ACCSCIENCE PUBLISHING

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RESEARCH ARTICLE

Rheology-informed hierarchical machine learning model for the prediction of printing resolution in extrusion-based bioprinting

Supplementary File

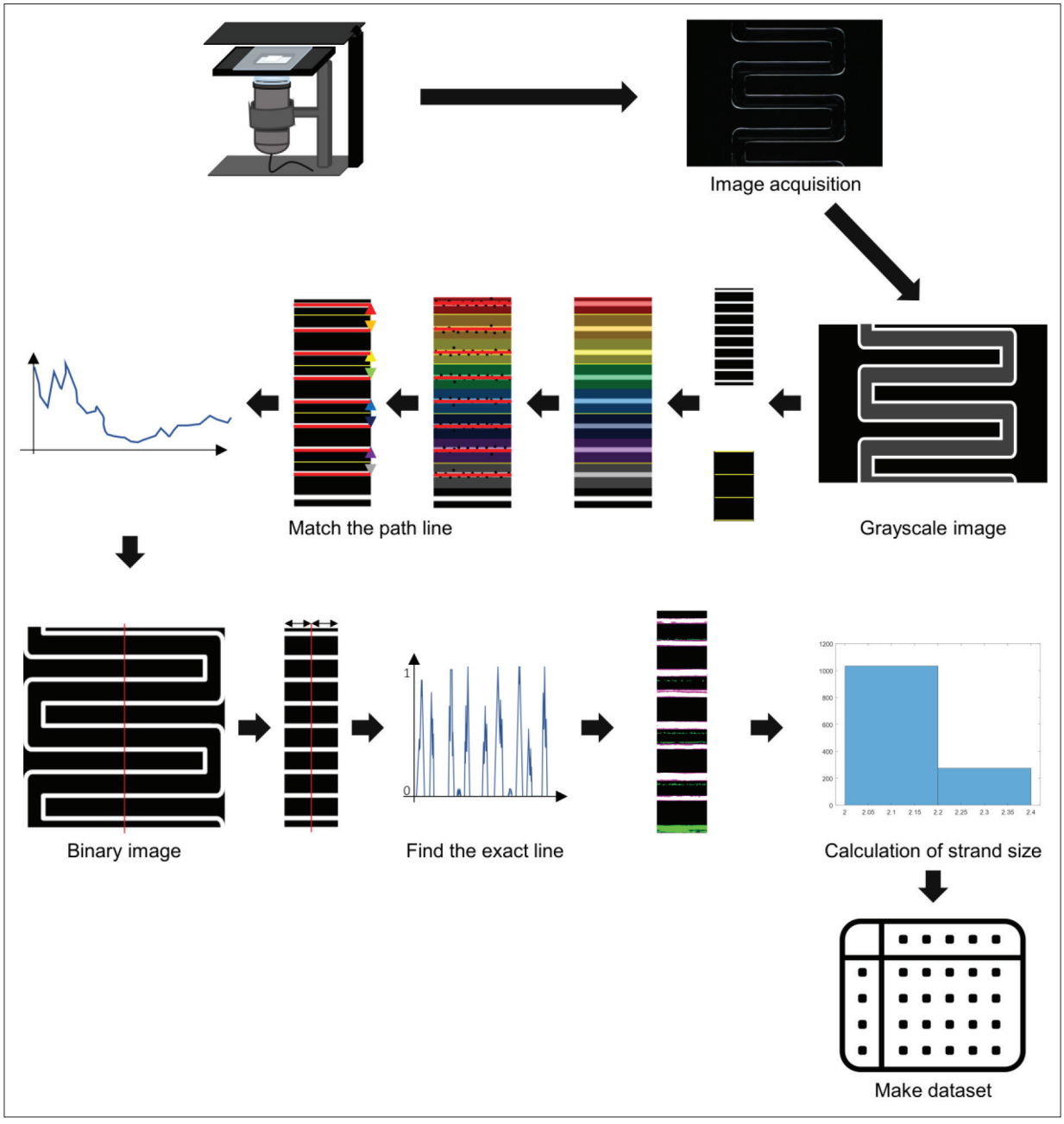

Figure S1. Scheme of the strand size measuring algorithm.

