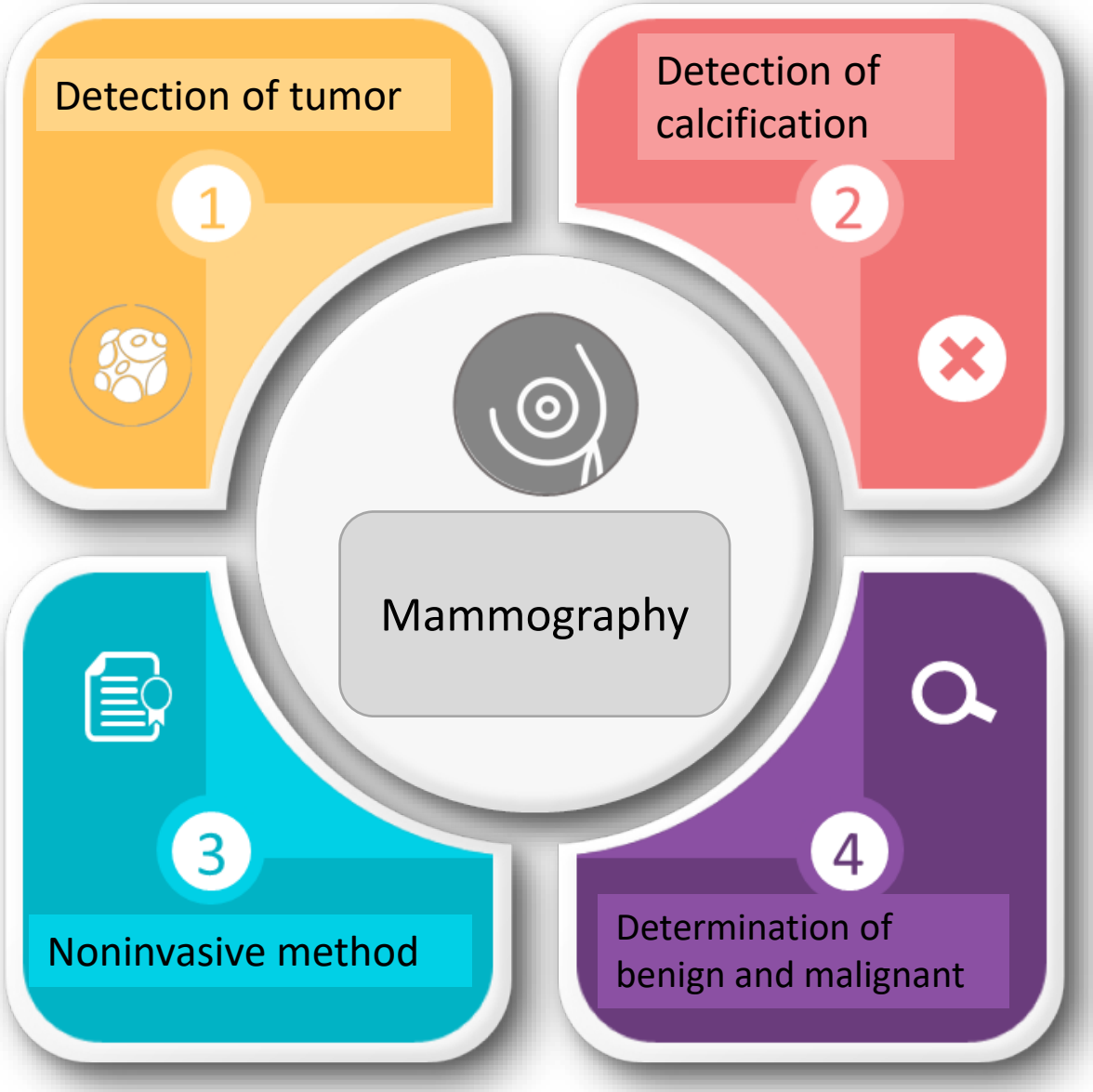
Automatic Assessment of the Quality of Patient Positioning in Mammography Using an Artificial Intelligent System

