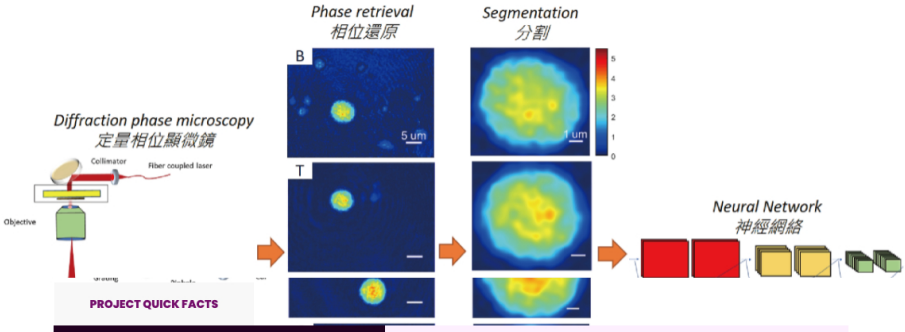
AI-enabled Portable Quantitative Phase Microscope for Blood Testing

#Screening #Deeplearning #2019



PROJECT QUICK FACTS

Principal Investigator

Prof. ZHOU Renjie

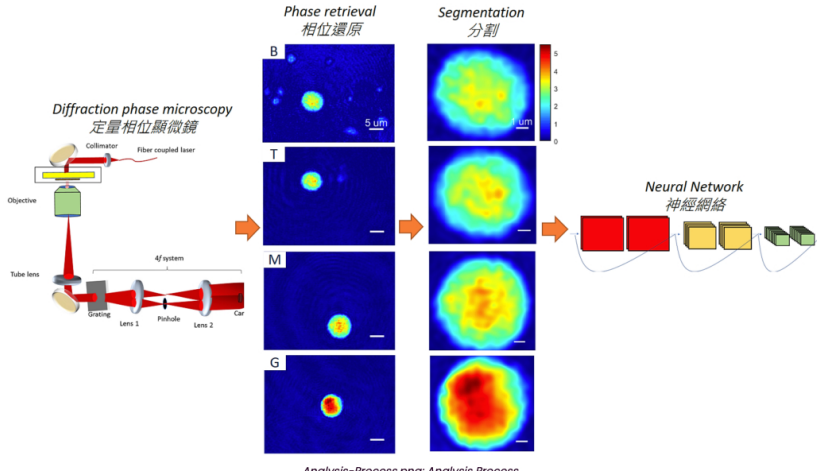
DEPARTMENT OF BIOMEDICAL ENGINEERING

- **Funding**
  Innovation and Technology Commission
- **Collaboration**
  Bay Jay Ray Technology Ltd.
- **Patent**
  1 US patent application

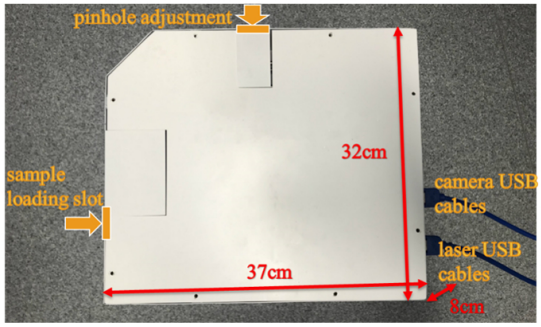
Through blood analysis, we can know the health condition in general. The increase or decrease in the number of immune-functioning leukocyte / white blood cell can reflect different diseases such as inflammation, infectious diseases and leukemia. Currently commonly used blood testing methods include manual observation on stained smears and fluorescence detection via flow cytometry, but the process is time consuming and labor intensive. Quantitative phase microscopy is a label-free imaging technology that has high imaging sensitivity and speed, but the instruments based on it are bulky and expensive. In order to provide high-precision blood testing technology in general clinics and underdeveloped areas, the CUHK team developed a low-cost artificial intelligent portable quantitative phase microscope to identify different types of human leukocytes based on quantitative phase imaging and deep learning. By learning the morphological features from thousands of cells in two-dimensional quantitative phase images, our learning model can distinguish monocytes, granulocytes, T-cells and B-cells from healthy volunteers' blood samples.

Uniqueness and Competitive Advantages:

- Low-cost
- High sensitivity (~ 1 nm)
- High range of lateral resolution (0.5 μm ~ 2 μm)
- High throughput (field of view 50 μm ~ 200 μm)
- High accuracy (92%)
- High speed (a few minutes to get analysis result)
- Compact in size and portable (37 × 32 × 8 cm with <5kg)
- Easy to use (label-free)
- Easily reconfigurable



Analysis-Process.png: Analysis Process



Prototype

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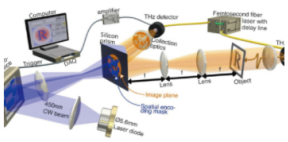

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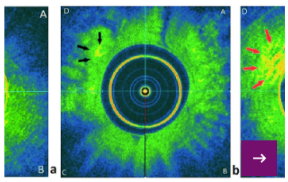

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