

# Supplementary data

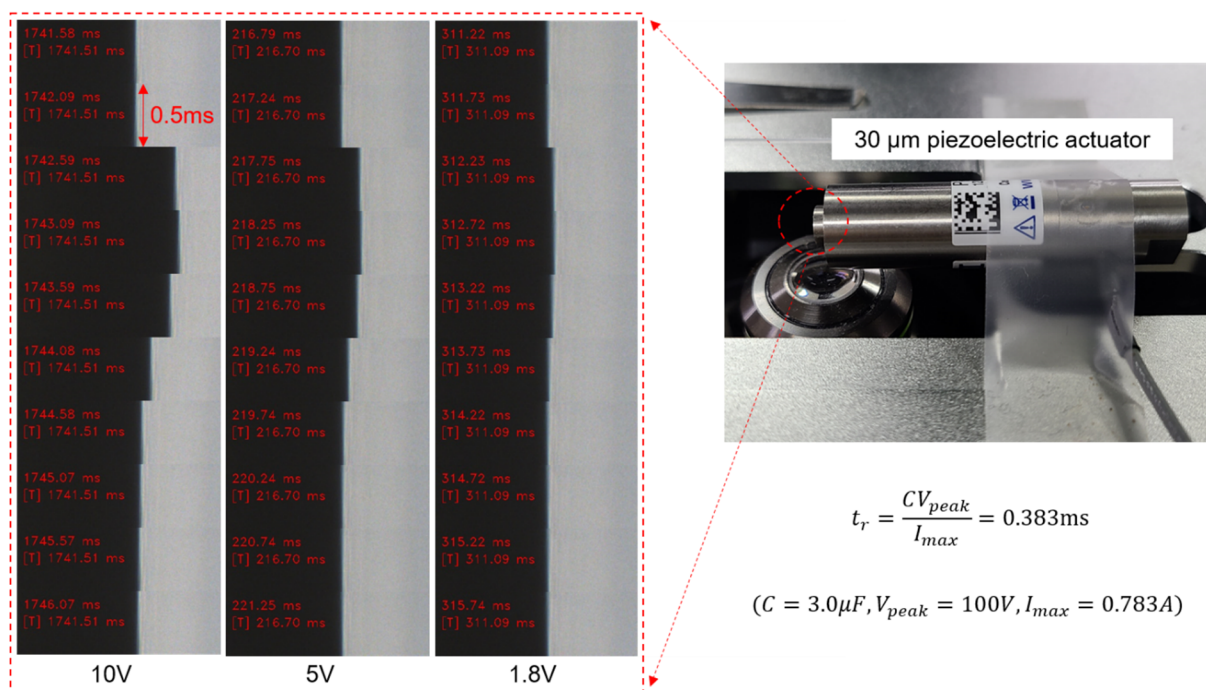
**Upgraded user-friendly image-activated microfluidic cell sorter using an optimized and fast deep learning algorithm**

