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Pattern capacity of a single quantum perceptron

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Artificial neural networks have proven to be an extremely efficient computational model in specific tasks such as pattern recognition or image classification and have revolutionized the field of data analysis on classical computers. At the same time, the advent of quantum computation has shown that purely quantum mechanical features such as coherence and entanglement allow for addressing hard computational tasks with an exponential improvement of the performances compared to classical computation. The great success achieved in these two fields has motivated a surge of interest in quantum machine learning, with the aim to understand whether the two fields can benefit from each other. Recent developments in this field have seen the introduction of several models to generalize the classical perceptron to the quantum regime. The capabilities of these quantum models need to be determined precisely in order to establish if a quantum advantage is achievable. Here we use a statistical physics approach to compute the pattern capacity of a particular model of quantum perceptron realized by means of a continuous variable quantum system.

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