Supplementary Table S3. Repeated nested cross-validation performance of multifeature classifiers using selected gradient-derived features.

Classifier	ACC	AUC	AUC 95% CI	Sens	Spec	F1	Precision
LightGBM	0.809 ± 0.137	0.876 ± 0.129	0.851–0.902	0.774 ± 0.233	0.835 ± 0.173	0.770 ± 0.179	0.818 ± 0.185
Logistic Regression	0.833 ± 0.133	0.930 ± 0.098	0.911–0.950	0.785 ± 0.238	0.868 ± 0.161	0.790 ± 0.199	0.833 ± 0.212
Random Forest	0.771 ± 0.140	0.890 ± 0.114	0.867–0.913	0.727 ± 0.252	0.806 ± 0.198	0.722 ± 0.209	0.767 ± 0.244
SVM	0.754 ± 0.136	0.894 ± 0.111	0.872–0.916	0.636 ± 0.312	0.850 ± 0.185	0.654 ± 0.256	0.773 ± 0.285
XGBoost	0.800 ± 0.142	0.883 ± 0.126	0.858–0.908	0.755 ± 0.242	0.831 ± 0.181	0.756 ± 0.199	0.805 ± 0.223

Values are reported as mean ± standard deviation across 100 outer evaluations from 10 repeats of nested 10-fold cross-validation. The AUC 95% CI is a fold-level confidence interval and should be interpreted descriptively because repeated folds are not fully independent.