

UNIVERSITY OF THE PHILIPPINES MANILA  
COLLEGE OF ARTS AND SCIENCES  
DEPARTMENT OF PHYSICAL SCIENCES AND MATHEMATICS

MAMMO: AN APPLICATION OF CONVOLUTIONAL NEURAL  
NETWORKS ON BREAST CANCER SCREENING

(USER MANUAL)

A special problem in partial fulfillment  
of the requirements for the degree of  
**Bachelor of Science in Computer Science**

Submitted by:

Sigfreed John S. Angeles

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## I. Mammo Server Installation

The Mammo web application requires the following dependencies and specifications:

### A. Python Dependencies

**Anaconda Python 3.5.x** is the recommended python distribution. The required python modules to run the system include:

1. flask
2. pdf-kit
3. flask-sqlalchemy

### B. Mammo Server Machine

The recommended requirements for the server include:

1. 2 GHz CPU rate or higher
2. Graphics Processing Unit (GPU) specifically a NVIDIA Graphics Card with 3.0 compute capability or higher
3. 8 GB RAM or higher
4. Up to 2 GB of free disk space

### C. Mammo Client Machine

The client side must have any of the following compatible up-to-date web browsers:

1. Google Chrome
2. Mozilla Firefox
3. Safari

## II. Mammo Web Application

### A. Home Screen

The home page of the system is seen in figure 1. A basic description of what the site is for is present here along with the features it has to offer. Also, a navbar that provides the user access to the site's features is present at all pages of the site.

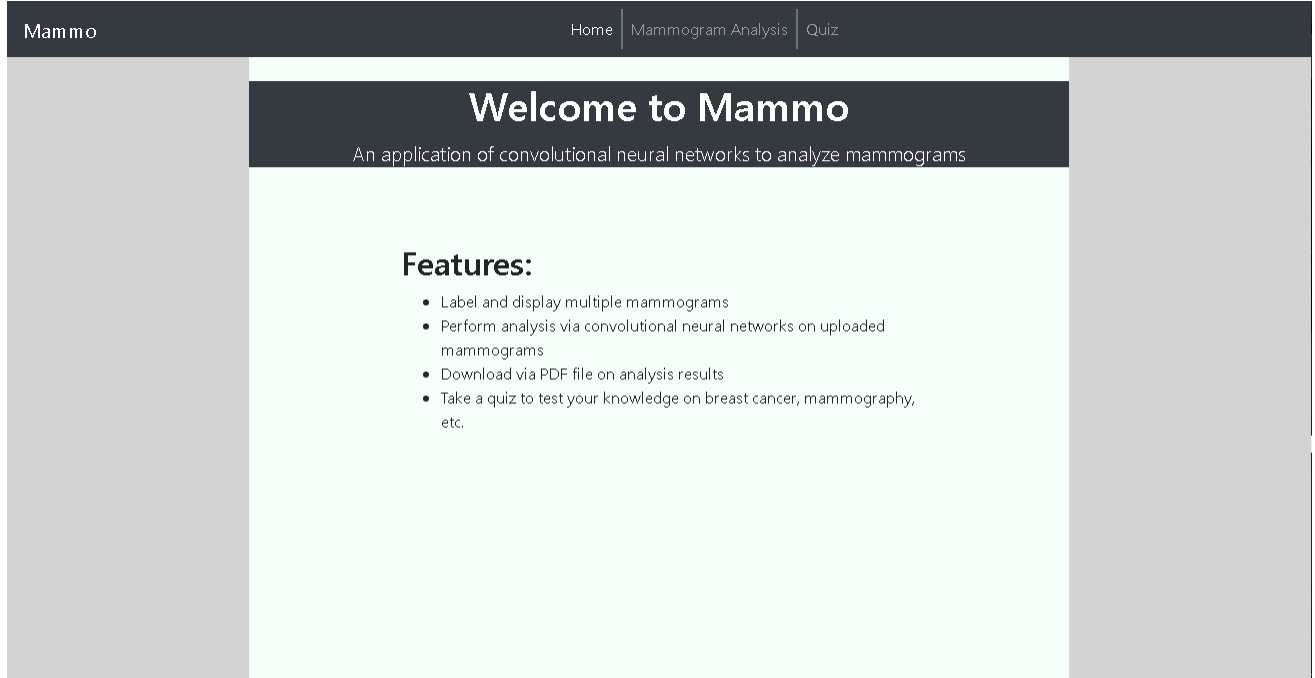


Figure 1: Mammo home page, Mammo

### B. Mammogram Analysis

#### 1. Uploading Mammograms

Figure 2 shows that a user has fully uploaded his chosen mammograms. A user may do this through the "Add Images" button at the top of the left sidebar or by just dragging and dropping files from his/her directory.

