

Medical Imaging

a.a. 2019-2020

Project

Mass Segmentation in Digital Mammograms

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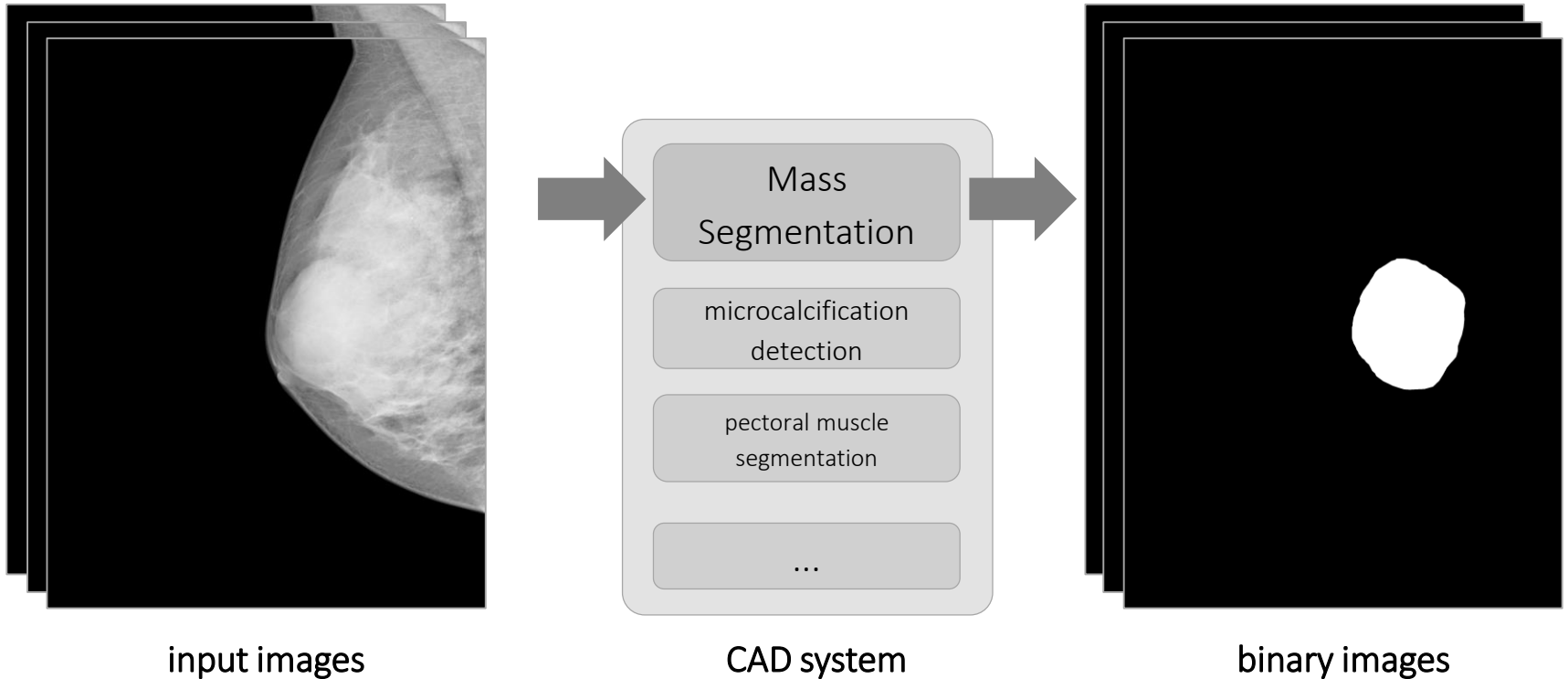
Motivations

- **X-ray mammography** is a widely used method to screen women for early detection of **breast cancer**
- **Computer Aided Diagnosis (CAD)** helps radiologists in interpreting screening mammograms
- the two most important lesions that may be present on a mammogram are **microcalcifications** and **masses**
 - CAD often consists first in **detecting** the lesions and then **classifying** them into benign / malignant



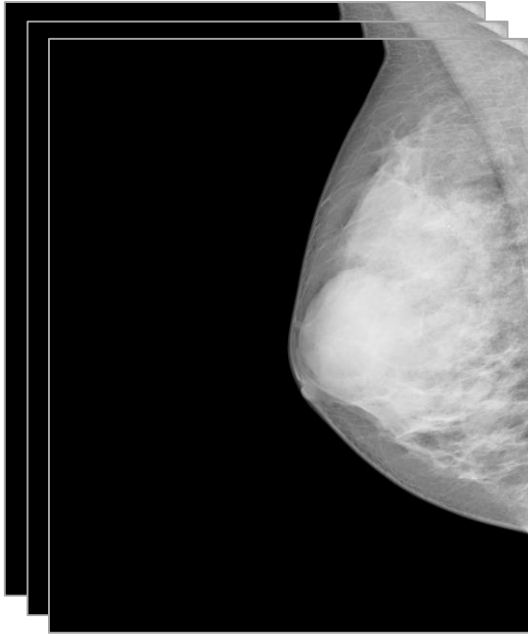
Goal

- implement a reusable module for *automated* **Mass Segmentation**
 - a must-have module in most **CAD** systems



Materials

- INBREAST dataset (410 images) containing:



