

Harnessing Machine Learning for Chicken Meat Quality Evaluation Using Curcumin-loaded Methylcellulose Intelligent Films

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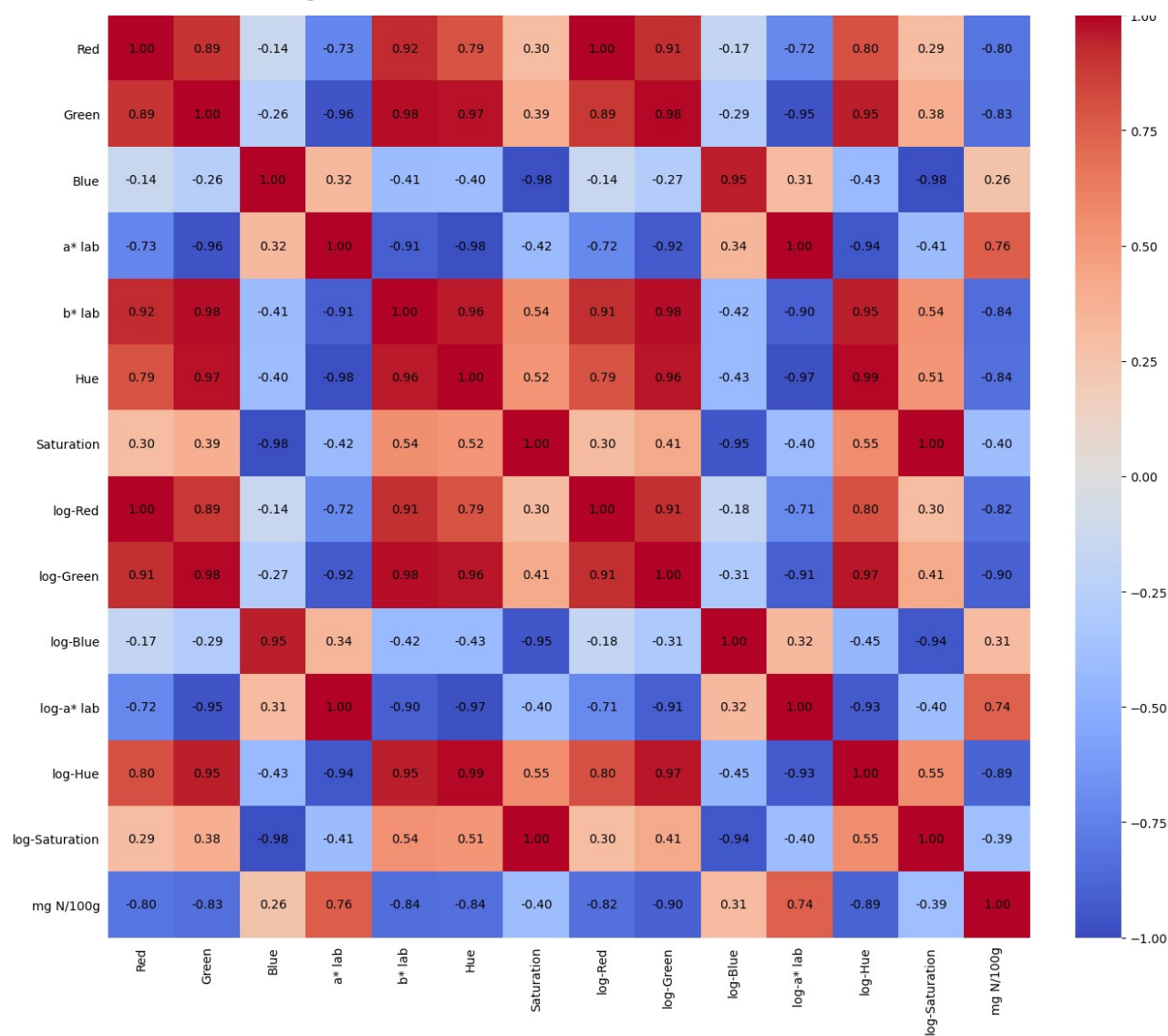


Fig. S1 Correlation matrix of extracted features from the images used for ML model training.