#### 2. Editing and Deleting Mammograms

The mammograms are uploaded with unregistered metadata that is up for the user to edit. A user may edit the mammograms by clicking the edit icon present at the upper right

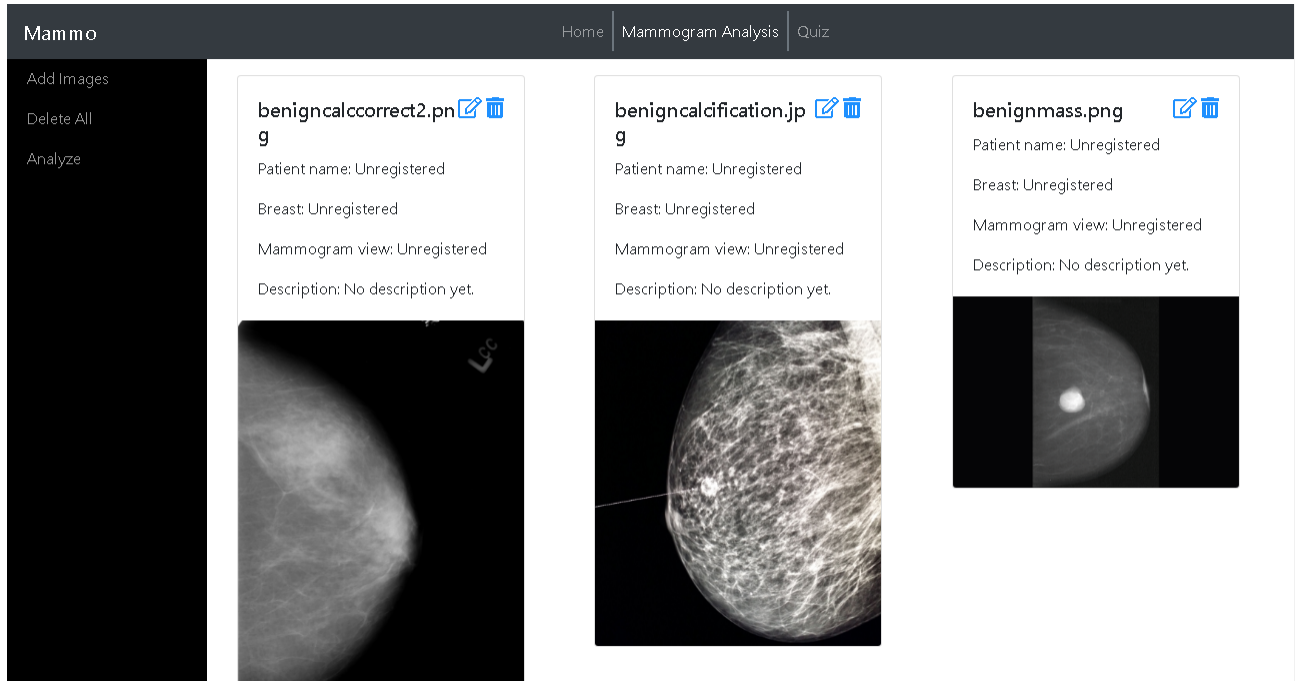


Figure 2: Three uploaded mammograms, Mammo

of the mammogram cards, or he may simply click on the picture of the mammogram as shown in figure 3. Also, a user may delete the mammogram by pressing the delete icon next to the edit. Moreover, a user may delete all the mammograms uploaded by the "Delete All" button on the sidebar. Also, a user must specify the region of interest to be analyzed by the CNN module. A user may leave the metadata entries blank, but he must choose a region of interest and save it.

### 3. Analyzing the Mammograms

After the user has entered the necessary patient data, he/she may then proceed to have the mammograms analyzed by the "Analyze Mammograms" on the sidebar (see figure 2). It may take a long time to process the mammograms. Figures 4 and 5 show the analysis made by the CNN module. A "Generate PDF" functionality is present for the user to save the results as PDF (see figure 6).