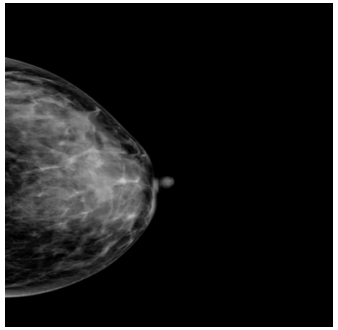
Early screening and diagnosis of breast cancer： Mammography



Quality control in mammography

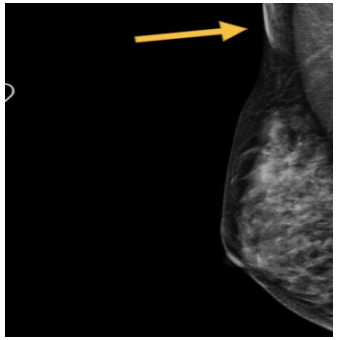
Qualified images are important basis for doctors to make accurate diagnosis.

Unqualified image images will lead to wrong diagnosis.



Quality control problem: incomplete gland

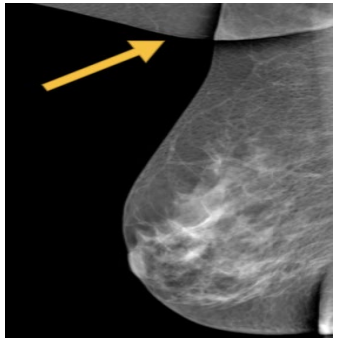
Diagnostic risk:
missed detection



Quality control problem:

skin overlapping

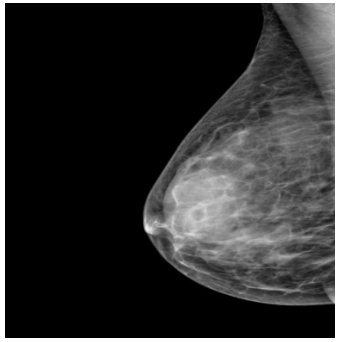
Diagnostic risk:
covering the lesion



Quality control problem:

shoulder overlapping

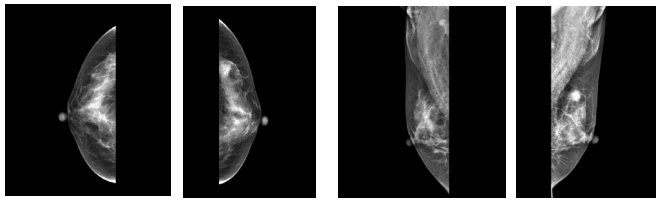
Diagnostic risk:
covering the lesion



Quality control problem: inadequate pectoralis major muscle

Diagnostic risk:
missed detection of malignant lymph nodes

Automatic patient positioning real time evaluation in mammography using an artificial intelligent system

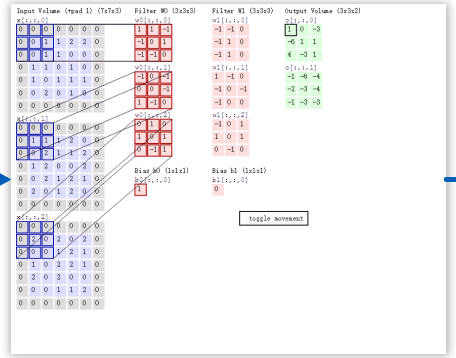


Images input

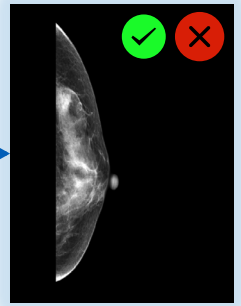
Feature recognition

Feature extraction

Data preprocessing

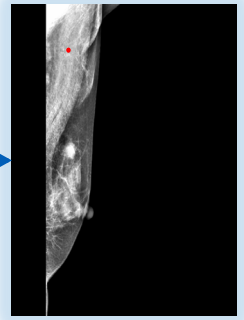


Feature extraction



Overall detection and evaluation

- incomplete gland
- incomplete pectoralis major muscle
- over or insufficient exposure



