Supplementary material

Supplementary Table 1. Ultrasound features of patients in the training and testing sets (n (%)).

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| Features | | Total patients  (n = 127) | Training set  (n = 88) | Testing set  (n = 39) |
| Subtype | Non-TNBC | 88 (69.29%) | 57 (64.77%) | 31 (79.49%) |
| TNBC | 39 (30.71%) | 31 (35.23%) | 8 (20.51%) |
| Boundary | Clear | 12 (9.45%) | 9 (10.23%) | 3 (7.69%) |
| Still clear | 8 (6.3%) | 4 (4.55%) | 4 (10.26%) |
| Unclear | 107 (84.25%) | 75 (85.23%) | 32 (82.05%) |
| Shape | Regular | 2 (1.57%) | 1 (1.14%) | 1 (2.56%) |
| Irregular | 125 (98.43%) | 87 (98.86%) | 38 (97.44%) |
| Edge | Smooth | 7 (5.51%) | 5 (5.68%) | 2 (5.13%) |
| Unsmooth | 120 (94.49%) | 83 (94.32%) | 37 (94.87%) |
| Lymph node metastasis | Yes | 57 (44.88%) | 42 (47.73%) | 15 (38.46%) |
| No | 68 (53.54%) | 45 (51.14%) | 23 (58.97%) |
| Unclear | 2 (1.57%) | 1 (1.14%) | 1 (2.56%) |
| Blood flow grade | Ⅰ | 30 (23.62%) | 21 (23.86%) | 9 (23.08%) |
| Ⅱ | 48 (37.8%) | 33 (37.5%) | 15 (38.46%) |
| Ⅲ | 49 (38.58%) | 34 (38.64%) | 15 (38.46%) |
| Orientation | Parallel | 61 (48.03%) | 43 (48.86%) | 18 (46.15%) |
| Vertical | 66 (51.97%) | 45 (51.14%) | 21 (53.85%) |
| Hyperechoic halo | Yes | 56 (44.09%) | 36 (40.91%) | 20 (51.28%) |
| No | 71 (55.91%) | 52 (59.09%) | 19 (48.72%) |
| Internal echo | Hypoecho | 122 (96.06%) | 85 (96.59%) | 37 (94.87%) |
| Mixed echo | 5 (3.94%) | 3 (3.41%) | 2 (5.13%) |
| Distribution of echo | Uniform | 9 (7.09%) | 7 (7.95%) | 2 (5.13%) |
| Uneven | 118 (92.91%) | 81 (92.05%) | 37 (94.87%) |
| Calcification | Yes | 79 (62.2%) | 55 (62.5%) | 24 (61.54%) |
| No | 48 (37.8%) | 33 (37.5%) | 15 (38.46%) |
| Posterior echo | No change | 87 (68.5%) | 59 (67.05%) | 28 (71.79%) |
| Attenuation | 38 (29.92%) | 28 (31.82%) | 10 (25.64%) |
| Enhancement | 2 (1.57%) | 1 (1.14%) | 1 (2.56%) |

TNBC: triple-negative breast cancer.

Supplementary Table 2. Consistency check.

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|  | Features | ICC |
| Maximum value | original\_firstorder\_RobustMeanAbsoluteDeviation | 0.78 |
| Minimum value | original\_firstorder\_10Percentile | 0.99 |
| Mean value |  | 0.95 |

ICC: intraclass correlation coefficient.

Supplementary Table 3. Univariate analysis of ultrasound features in the training and testing sets.