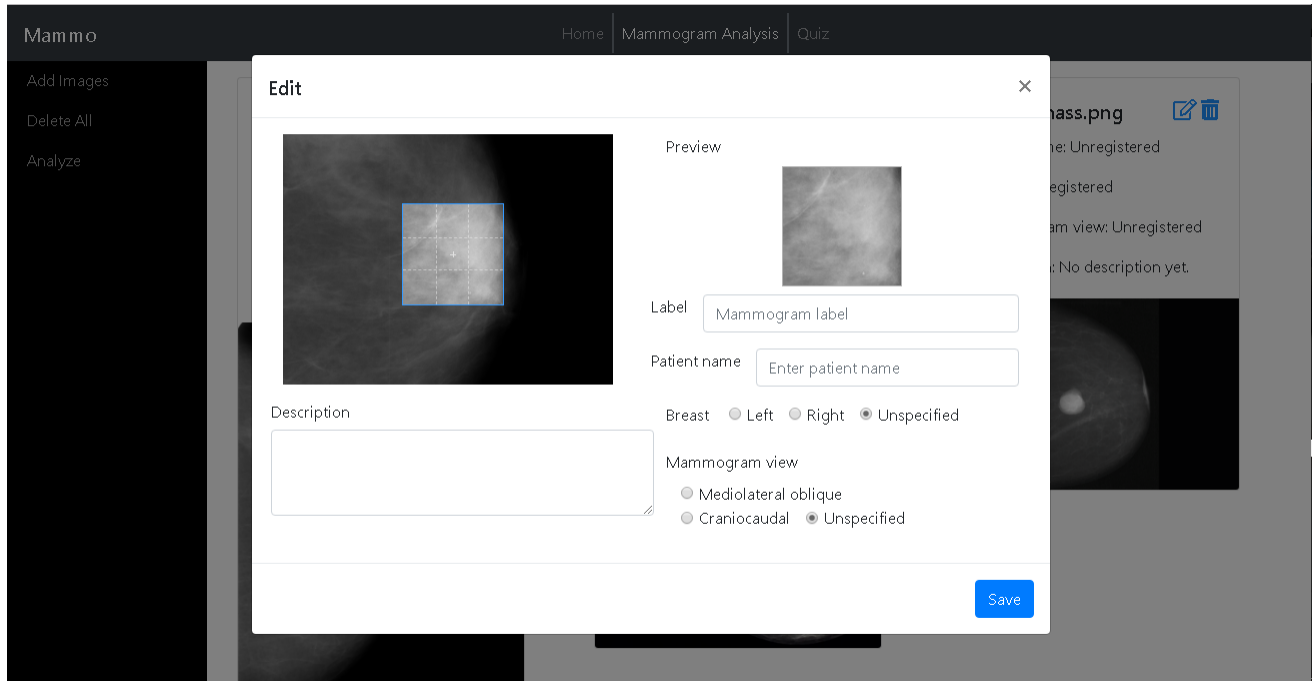


Figure 3: Editing metadata of the mammogram, Mammo

## C. Quiz

### 1. Taking the Quiz

A user or a student/trainee has the option to take a randomly-generated 10-item pop quiz regarding breast cancer, mammography, treatment, etc. (see figure 7).

### 2. Quiz Results

After the user has answered the questions and reviewed the answers, he/she may submit the quiz for evaluation by the "Submit" button seen in figure 8.

The user's score and the correct answer are seen in figure 9.

