Supplementary Figure S1

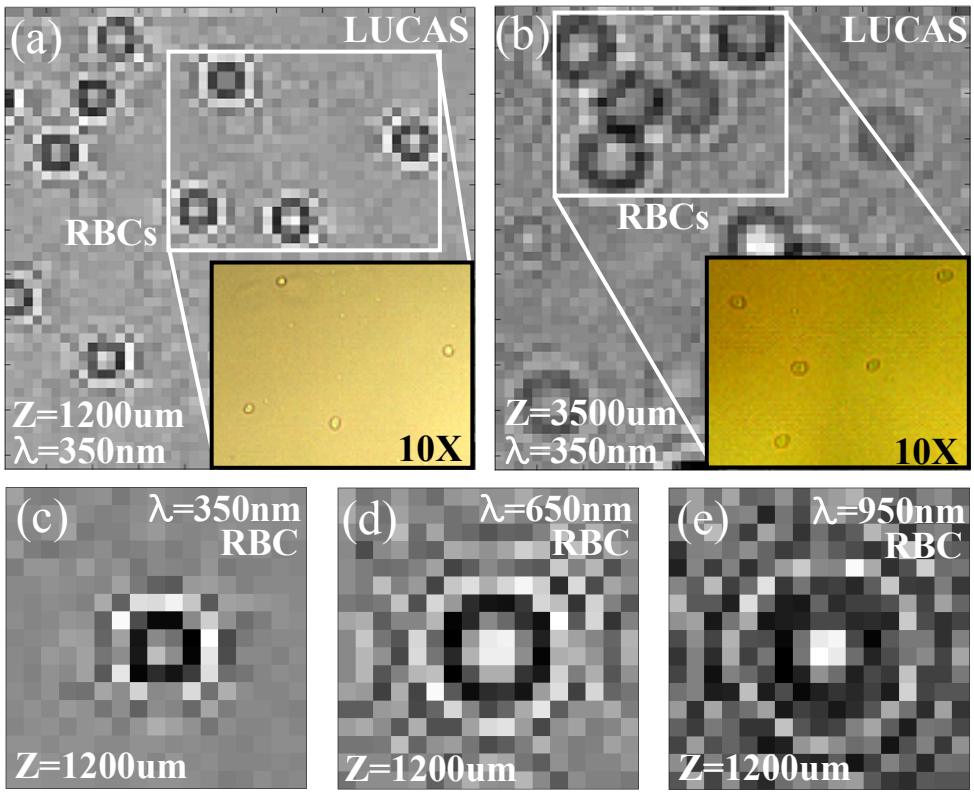


Figure S1. Summary of the conventional incoherent LUCAS technique (9 μm pixel size). (a) and (b) show the diffraction signature differences of human red blood cells (RBCs) as a function of sample-to-sensor distance (Z), i.e. (a) Z=1200μm and (b) Z=3500μm. Inset frame in each figure shows a matching 10X objective microscope image of the same field of view. (c-e) illustrate the effects of the illumination wavelength on the diffraction signature of RBCs such that (c) λ = 350nm, (d) λ = 650nm and (e) λ = 950nm.

