

### Supplementary Data 1. Basic information of S-Detect for breast.

S-Detect is consisted of 3 modules; lesion segmentation, ACR BI-RADS (American College of Radiology-Breast Imaging Reporting and Data System) lexicon classification and risk classification. Each module was developed by each convolutional neural network using more than 10,000 breast ultrasonography images with their Region-of-interests (ROIs), BI-RADS lexicons provided by radiologists and histopathologic results. A deep learning network consists of multiple layers with their own non-linear mappings between the input and output. Each layer adjusts internal parameters, called weights, to minimize the error between the input and correct output, based on big data. In the final layer, the inputs are transformed to probabilities that sum to one. The final decision was obtained by combining the output of the BI-RADS lexicon features with that of the other network for ROI segmentation, and provided as binary form in the user interface, either possibly benign or possibly malignant.

Supplementary Table 1. Distribution of changes in final assessments

Unaided (U) BI-RADS	BI-RADS	Sequential (R1) No. (%)	Simultaneous (R2) No. (%)
2	2	133 (95.7)	92 (66.2)
	3	5 (3.6)	42 (30.2)
	4a	1 (0.7) <sup>a)</sup>	4 (2.9) <sup>a)</sup>
	4c	NA	1 (0.7) <sup>a)</sup>
3	2	18 (2.0)	82 (9.0)
	3	846 (93.3)	713 (78.6)
	4a	42 (4.6) <sup>a)</sup>	106 (11.7) <sup>a)</sup>
	4b	NA	5 (0.6) <sup>a)</sup>
4a	4c	1 (0.1) <sup>a)</sup>	1 (0.1) <sup>a)</sup>
	2	NA	11 (1.4) <sup>a)</sup>
	3	136 (17.1) <sup>a)</sup>	303 (38.1) <sup>a)</sup>
	4a	558 (70.1)	349 (43.8)
4b	4b	100 (12.6)	97 (12.2)
	4c	2 (0.3)	34 (4.3)
	5	NA	2 (0.3)
	2	NA	2 (0.6)
4c	3	2 (0.6)	24 (7.0)
	4a	34 (9.9)	89 (25.8)
	4b	234 (67.8)	132 (38.3)
	4c	73 (21.2)	75 (21.7)
5	5	2 (0.6)	23 (6.7)
	3	NA	8 (2.7)
	4a	8 (2.7)	23 (7.6)
	4b	18 (6.0)	81 (26.9)
5	4c	232 (77.1)	116 (38.5)
	5	43 (14.3)	73 (24.3)
	3	NA	2 (0.4)
	4a	1 (0.2)	6 (1.3)
5	4b	NA	25 (5.4)
	4c	11 (2.4)	85 (18.3)
	5	452 (97.4)	346 (74.6)

BI-RADS, Breast Imaging Reporting and Data System; NA, not applicable.

<sup>a)</sup>Conversions from BI-RADS 2 or 3 to more than BI-RADS 4a or vice versa are presented.