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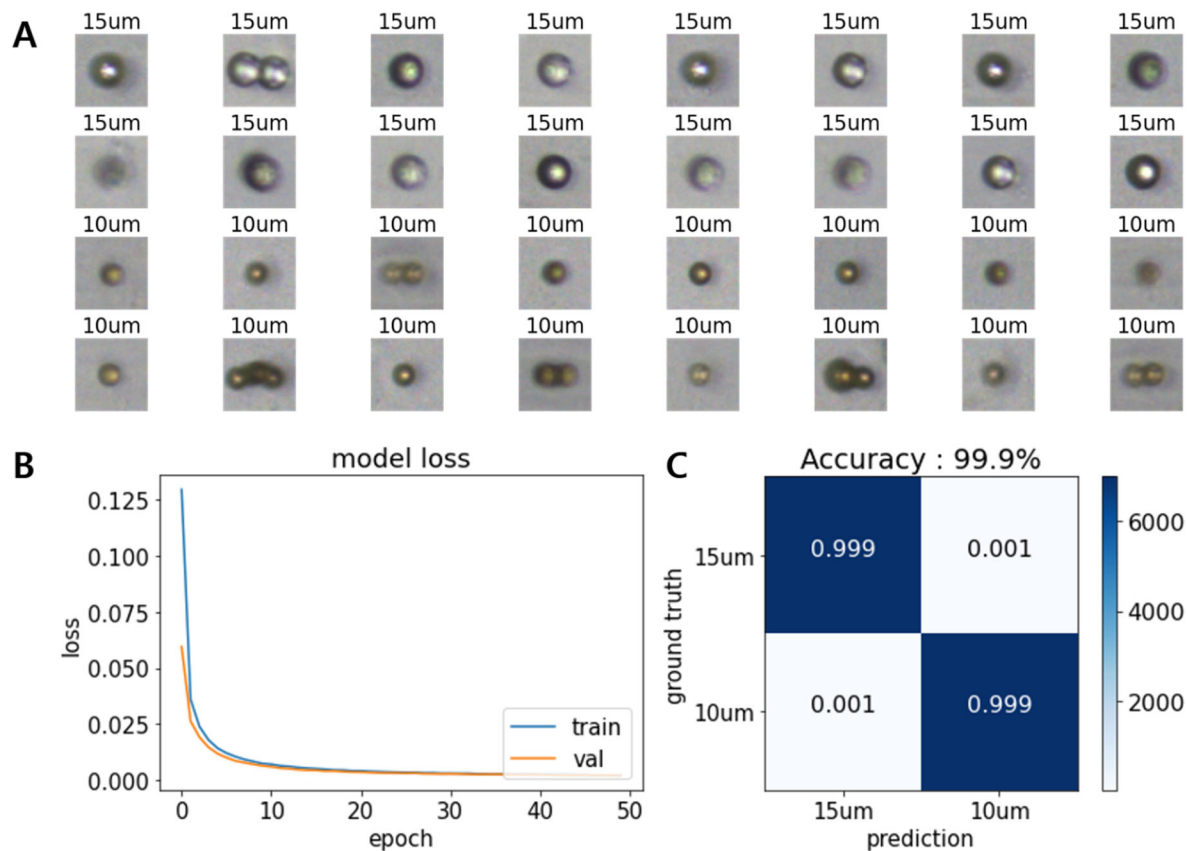
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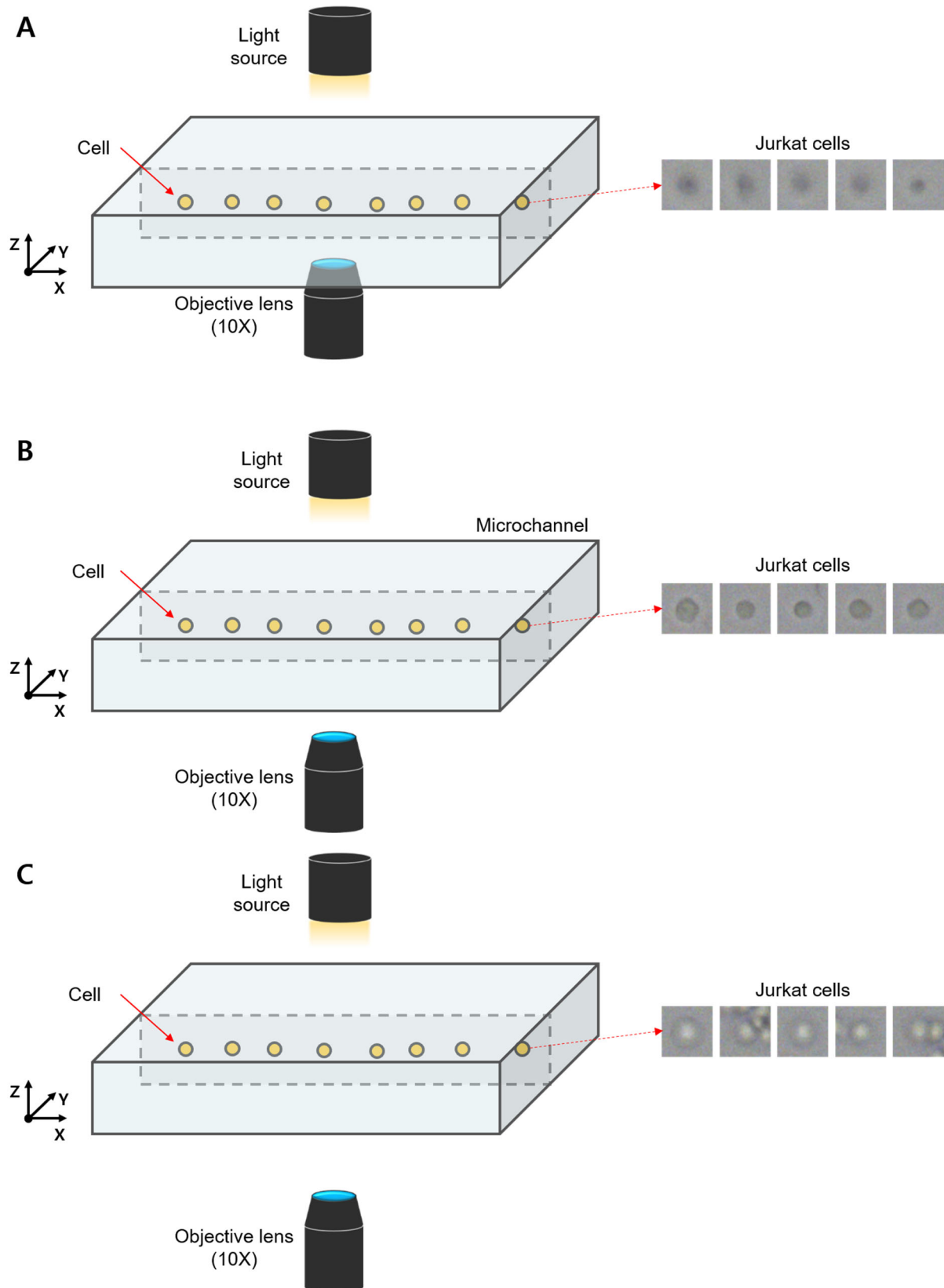
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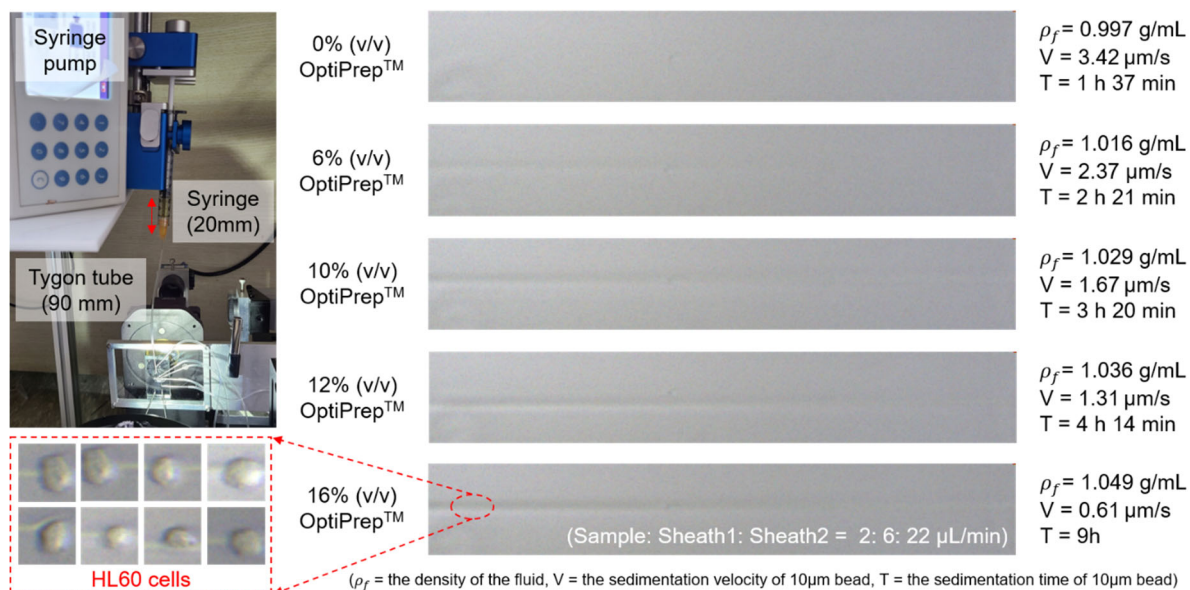
**Figure S1.** Microscopic images recorded at 2000 fps show how a 30  $\mu\text{m}$  piezoelectric actuator expands and contracts after a sorting signal. The calculated rising time of the 30  $\mu\text{m}$  piezoelectric actuator is 0.383 ms at 100V.