Supplementary Figure S2

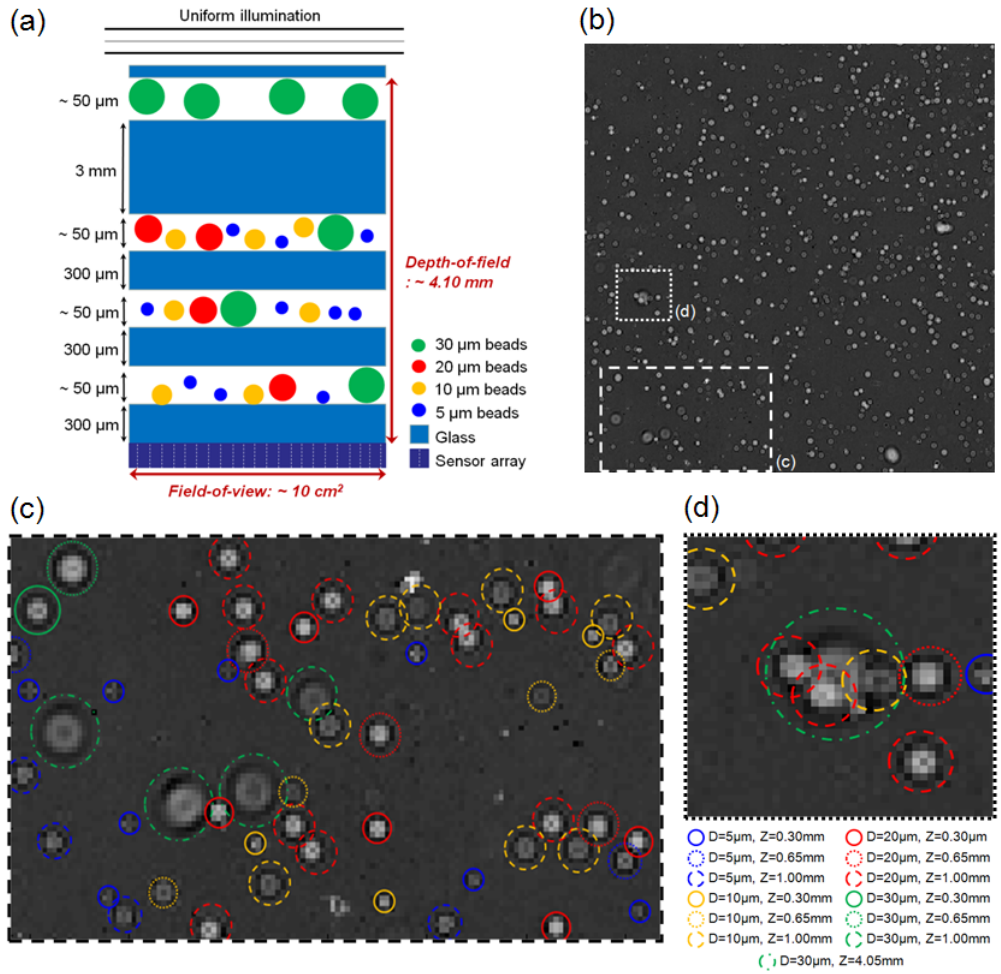


Figure S2. (a) A multi-layered object where various micro-particle types were all mixed with each other over a DOF of > 4mm and a FOV of ~ 10cm^2. (b) Conventional LUCAS image acquired for the object shown in (a). (c) Zoomed version of the LUCAS image taken from the marked frame in (b), showing various shadow signatures corresponding micro-beads of different diameters at different planes. (d) Zoomed version of the conventional LUCAS image taken from the marked frame in (b), showing that even overlapping shadow signatures may be identified individually by their unique patterns.

Supplementary Figure S3

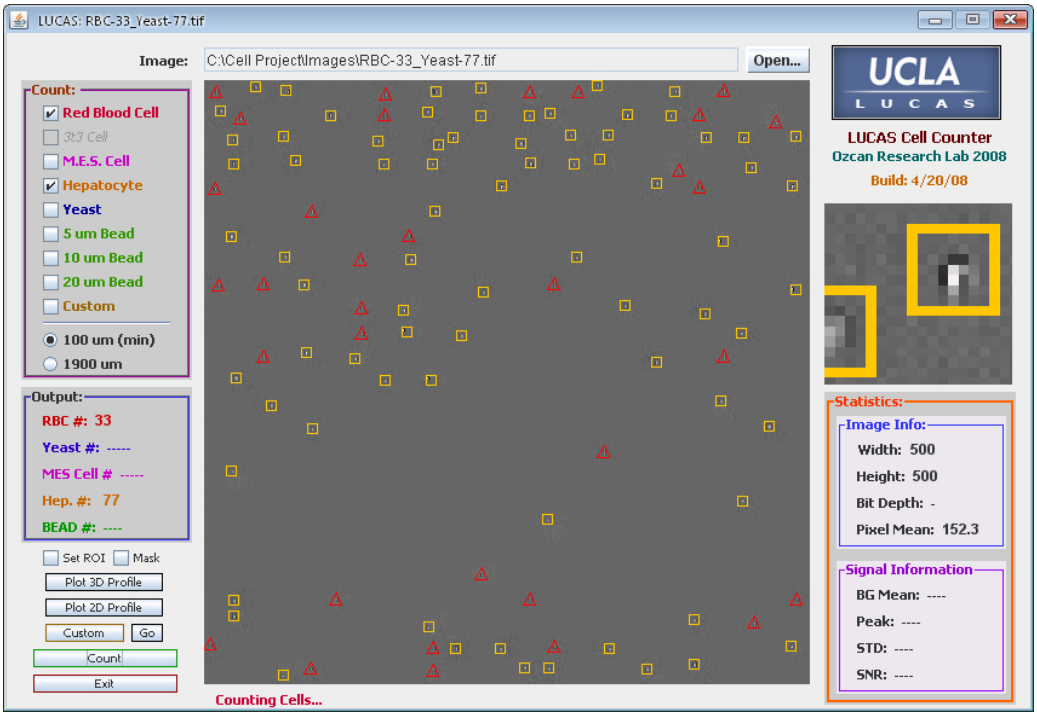
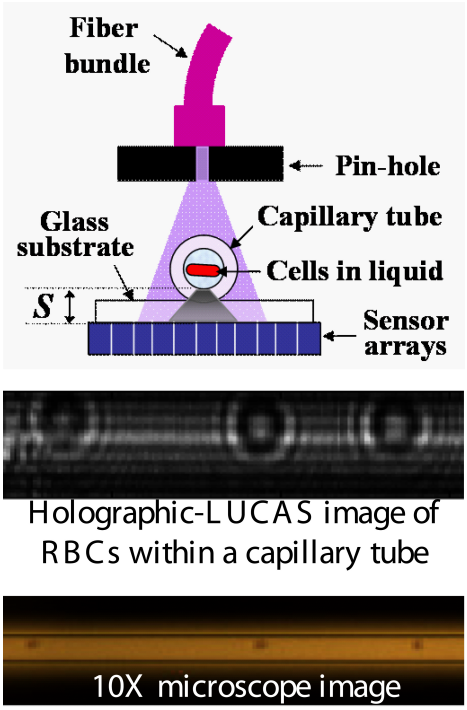


Figure S3. LUCAS image for a mixture of RBCs and hepatocytes is shown. The location and count of each RBC and hepatocyte are successfully detected by our custom developed decision algorithm. The red and yellow colours mark the location of RBCs and hepatocytes, respectively.

Supplementary Figure S4



5 **Figure S4.** (Top) Holographic-LUCAS set-up for lensfree on-chip imaging of cells within capillaries. (Middle) RBCs imaged through a 20um capillary tube using the set-up shown at the top. (Bottom) 10X objective-lens image of the same field of view is shown.