Breast Mass Analyzer (BMA)

Ultrasound tool supporting characterization and diagnosis of suspicious breast masses.

- Support characterization of suspicious breast masses
- Support clinical decision on suspicious cases
- Reduce the number of unnecessary biopsies

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We make Complexity Easy and Explainable

1. BMA analyses the contoured mass in seconds and automatically extracts US morphological and pattern descriptors associated to malignancy/benignancy predictors aligned with BI-RADS® lexicon.

2. The system shows instantly the findings and the diagnostic category of the mass on display and link to our Breast Interactive Workflow – Report.

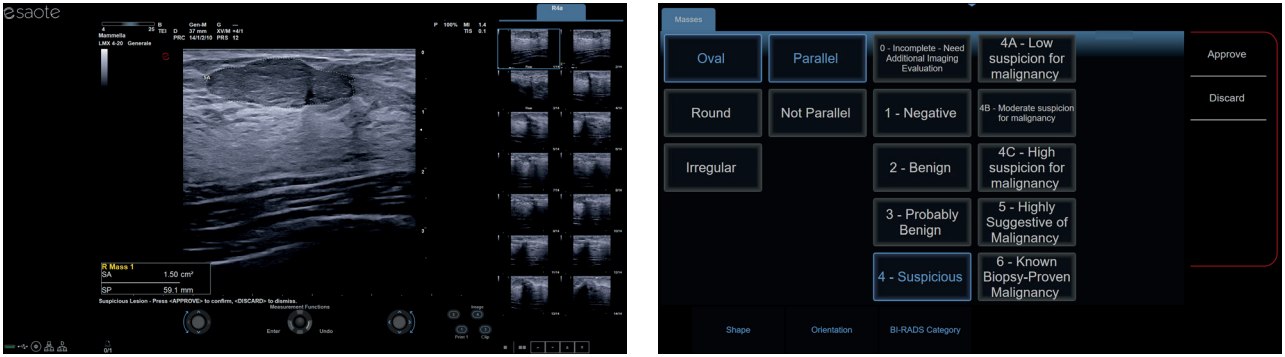
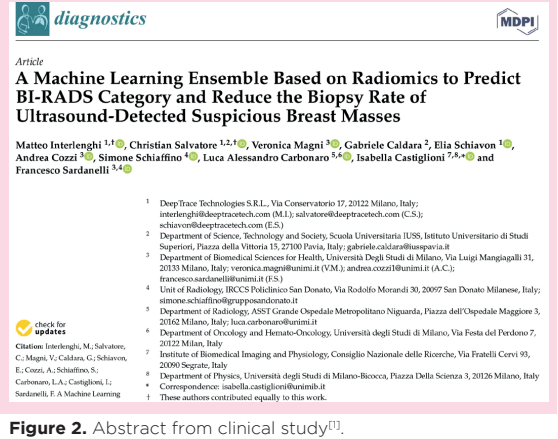


Figure 1. BMA procedure: Mass processing & BI-RADS® categorization.

Validated on more than 800 patients in published clinical study[1].

- Improve specificity and positive predictive value of radiologist
- Potential to reduce biopsy rate of histopathology-confirmed benign lesions more than 15%
- Inter-intra observer agreement of 92-96%



diagnostics

MDPI

Article

A Machine Learning Ensemble Based on Radiomics to Predict BI-RADS Category and Reduce the Biopsy Rate of Ultrasound-Detected Suspicious Breast Masses

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check for updates

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Figure 2. Abstract from clinical study[1].

Table 1. Histopathology of the 834 breast masses included in the study.

Malignant or Benign	Histopathology Type	Number	Percentage
Benign	Fibroadenoma	146	34.0%
	Sclerosing lesions /adenosis	64	14.9%
	Normal breast tissue	38	8.8%
	Inflammatory lesions	36	8.4%
	Papilloma (no atypia)	27	6.3%
	Cysts, ductal ectasia, or seromas	37	8.6%
	Usual ducal hyperplasia	17	3.9%
	Atypical ducal hyperplasia	8	1.9%
	Fibroadenomatoid changes	23	5.3%
	Other benign findings	34	7.9%
	Total	**430**	**100%**
Malignant	Invasive ductal carcinoma	304	75.2%
	Invasive lobular carcinoma	42	10.4%
	Ductal carcinoma in situ	19	4.7%
	Other malignancies originating from breast tissues	35	8.7%
	Other malignancies (metastases from non breast tissues)	4	1.0%
	Total	**404**	**100%**

Table 2. Performances of the ensemble of support vector machines in the external testing datasets.

Performance Metric	Testing Set I	Testing Set II
SVM sensitivity (95% CI)	98.0% (89.6%-99.9%)	94.4% (84.6%-98.8%)
SVM NPV (95% CI)	92.9% (66.1%-99.8%)	75.0% (42.8%-94.5%)
SVM PPV (95% CI)	45.9% ** (36.3%-55.7%)	50.5% ** (40.4%-60.6%)
Radiologists' PPV	41.5% ** (32.7%-50.7%)	47.8% ** (38.3%-57.4
SVM specificity (95% CI)	18.1% ** (10.0%-28.9%)	15.3% ** (7.2%-27.0%)
Radiologists' specificity	0.0%	0.0%

SVM, support vector machines; CI, confidence interval; NPV, negative predictive value; PPV, positive predictive value. ** indicates a p-value < 0.005, calculated considering chance / random classification. Note: the 0% radiologists' specificity is an obliged result determined by the inclusion of breast masses that were all referred to ultrasound-guided core needle biopsy.

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Bibliography

[1] A Machine Learning Ensemble Based on Radiomics to Predict BI-RADS® Category and Reduce the Biopsy Rate of Ultrasound-Detected Suspicious Breast Masses. Interlenghi M, Salvatore C, Magni V, Caldara G, Schiavon E, Cozzi A, Schiaffino S, Carbonaro LA, Castiglioni I, Sardanelli F.Diagnostics (Basel). 2022 Jan 13;12(1):187. doi: 10.3390/diagnostics12010187.PMID: 35054354

[2] D'Orsi, C.J.; Sickles, E.A.; Mendelson, E.B.; Morris, E.A. ACR BI-RADS® Atlas, Breast Imaging Reporting and Data System, 5th ed.; American College of Radiology: Reston, VA, USA, 2013.

BMA Indications

BMA software tool use is indicated for caucasian women with breast masses detected at ultrasound imaging and considered suspicious for breast cancer by physicians with experience in breast ultrasound who can use it as a support for: reporting ultrasound-detected suspicious breast masses and, as a consequence, making an informed decision to send such masses to ultrasound-guided needle biopsy or to short interval follow-up.
For further and more detailed infomations about BMA, please refer to specific section of the Esaote Ultrasound User Manuals.

Please scan here to download our BMA White Paper

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