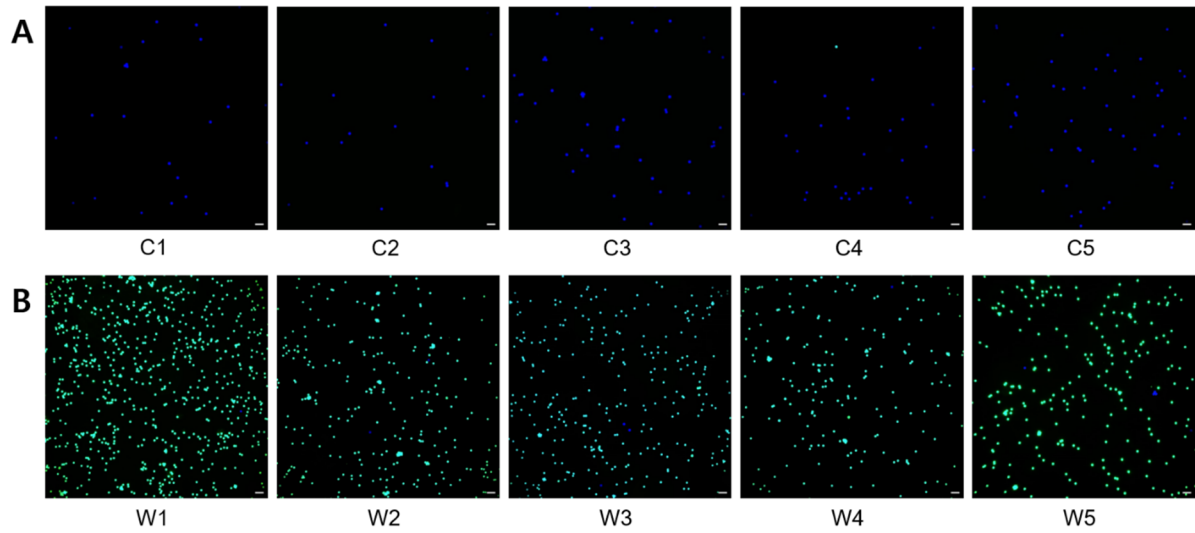
**Figure S2.** (A) Fluorescent bead images obtained using the upgraded user-friendly image-activated microfluidic cell sorter, (B) Training Learning Curve, (C) Confusion matrix on the test set. 56,000 images of fluorescent beads were trained by ResNet18 for 50 epochs.



