Artificial Intelligence in Cancer

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Abstract

Background and Aim: In the last decade, the battle against cancer has reached a new level: the merger between precision medicine and artificial intelligence (AI) models. AI is omnipresent in the healthcare system, providing fast, accurate diagnosis. By using microarrays of deoxyribonucleic acid and mass spectrometry, AI models such as artificial neural networks use their adaptive learning and nonlinear mapping properties to personalize their hyperparameters providing personalized diagnosis and treatment. *Methods:* Several novel adaptive neural networks are presented. Their diagnosis performance and computational speed is increased by having genomic knowledge embedded in their architecture. The *fLogSLFN* model uses the logistic regression to initialize the weights between the input and the hidden layer in a single hidden feedforward neural network (SLFN). This AI model can be applied when dealing a with a two-class decision problem. Because the *fLogSLFN* was limited to binary problems, we have extended it to the case of multiple classes by considering two approaches: a parallel *LogSLFN* and a cascaded *LogSLFN*. The parallel approach *pLogSLFN* uses the one-against-all method and thus transforms the multi-decision class problem into a two-class problem. The logSLFN is applied in parallel using the logistic regression to compute the weights for each class. The cascaded approach *cLogSLFN* uses the logistic regression to compute the weights for the first class, then eliminates them, and so on. *Results*: The *fLogSLFN* has proved to be successful in differentiating breast and lung cancer. The *pLogSLFN* and *cLogSLFN* have been applied on datasets concerning differentiating breast, kidney, colon, lung, prostate, and liver cancer. The statistical analysis revealed that the *pLogSLFN* outperforms the *cLogSLFN*. *Conclusions*: Diagnosing and treating cancer has changed through precision medicine. The DNA arrays contain crucial information and can be processed through AI models. Three novel AI models that provide fast and reliable diagnosis have been discussed.

Keywords: Artificial neural networks; Logistic regression; Cancer; Precision medicine