Assessing the Potential of Multi-view approaches in Breast Cancer Mass Detection

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Background In the mammography exam two views of the breast are taken, which hold complementary information for the diagnosis. Current breast cancer CAD systems integrate the information from the two views in a naive way, either averaging or concatenating image level features. **Is there potential to improve CAD systems by integrating the information coming from the two breast views at the lesion level?**

Problem Formulation:

For a breast with exactly one lesion, visible in the two breast views, given the image patch of the lesion in one view (**anchor**), find the image patch of the lesion on the other view from a set of 6 candidates.

Models

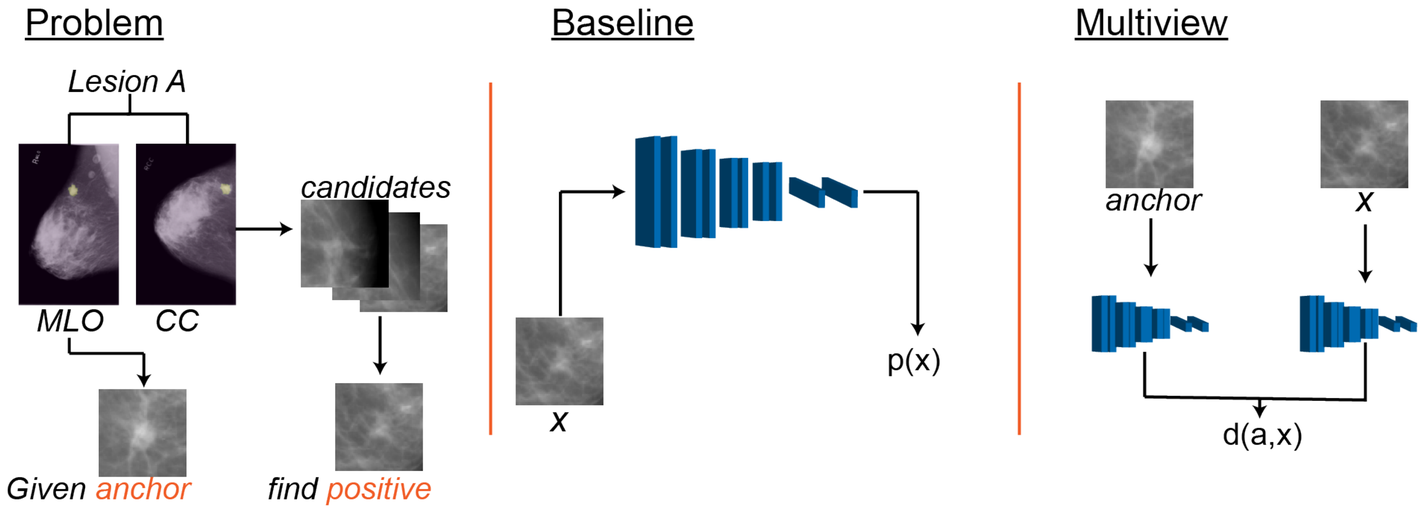
Baseline: Convolutional Neural Network architecture trained from scratch by minimizing the cross entropy loss function. **No information about the anchor is used for the classification.**

Multiview: Same architecture trained by minimizing the triplet loss. Candidates are ranked by proximity to the anchor. **Based solely on similarity to the anchor.**

Hybrid: Baseline model, but the top ranking candidate from the multiview model is given a bonus.

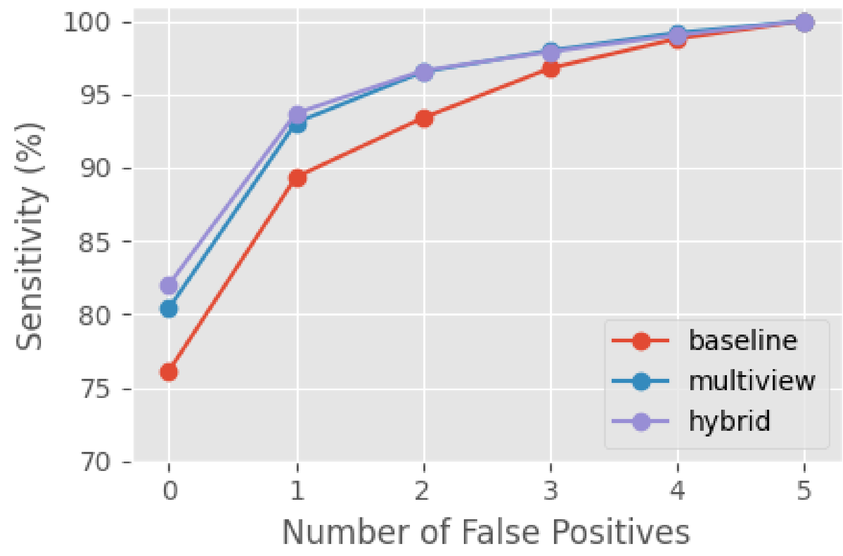
Data

The CBIS-DDSM dataset was used. Only images containing one mass visible in both the CC and MLO view were selected. Candidates were obtained by taking one patch centered in the lesion (positive) and five patches from false positive locations obtained with a pre-trained lesion detector (negatives).



Experimental Results

Multiview outperforms the baseline;
The Hybrid strategy is the top performing;



Main Conclusions

Using information about the lesion appearance in one view helps lesion detection in the other view, suggesting **current algorithms can be improved by integrating information at lesion-level instead of at the image-level.** Future work should focus on how to do this integration for state-of-the-art methods.

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