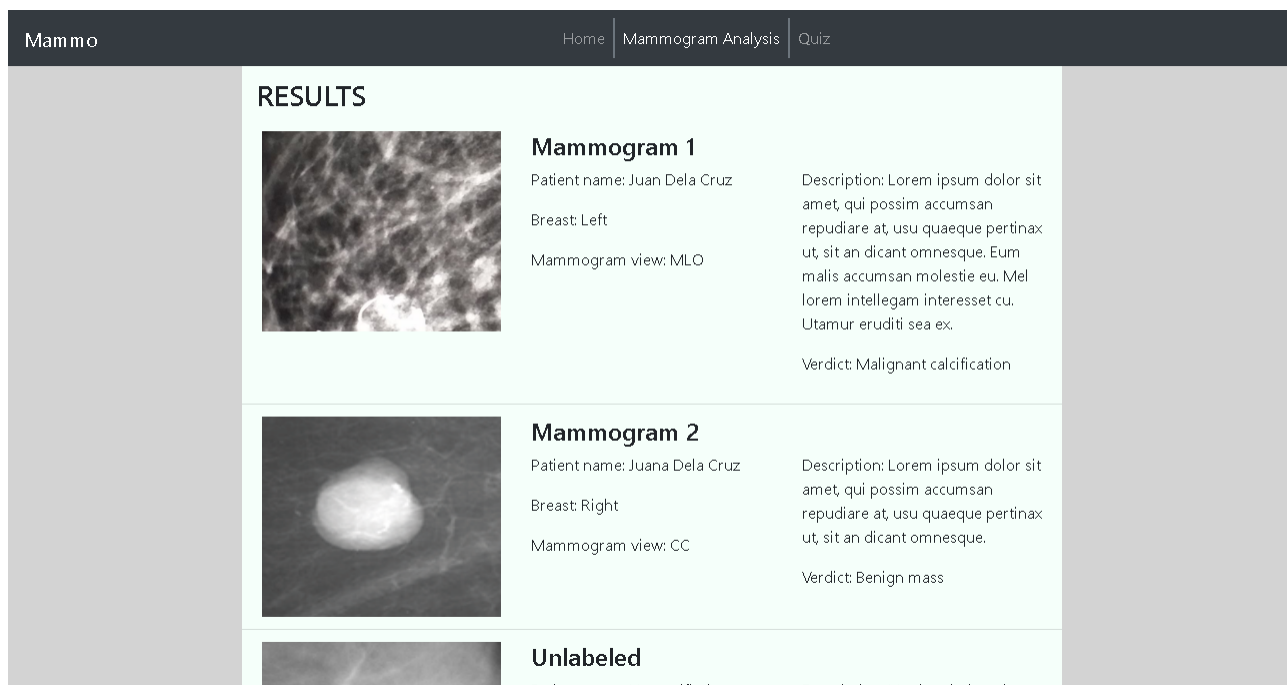


Figure 4: Results of the analysis made by the CNN module part 1, Mammo

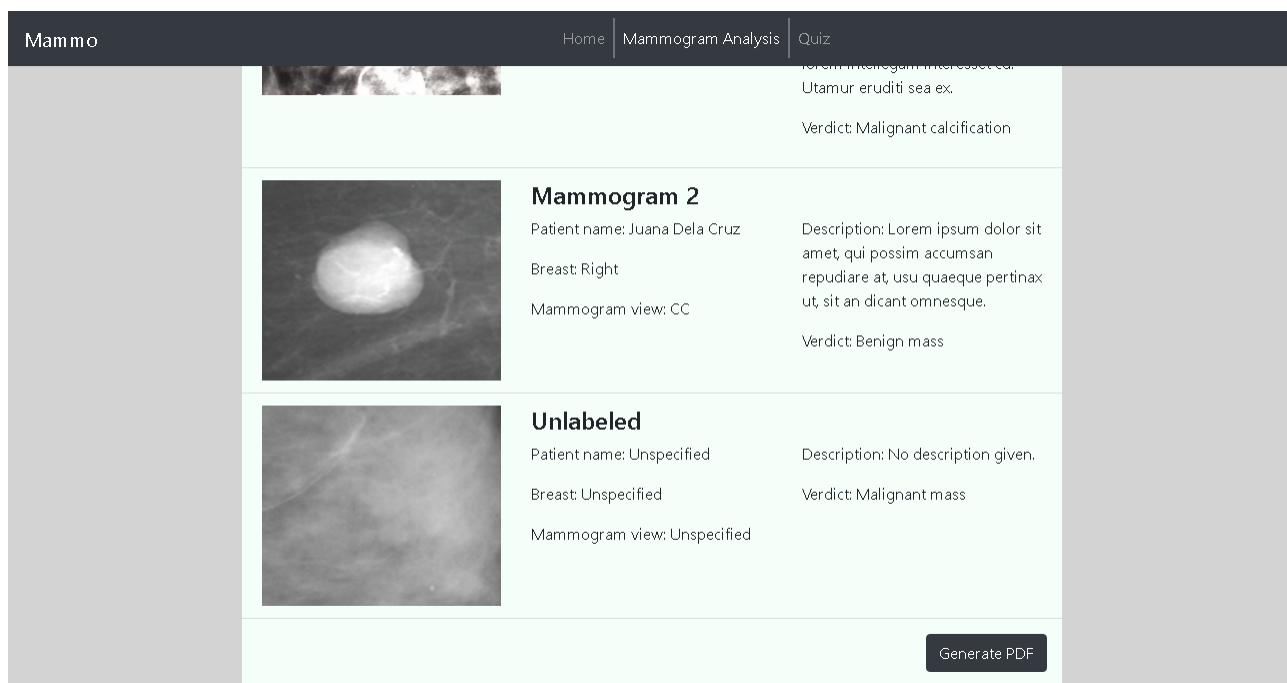


Figure 5: Results of the analysis made by the CNN module part 2, Mammo

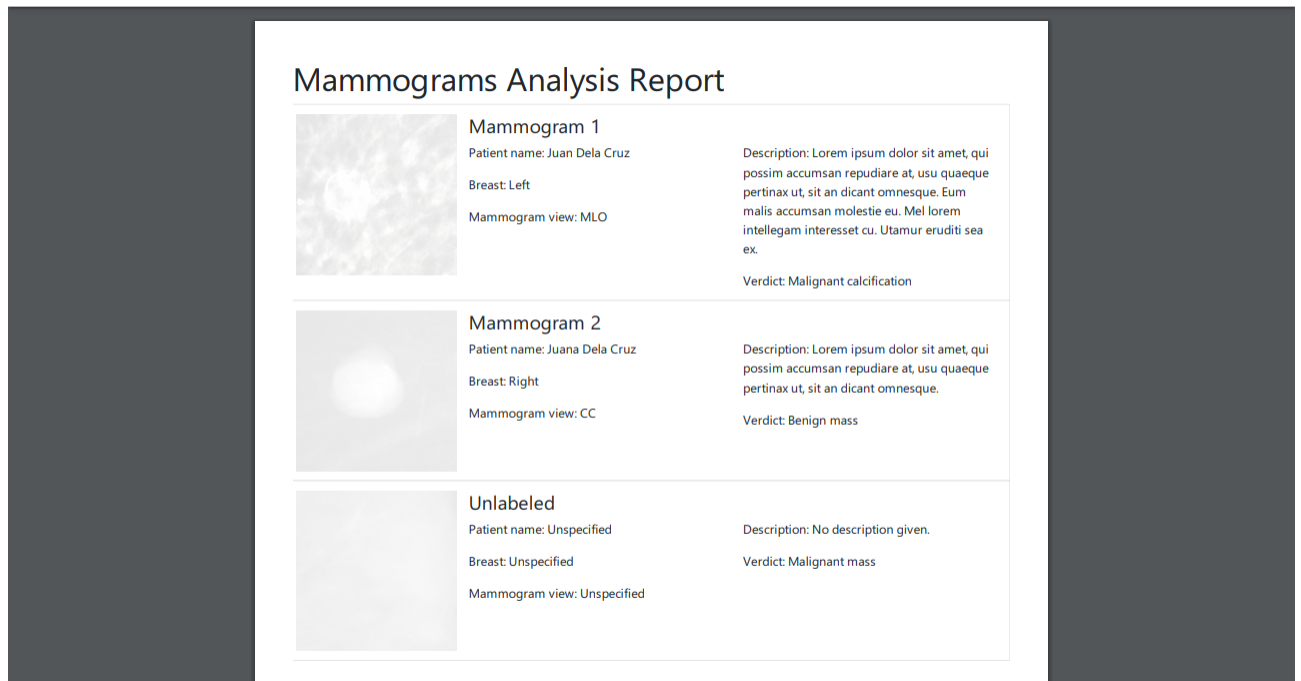


Figure 6: A generated PDF file of Mammogram Analysis Report, Mammo

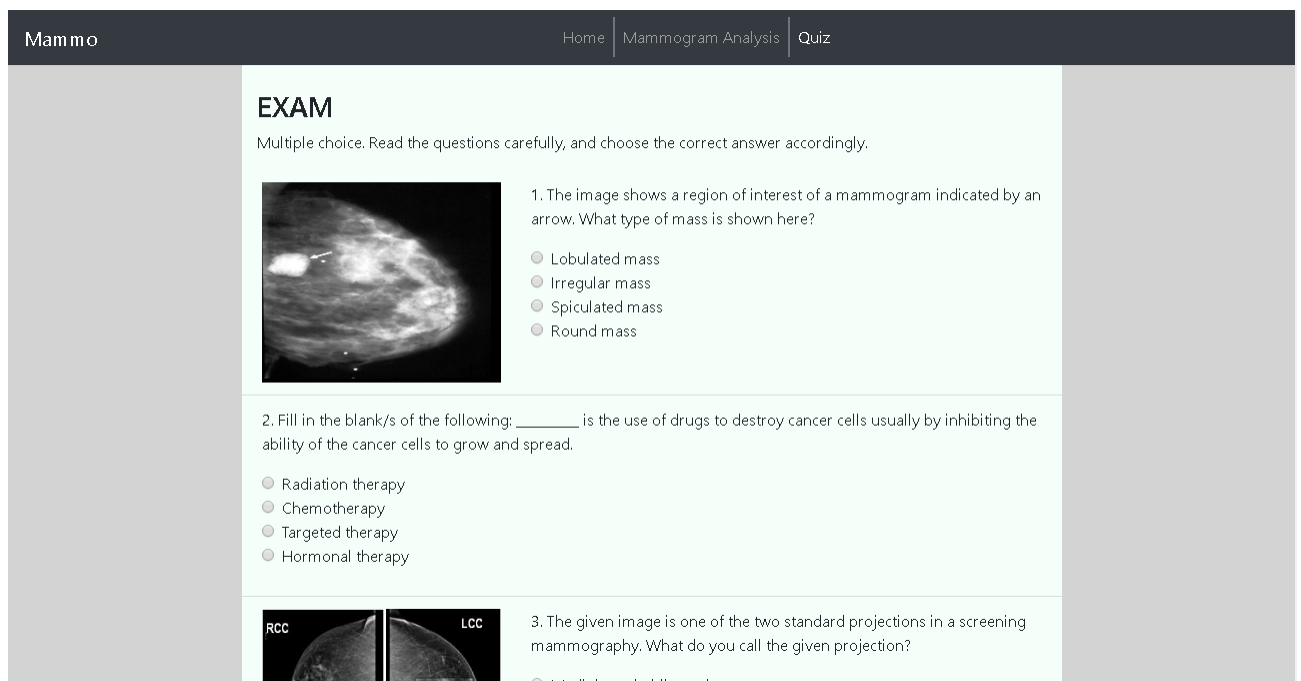
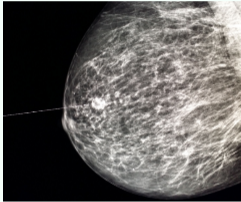


Figure 7: A sample of the quiz, Mammo

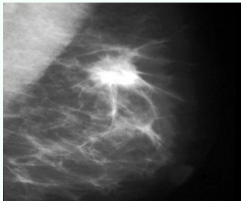
Mammo
Home | Mammogram Analysis | Quiz

☒ Lobular carcinoma in situ  
☐ Invasive ductal carcinoma  
☐ Ductal carcinoma in situ



