Electronic Supplementary Material (ESI) for Soft Matter.

Using Machine Learning to Discover Shape Descriptors for Predicting Emulsion Stability in a Microfluidic Channel

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ELECTRONIC SUPPLEMENTARY INFORMATION

Figure S1. Detailed architecture of our machine learning model combining the autoencoder and drop outcome classifier.

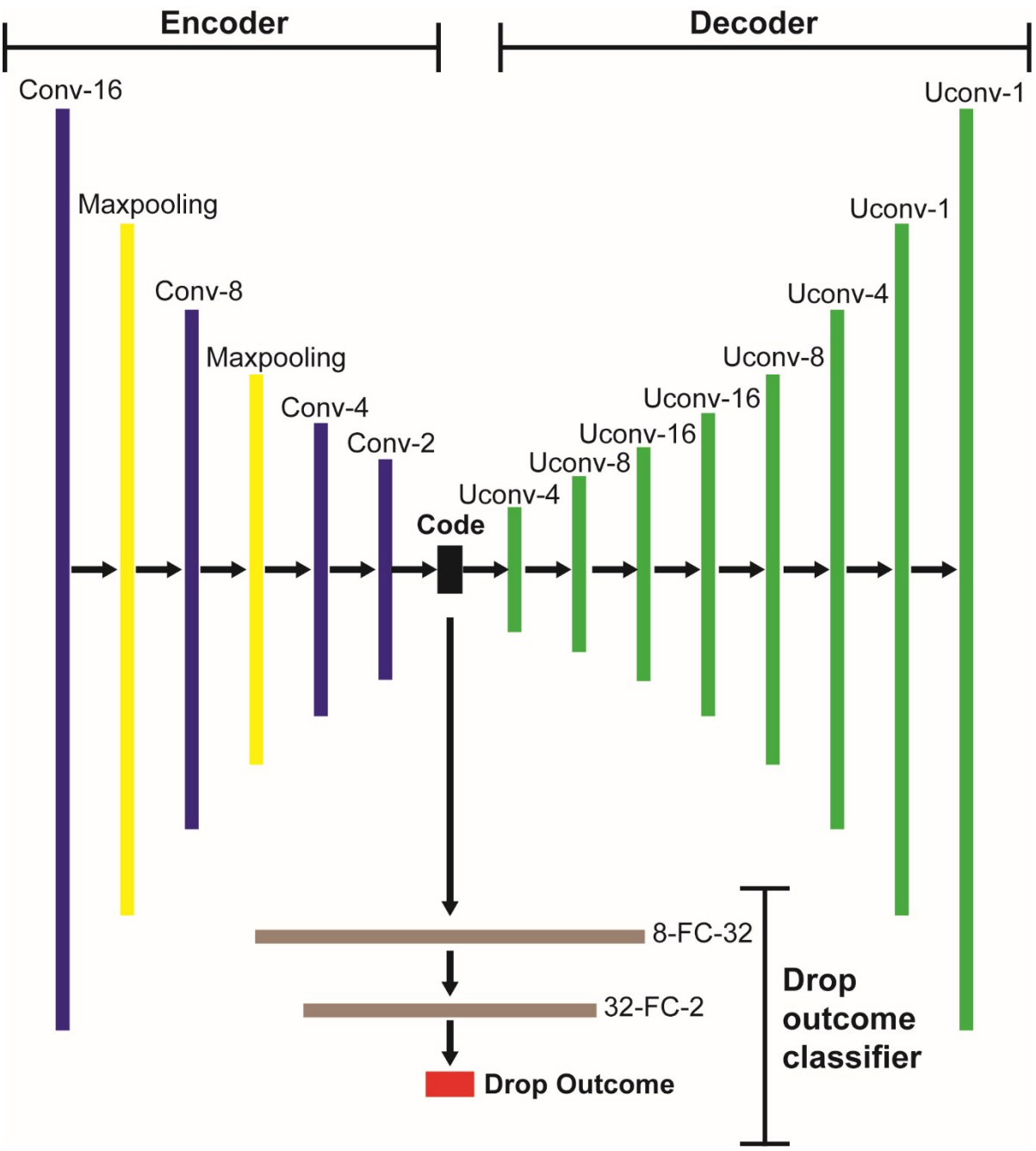

Figure S2. Image overlay (black) of input images (red) and reconstructed images (green). Left: Representative images when the model is trained with two-phase training paradigm. Right: Representative images when the model is trained with single-phase training paradigm to minimize combined loss only.