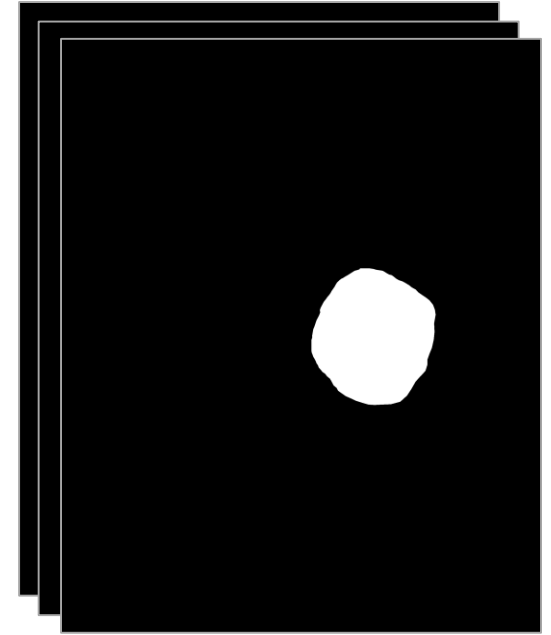
mammograms (16-bit)

`/dataset/images`



breast-air masks

`/dataset/masks`

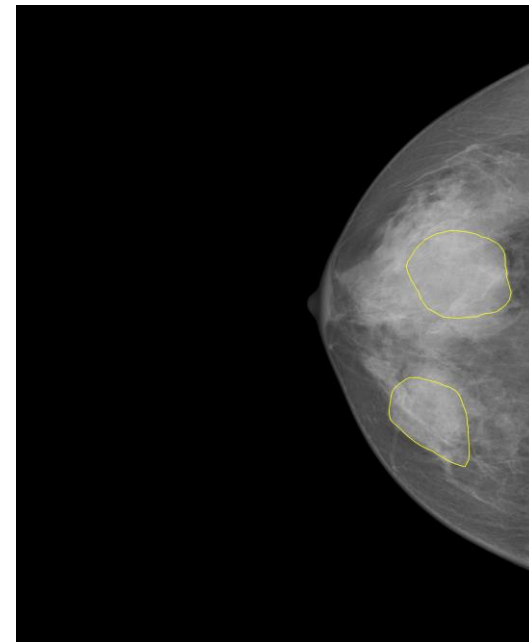
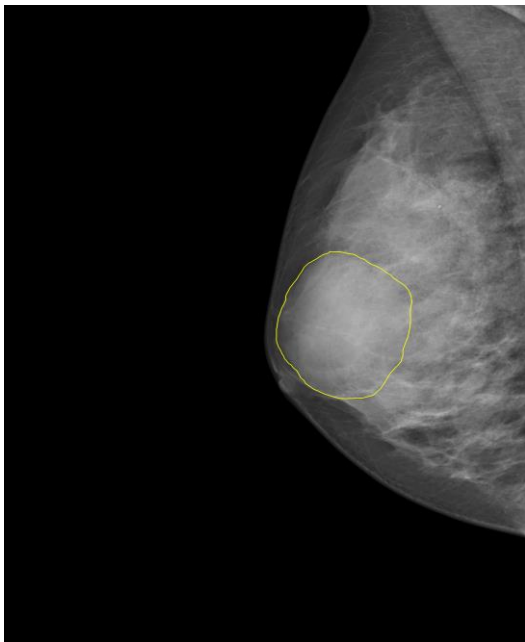


manual annotations

`/dataset/groundtruths`

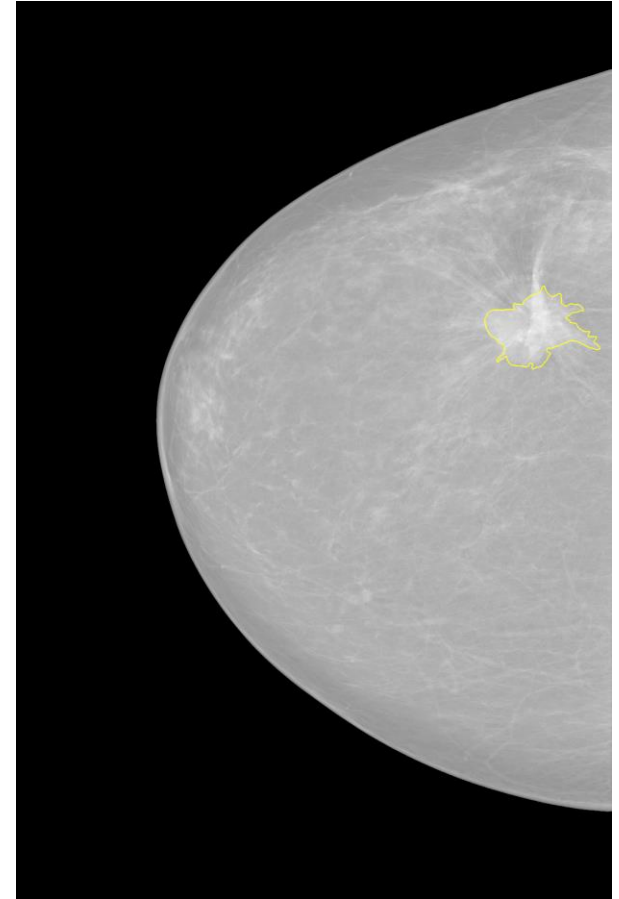
Materials

- warning: among the 410 images, only 107 contain masses (positive images)
 - there are only 107 manual annotations in the /dataset/groundtruths folder
 - see also the 107 overlayed annotations in the /dataset/overlay folder



Coefficient of difficulty

- base coefficient of difficulty
 - yes, this is a difficult project!
 - e.g. see the mass on the right



Hints

- top-down approach
 1. **preprocessing**
 - e.g. contrast enhancement with one of the techniques learnt from *Image Processing*
 2. **mass candidate extraction**
 - e.g. oversegmentation with one of the techniques learnt from *AIA*
 3. **feature extraction**
 - extract a set of meaningful features from each mass candidate (features learnt from *AIA* + others)
 4. **classification**
 - use machine learning (SVM, Boosting, Random Forest, ... others learnt from *Pattern Recognition*) to classify candidates into masses and nonmasses