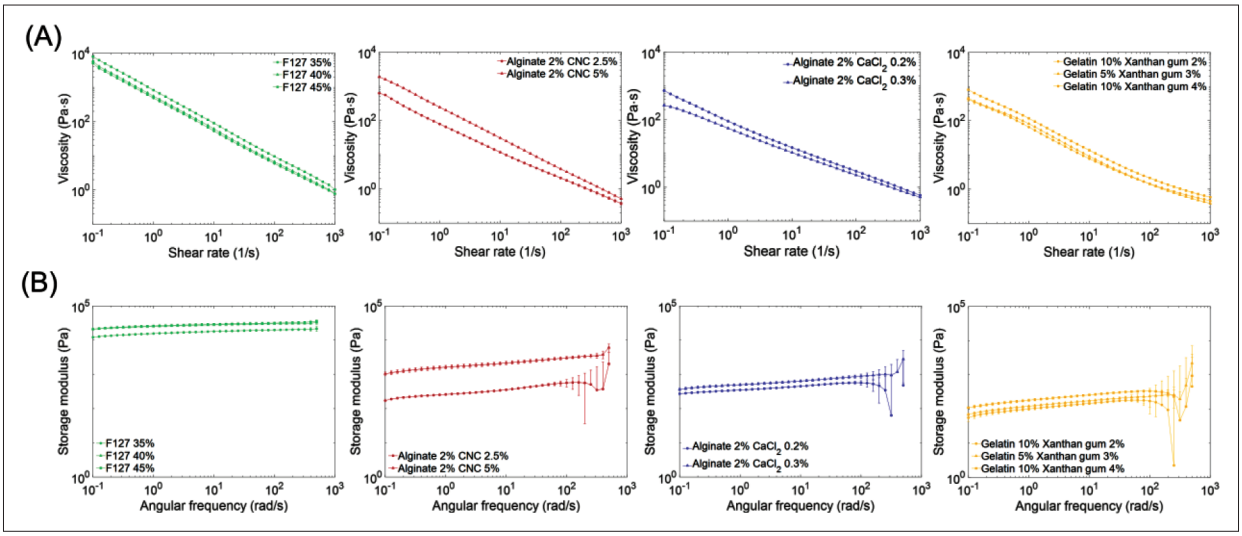

Figure S2. (A) Viscosity and (b) storage modulus separated with ink composition.