Table S1. Prediction accuracy and confusion matrix of model trained with single-phase training paradigm to minimize combined loss only.

Prediction accuracy (%)	**True intact**	**False intact**	**True break**	**False break**
89.6	901	122	890	87

Figure S3. A. MSE loss (blue line) and combined loss (red line) as a function of training epoch. **B.** Combined loss for learning rate = 0.001 (red line) and learning rate = 0.010 (blue line). The quality of image reconstruction is also presented.

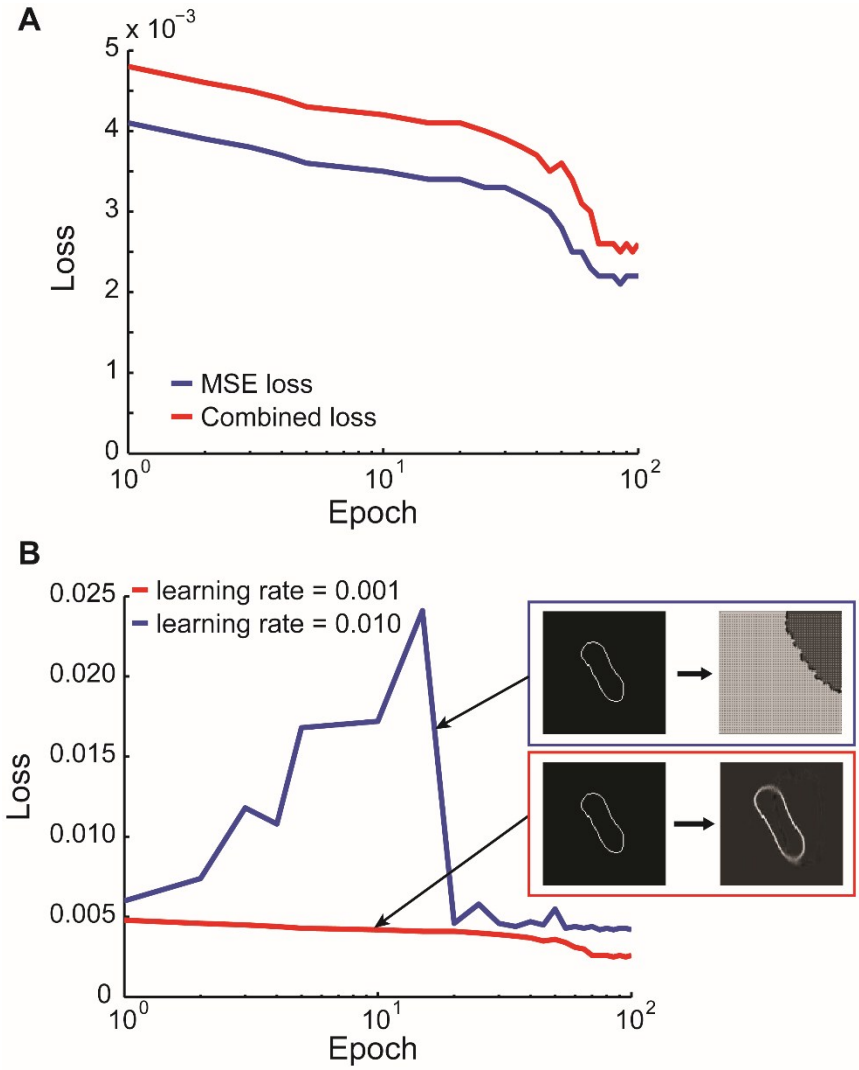

Figure S4. Frequency of occurrence of drop shapes as measured by scalar shape descriptors **A.** SS_1, **B.** SS_2, and **C.** SS_3, respectively. The threshold of break-up prediction is indicated by the green lines (see section 2.4 for details).