Partial detection and evaluation

- skin fold
- nipple not in the contour line
- shoulder overlap shadow
- contralateral breast
- abdominal skin
- foreign body

Real time quality control in 2 seconds

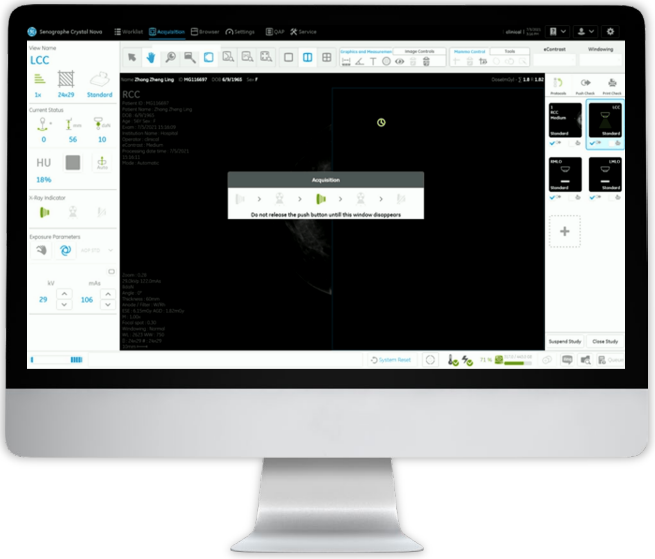
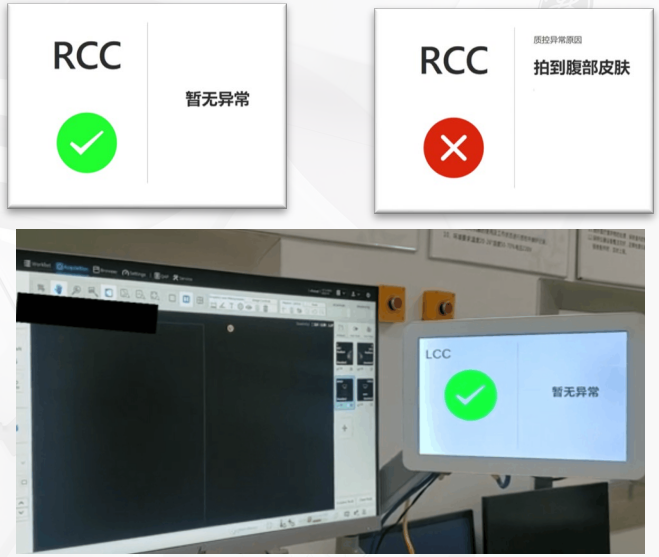