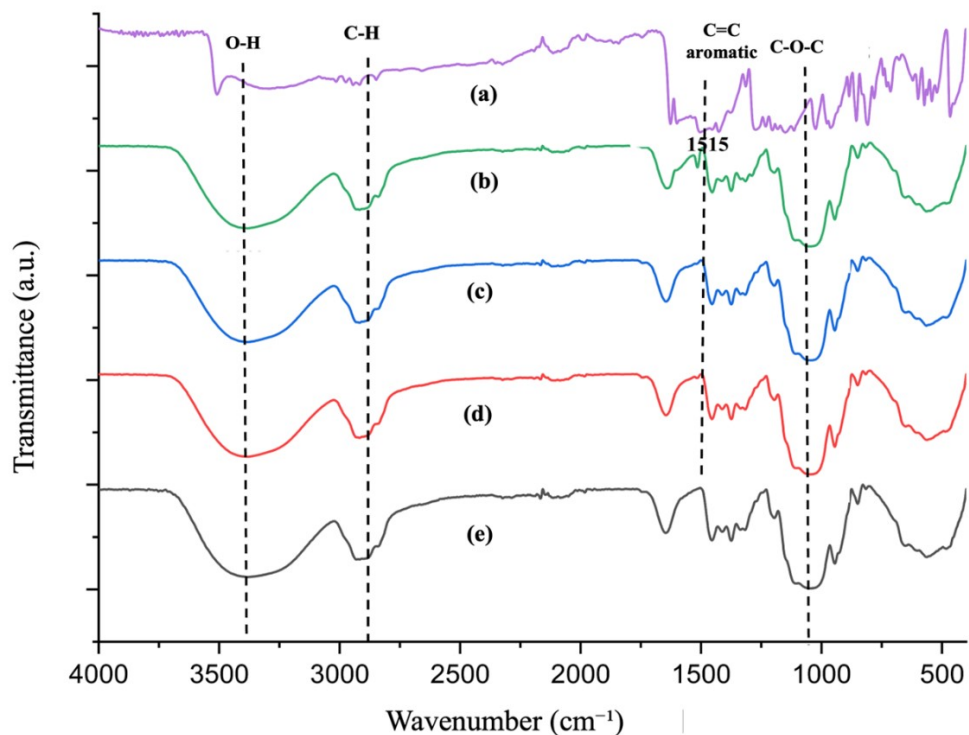


Fig. S2 ATR-FTIR spectra of (a) Cur powder, (b) MC/3.0% Cur, (c) MC/1.0% Cur, (d) MC/0.5% Cur, and (e) neat MC films.

Table S1 Classification model analysis.

Models	Best Parameters	Accuracy (%)	Mean 10-fold Cross-Validated Accuracy (%)
Logistic Regression	C: 1, Solver: liblinear	90.1	88.6±2.0
SVC	C: 10, Kernel: RBF	96.0	95.0±2.3
Decision Tree	Max depth: 10, Min samples split: 2	96.4	95.5±1.5
ANN	Activation: ReLU, Hidden layers: (50, 50), Alpha: 0.01, Max iter: 3000, Solver: Adam, Learning rate: constant	96.5	96.3±1.1

Table S2 Regression model analysis.

Models	Best Parameters	RMSE (mg N/100g)	R²	Mean 10-fold Cross-Validated R²
ANN	Activation: ReLU, Alpha: 0.01, Hidden layer sizes: (50, 50), Learning rate: constant, Max iter: 3000, Solver: Adam	1.991	0.928	0.940±0.016
SVR	C: 100, Gamma: scale, Kernel: RBF	1.981	0.928	0.939±0.019
Linear Regression	Default parameters used	3.665	0.755	0.794±0.03

Table S3 Hyperparameters of ANN models.

Parameters	Regression ANN (MLPRegressor)	Classification ANN (MLPClassifier)
Input features	3 (log-Hue, Saturation, b* Lab)	3 (log-Hue, Saturation, b* Lab)
Hidden layers	(50, 50) – two layers, 50 neurons each	(50, 50) – two layers, 50 neurons each
Activation	ReLU	ReLU
Solver	Adam	Adam
Alpha	0.01	0.01
Learning rate	Constant	Constant
Max iterations	3000	3000
Random state	42	42
Output neurons	1 (continuous value: mg N/100g)	3 classes (freshness categories)
Output activation	Linear	Softmax