

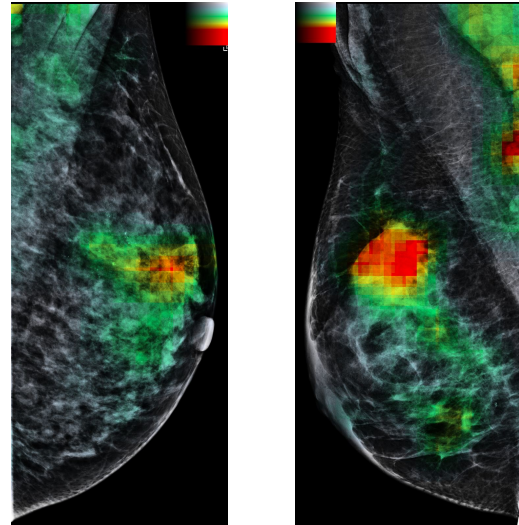
Evaluation of an AI System for Breast Cancer Screening in Mammograms of Young Women

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Objectives

In this work, we sought to make adaptations to a previously developed architecture by New York University (NYU) [1], in order for it to function in the context of the Brazilian national health system (SUS), with speed and reliability in mind, to provide an automated screening process to aid radiologists, while simultaneously focusing the diagnosis training in identifying lesions in young women (as lesions in this subset of patients are frequently smaller than those over 40 years old). Historically, this has been a complex task, due to difficulties inherent to the problem at hand; it isn't uncommon for health officers to struggle when identifying possibly irregular nodules in younger women, on account of the tumors' smaller stature and overall differences in breast anatomy in this subset of individuals.



Methodology

For the adaptation of the NYU neural network, we applied the *transfer learning* technique, Utilizing both open source datasets INbreast and CBIS-DDSM, as well as over 10 years of mammography exams done in the ICESP complex, after an extensive anonymization process. Posterior to training and validation, we provided a simple graphical user interface for easy software operation, along with a handful of added features, such as *heatmaps* in PNG format and a full, 4-image exam diagnosis. It is also important to mention that, despite the present focus on the NYU network, many other architectures [2] were also rigorously tested, but [1] was the overall better performer.

Results

An overall AUC (Area Under Cover) of 0.819 was achieved for all age groups, and 0.876 for women under 40 years of age. More details can be found in our publication [3]. Below are examples of positive screenings for malign lesions:

Conclusion

Based on the data provided by our experiments, it can be shown that there wasn't a significant drop in performance when utilizing the NYU network, designed for general population screenings, in a set of mammograms of young women.

References

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3. Petrini, D. G. P., Valente, G. V., Shimizu, C., Roela, R. A., de Araújo, G. M., Tucunduva, T. C. D. M., ... & Kim, H. Y. (2020). Evaluation of an AI system for breast cancer screening in mammograms of young women.