Image input

2 sec

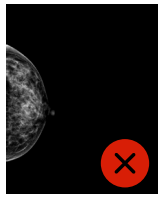
AI analysis



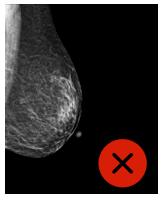
Results output

Nine types of abnormalities detection during mammography

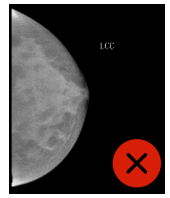
Incomplete gland



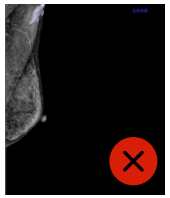
Incomplete pectoralis major muscle



Over or insufficient exposure



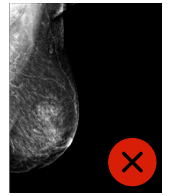
Skin fold



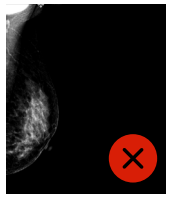
LMLO

No abnormality

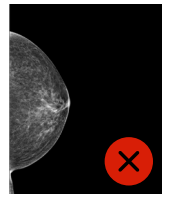
Nipple not in the contour line



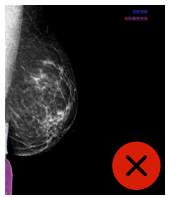
Shoulder overlap



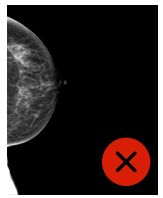
Contralateral breast



Abdominal skin



Foreign body



Acquisition alert

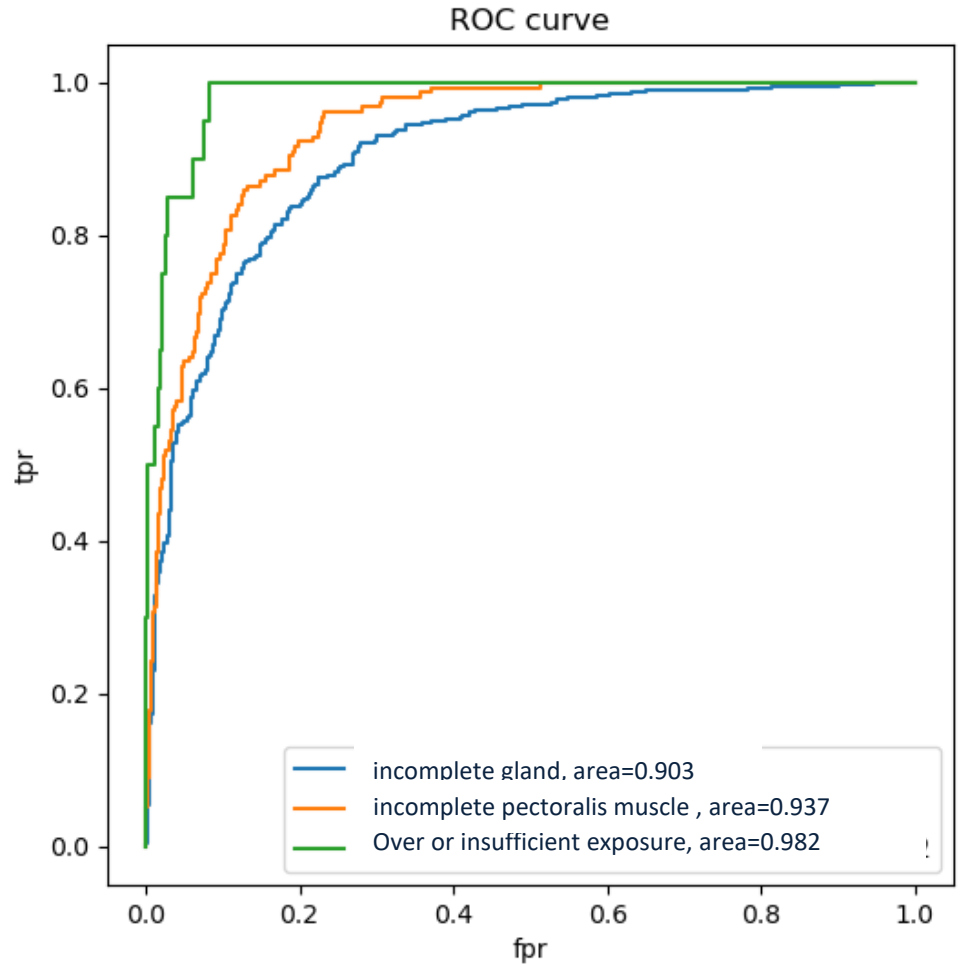
Performance of mammography quality control system

Training data set

30000+ case

Validation accuracy

95.8%



Validation ROC curve

Statistical analysis of image quality for improvement

With the help of systematic review and evaluation of the changes in the quality of photography during four quarters, image quality of mammography can be improved by using this management system.

