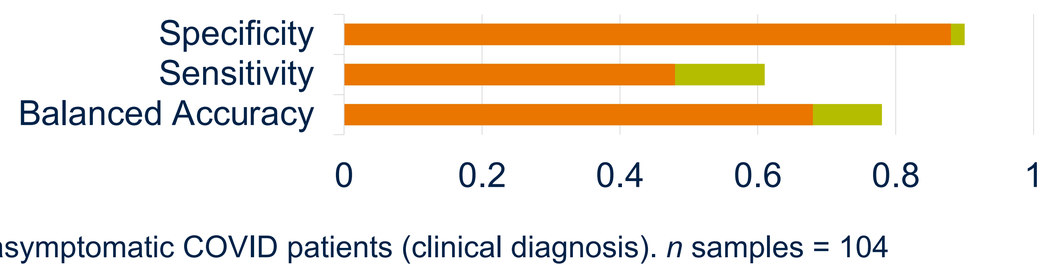


Transfer to other cytometry domains: cancer, immunology, infection and other sample types: CSF, urine

Augmentation with synthetic data improves model performance of imbalanced data sets



~ 15% improvement in performance



Dataset: UCLH Flow cytometry with additional cell surface markers for long and asymptomatic COVID patients (clinical diagnosis). *n* samples = 104

Next Steps: (+ +) × 10^6 = **clinical diagnoses, responses to treatment, patient outcomes and more?**

Extracurricular!

Lilly 111
Winner
NHS Hackday 2024
Medical disposition triaging chatbot

Empath.ai
Most Illuminating Concept
Google AI in Health Hackathon
Challenging communication simulator and trainer