**Figure S3.** (A) Out of focus (too close), (B) In focus, (C) Out of focus (too far)



**Figure S4.** Microscopic images of focused sample flow according to OptiPrep™ concentration. As the OptiPrep™ concentration increases, the focused stream is photographed together in the background of the cell image. When OptiPrep™ concentration is 0%, the 10  $\mu\text{m}$  beads sink into the inlet of the syringe, which takes about an hour and 37 minutes.



**Figure S5.** Fluorescence microscopy images of five consecutive bead sorting performed on the upgraded system (scale bar 100  $\mu\text{m}$ ). The blue and green dots indicate 15  $\mu\text{m}$  and 10  $\mu\text{m}$  beads, respectively. (A) Collection channel (Post-sorting), (B) Waste channel.

**Table S1.** Ratios of 15  $\mu\text{m}$  and 10  $\mu\text{m}$  beads in collection and waste outlets. The results in this table were evaluated by manually counting the dots with a fluorescence microscope.

	15 $\mu\text{m}$ (Blue)	10 $\mu\text{m}$ (Green)		15 $\mu\text{m}$ (Blue)	10 $\mu\text{m}$ (Green)
C1	99.7%	0.3%	W1	0.2%	99.8%
C2	100.0%	0.0%	W2	0.1%	99.9%
C3	98.5%	1.5%	W3	0.5%	99.5%
C4	99.2%	0.8%	W4	0.5%	99.5%
C5	99.7%	0.3%	W5	2.9%	97.1%
Pre-sorting ratio	14.9%	85.1%			