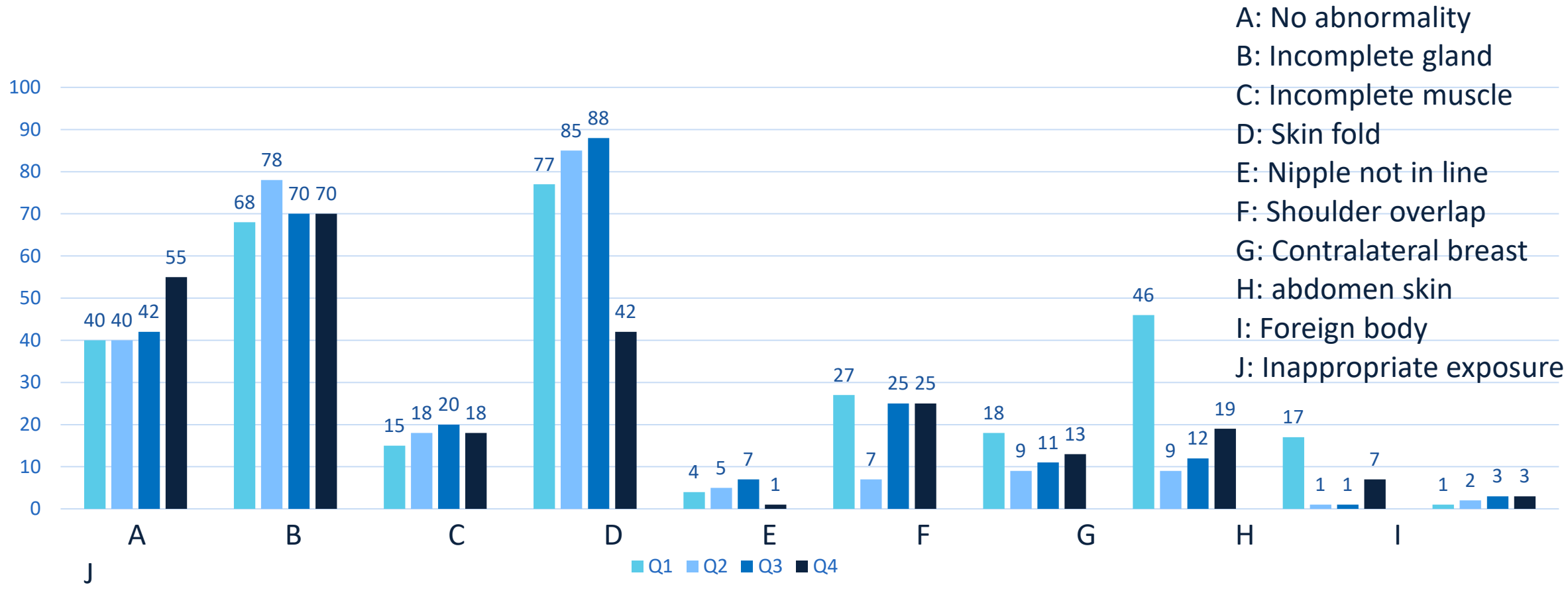


Image quality improvement after using artificial intelligent based quality control system

Image quality score	A grade	B grade	C grade	invalid
No Quality control system	86.7%	10.7%	2.6%	0
With quality control system	91.4% ↑	7.2% ↓	1.4% ↓	0

Diagnostic value	sensitivity	specificity
No Quality control system	85.22%	89.51%
With quality control system	86.21% ↑	90.67% ↑

Artificial Intelligent based real time quality control and manage system

Provide real-time quality control results for technicians

- Ensure the effectiveness of photography
- Reduce waste

Provide qualified images for doctors

- Reduce the risk of misdiagnosis
- Reduce recall rate

Provide efficient management tools for managers

- Standardized management of images and data