Comparison between machine learning and deep learning for the classification of mammograms in BI-RADS

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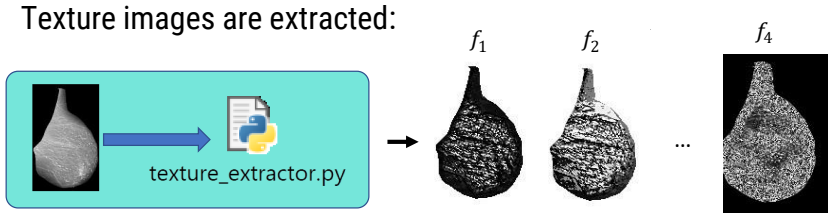
Epidemiological statistics portray the fact that breast cancer is a significant health concern and economic burden, undoubtedly justifying the need for breast cancer screening. Nevertheless, how the current diagnosis is made in clinical practice is prone to errors. Hence, there is a necessity for a tool to assist physicians when classifying mammographies into the four categories of BI-RADS. In this project, two approaches are presented: one based on machine learning and the other one based on deep learning. Mainly, beyond the comparison of the results, what is intended is to analyze and discuss in-depth the process followed to achieve their respective developments and subsequent implementation. Thus, the difficulties and drawbacks found when evaluating and comparing the two models are shown. Consequently, three mammography databases are used that experts have already classified following the BI-RADS guidelines.

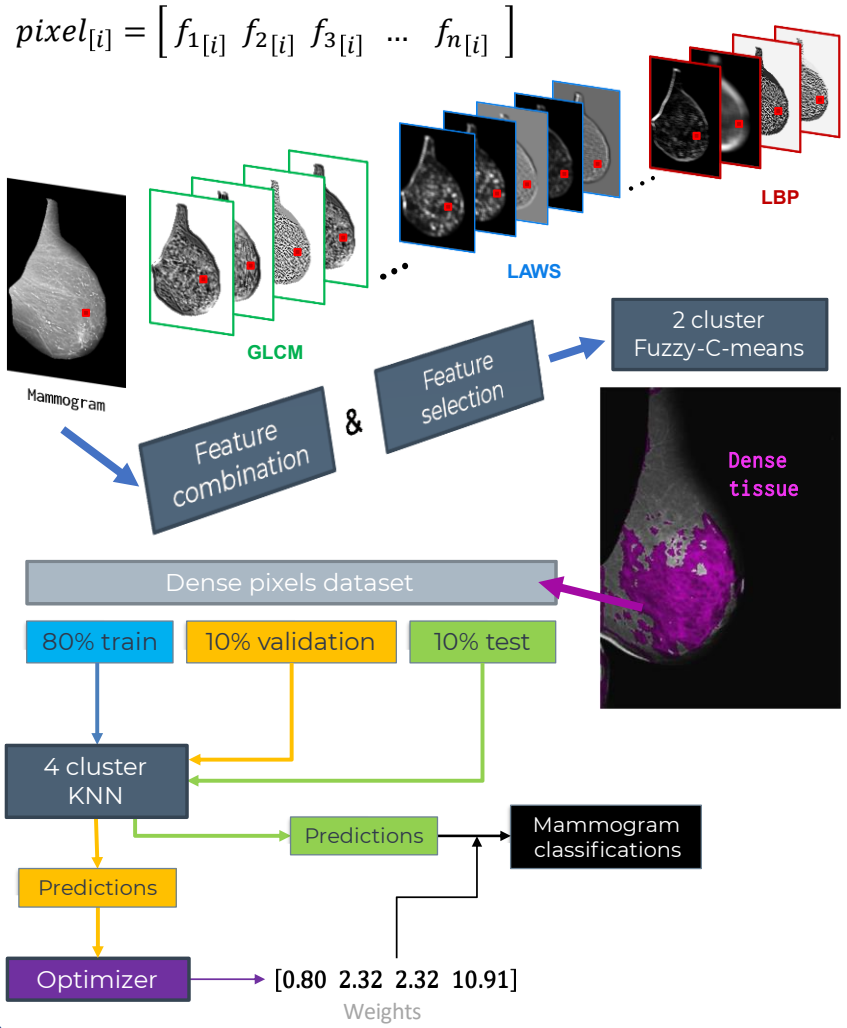
MACHINE LEARNING

Texture images are extracted:



