

Electric bioimpedance sensing for the detection of head and neck squamous cell carcinoma: a preliminary feasibility study

Supplementary Material

Supplementary Figures

Figure S1: The SmartProbe system Graphic User Interface (GUI) showing A) a system status window; B) a polar plot with a red dot indicating the impedance value measured at 100 KHz; C) system mode selection buttons; D₁) optional “note” field and D₂) two obligatory information fields to be filled for every patient; E) multiple-choice menus to select the calibration method and the tissues characteristics.

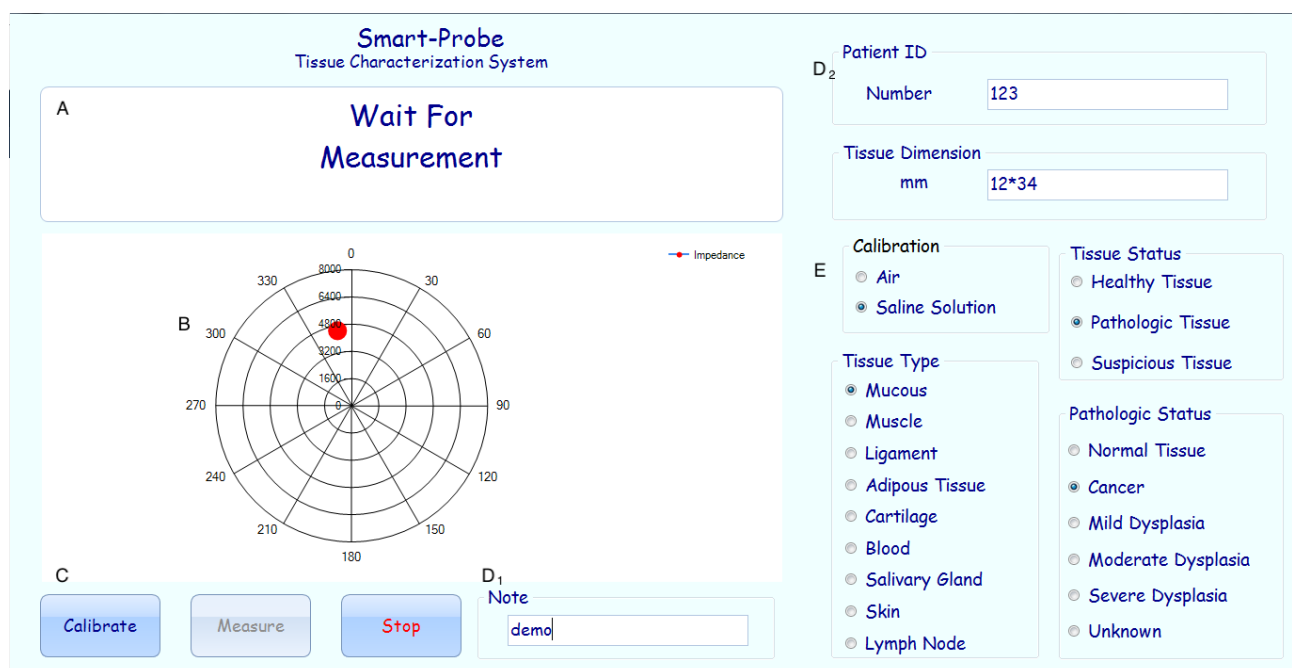


Figure S2: Bode plots for each tissue type. In red are represented the results of the pathological samples and in green the healthy ones.