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| --- | --- | --- | --- | --- | --- | --- | --- |
| Feature | | Training set  (n = 88) | | | Testing set  (n = 39) | | |
| TNBC  (n = 31) | Non-TNBC  (n = 57) | *p* | TNBC  (n = 8) | Non-TNBC  (n = 31) | *p* |
| Boundary | Clear | 7 (22.58%) | 2 (3.51%) | 0.001 | 2 (25%) | 1 (3.23%) | 0.016 |
| Still clear | 3 (9.68%) | 1 (1.75%) | 2 (25%) | 2 (6.45%) |
| Unclear | 21 (67.74%) | 54 (94.74%) | 4 (50%) | 28 (90.32%) |
| Shape | Regular | 1 (3.23%) | 0 (0%) | -- | 1 (12.5%) | 0 (0%) | -- |
| Irregular | 30 (96.77%) | 57 (100%) |  | 7 (87.5%) | 31 (100%) |  |
| Edge | Smooth | 5 (16.13%) | 0 (0%) | -- | 2 (25%) | 0 (0%) | -- |
| Unsmooth | 26 (83.87%) | 57 (100%) |  | 6 (75%) | 31 (100%) |  |
| Lymph node metastasis | Yes | 15 (48.39%) | 27 (47.37%) | 0.812 | 4 (50%) | 11 (35.48%) | 0.398 |
| No | 16 (51.61%) | 29 (50.88%) | 4 (50%) | 19 (61.29%) |
| Unclear | 0 (0%) | 1 (1.75%) | 0 (0%) | 1 (3.23%) |
| Blood flow grade | Ⅰ | 10 (32.26%) | 11 (19.3%) | 0.109 | 3 (37.5%) | 6 (19.35%) | 0.095 |
| Ⅱ | 12 (38.71%) | 21 (36.84%) | 4 (50%) | 11 (35.48%) |
| Ⅲ | 9 (29.03%) | 25 (43.86%) | 1 (12.5%) | 14 (45.16%) |
| Orientation | Parallel | 19 (61.29%) | 24 (42.11%) | 0.085 | 3 (37.5%) | 15 (48.39%) | 0.580 |
| Vertical | 12 (38.71%) | 33 (57.89%) | 5 (62.5%) | 16 (51.61%) |
| Hyperechoic halo | Yes | 15 (48.39%) | 21 (36.84%) | 0.294 | 3 (37.5%) | 17 (54.84%) | 0.380 |
| No | 16 (51.61%) | 36 (63.16%) | 5 (62.5%) | 14 (45.16%) |
| Internal echo | Hypoecho | 28 (90.32%) | 57 (100%) | -- | 8 (100%) | 29 (93.55%) | -- |
| Mixed echo | 3 (9.68%) | 0 (0%) |  | 0 (0%) | 2 (6.45%) |  |
| Distribution of echo | Uniform | 3 (9.68%) | 4 (7.02%) | 0.664 | 1 (12.5%) | 1 (3.23%) | 0.339 |
| Uneven | 28 (90.32%) | 53 (92.98%) | 7 (87.5%) | 30 (96.77%) |
| Calcification | Yes | 18 (58.06%) | 37 (64.91%) | 0.527 | 4 (50%) | 20 (64.52%) | 0.456 |
| No | 13 (41.94%) | 20 (35.09%) | 4 (50%) | 11 (35.48%) |
| Posterior echo | No change | 26 (83.87%) | 33 (57.89%) | 0.034 | 5 (62.5%) | 23 (74.19%) | 0.256 |
| Attenuation | 4 (12.9%) | 24 (42.11%) | 2 (25%) | 8 (25.81%) |
| Enhancement | 1 (3.23%) | 0 (0%) | 1 (12.5%) | 0 (0%) |

TNBC: triple-negative breast cancer.

Supplementary Table 4. Radiomics feature screening through random forest dimensionality reduction.

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| Classification | Feature names | Importance |
| first-order features | original\_firstorder\_totalenergy | 0.02 |
| original\_firstorder\_energy | 0.02 |
| shape features | original\_shape\_surfacevolumerati | 0.02 |
| original\_shape\_elongation | 0.02 |
| original\_shape\_surfacearea | 0.02 |
| original\_shape\_sphericity | 0.02 |
| original\_shape\_voxelvolume | 0.02 |
| original\_shape\_meshvolume | 0.02 |
| texture features | original\_glszm\_graylevelnonunifo | 0.04 |
| original\_ngtdm\_coarseness | 0.02 |
| original\_glrlm\_runlengthnonunifo | 0.02 |
| original\_ngtdm\_busyness | 0.02 |
| original\_glrlm\_graylevelnonunifo | 0.02 |
| original\_ngtdm\_strength | 0.02 |