9. The image shows a mammogram with a large round region of interest indicated by the line. Is this a benign or malignant calcification?

☒ Benign calcification  
☐ Malignant calcification



10. The given image is a type of mass that indicates malignancy. Which of the following types of mass is indicated here?

☐ Irregular masses  
☒ Obscured masses  
☐ Lobulated masses  
☐ Spiculated masses

Submit

Figure 8: Submit the quiz, Mammo

Mammo
Home | Mammogram Analysis | Quiz

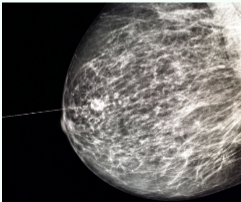
**TOTAL SCORE: 3**

✓

1. Fill in the blank/s of the following: \_\_\_\_\_ targets the resources (proteins, specific genes, tissue environment) that fuel the survival and growth of cancer.

☒ Targeted therapy  
☐ Chemotherapy  
☐ Radiation therapy  
☐ Hormonal therapy

✗

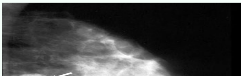


2. The image shows a mammogram with a large round region of interest indicated by the line. Is this a benign or malignant calcification?

☐ Benign calcification  
☒ Malignant calcification  
☐  
☐

The correct answer is Benign calcification.

✗



3. The image shows a region of interest of a mammogram indicated by an arrow. What type of mass is shown here?

Figure 9: Results of the quiz, Mammo