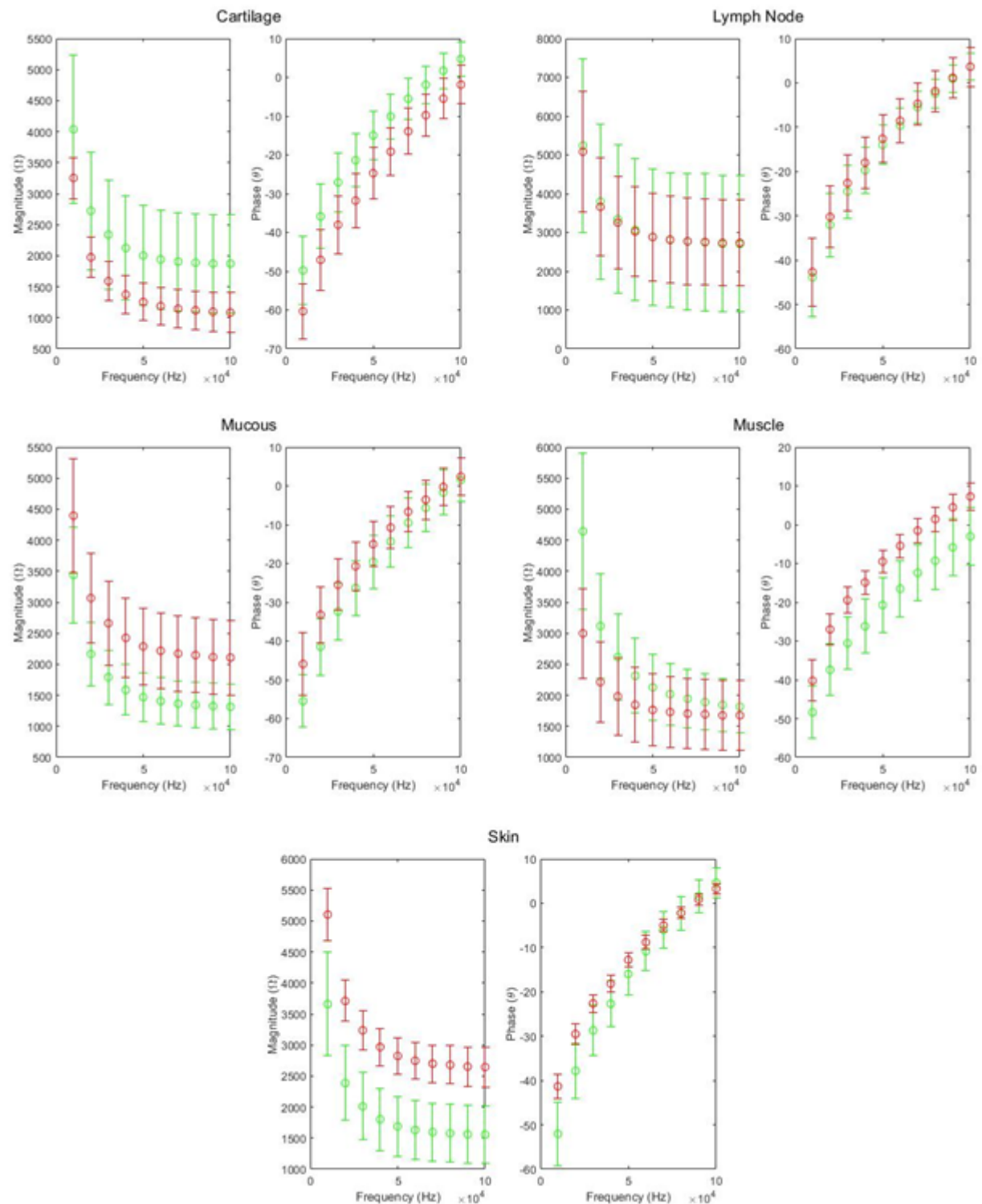


Table S1: Performance metrics of tissue-specific classifiers based on 10 kHz impedance values from the overall patient population (with 5-fold cross-validation). Legend: SVM, support vector machine; F1, F1 score; MCC, Matthew's Correlation Coefficient; AUC, Area under the ROC Curve.

Method	Type	Mucosa	Lymph Node	Muscle	Cartilage	Skin
SVM	Sensitivity	0.85	0.73	0.78	0.92	0.89
	Specificity	0.78	0.50	0.96	1.00	0.95
	Accuracy	0.83	0.64	0.87	0.99	0.92
	F1	0.88	0.70	0.85	0.96	0.93
	MCC	0.59	0.24	0.75	0.95	0.83
	AUC	0.87	0.67	0.95	1.00	0.99
XGBoost	Sensitivity	0.89	0.74	0.92	0.67	0.96
	Specificity	0.77	0.51	0.91	0.93	0.95
	Accuracy	0.85	0.66	0.91	0.88	0.96
	F1	0.89	0.73	0.89	0.67	0.96
	MCC	0.66	0.25	0.82	0.59	0.91
	AUC	0.83	0.62	0.91	0.80	0.96
Random Forest	Sensitivity	0.90	0.72	0.93	0.75	0.93
	Specificity	0.74	0.51	0.90	0.94	1.00
	Accuracy	0.85	0.64	0.91	0.91	0.96
	F1	0.89	0.72	0.88	0.75	0.96
	MCC	0.65	0.22	0.81	0.69	0.92
	AUC	0.87	0.70	0.97	0.94	0.96