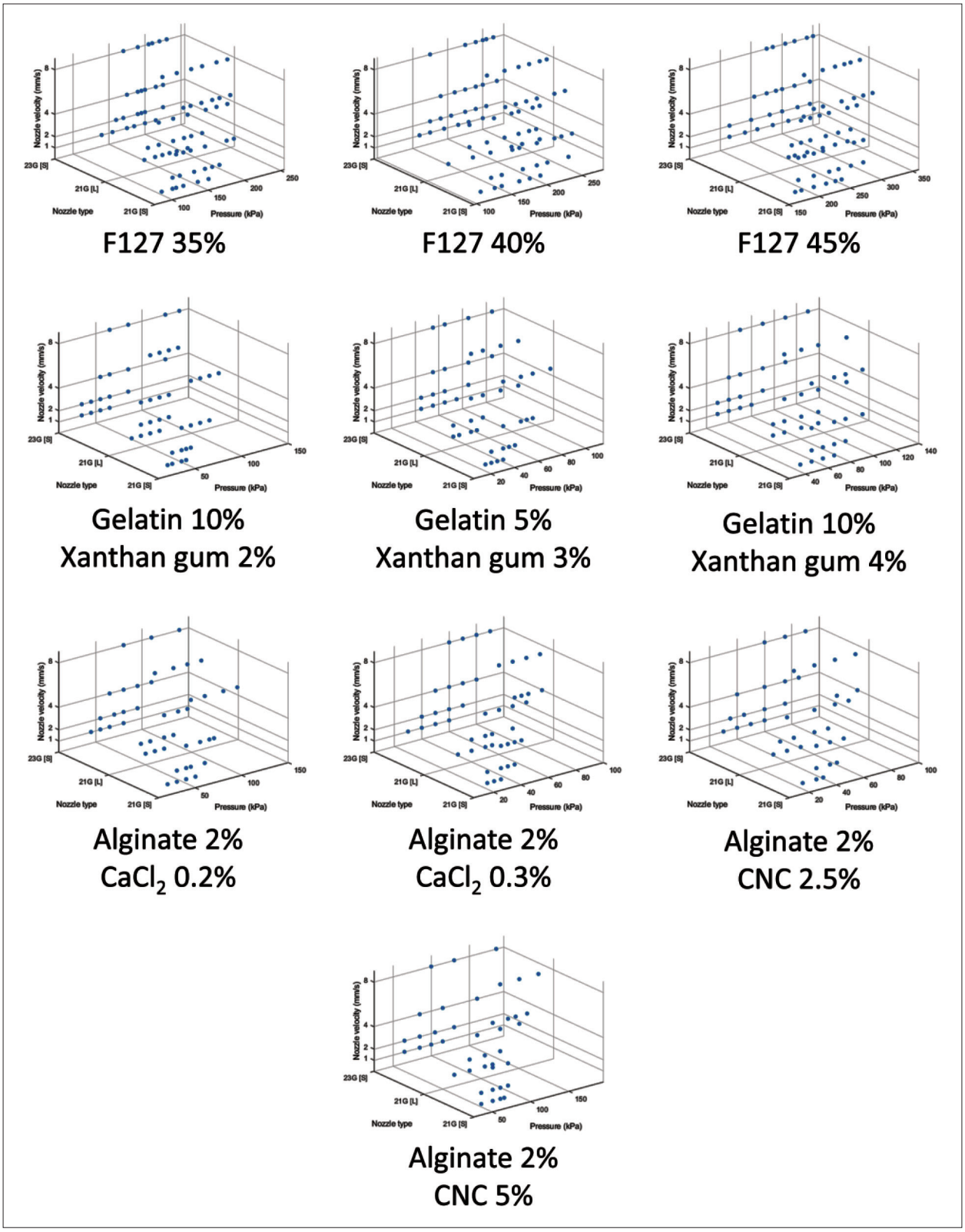

Figure S3. Graphs of the collected data with printing parameters (nozzle type, pressure, and nozzle velocity) for each bioink composition.

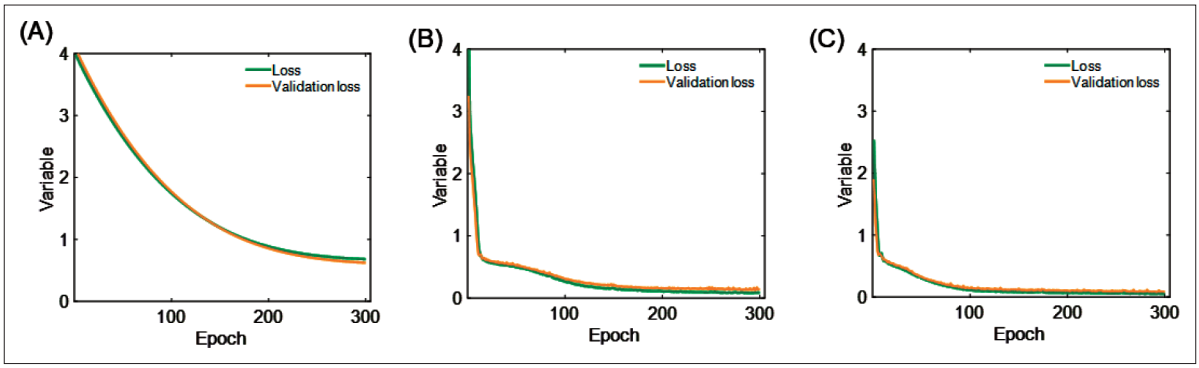

Figure S4. The learning curve to estimate the learning performance of (A) parameter-dependent model, (B) concentration-dependent model, and (C) rheology-informed hierarchical model.

Table S1. The number of training, validation, testing, and prediction data according to prediction variables

Type	Prediction variable		Training dataset			Prediction dataset
			Training set	Validation set	Test set	Prediction set
Printing parameter	Nozzle velocity (mm/s)	1	204	68	68	112
		2	202	68	68	114
		4	203	68	68	113
		8	203	68	68	113
	Pressure (kPa)	50	264	88	88	12
		70	260	87	87	18
		90	267	89	89	7
		110	267	90	89	6
		130	268	90	90	4
Concentration	F127 (%)	35	228	76	76	72
		40	228	76	76	72
		45	228	76	76	72
	Gelatin/XG (%)	10/2	241	81	81	49
		5/3	243	81	81	47
		10/4	242	81	81	48
	Alginate/$CaCl_2$ (%)	2/0.2	243	82	82	45
		2/0.3	243	81	81	47
Composition	Alginate/CNC (%)	2/2.5	270	91	91	44
		2/5	270	91	91	41

Abbreviations: CNC, cellulose nanocrystal; XG, xanthan gum.