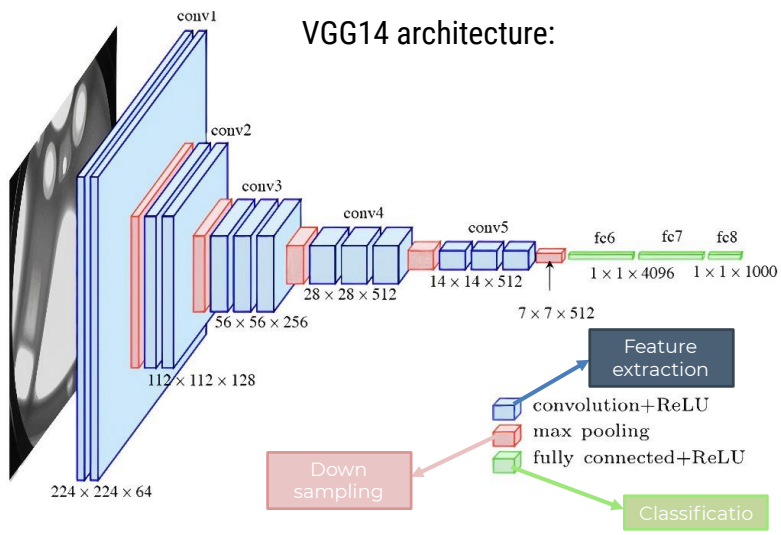
Each mammogram's pixel is defined:

$$pixel_{[i]} = \left[f_{1_{[i]}} \; f_{2_{[i]}} \; f_{3_{[i]}} \; \dots \; f_{n_{[i]}} \right]$$

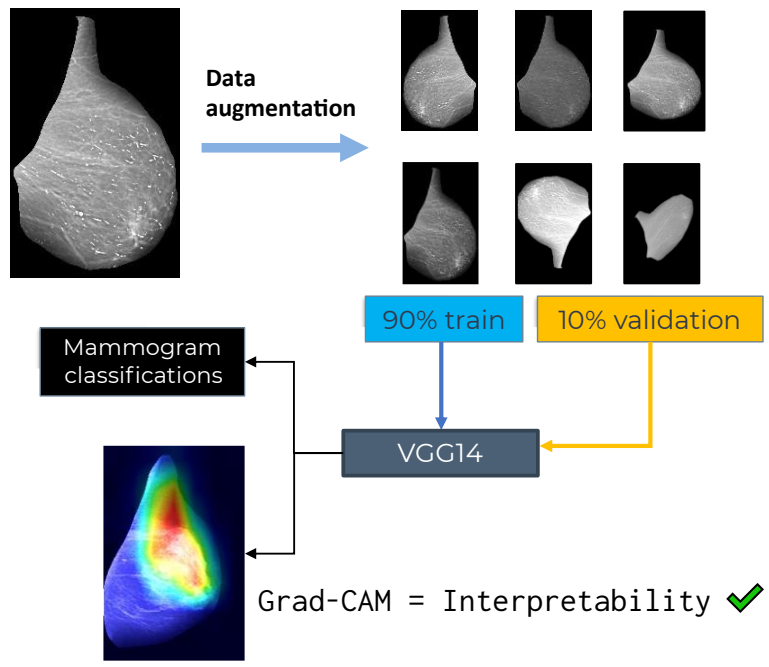


DEEP LEARNING

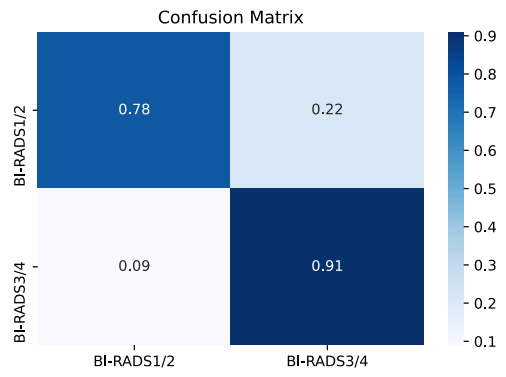
VGG14 architecture:



Data is augmented and, after training the model, predictions can be done:



RESULTS



Results obtained are presented and an exhaustive discussion is performed, demonstrating that the machine learning model requires great effort and experience to obtain acceptable results. In contrast, the deep learning model shows a much higher accuracy and can be considered as key for future work or research in this area.