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THE ZETA FUNCTION FOR LEARNING THEORY AND RESOLUTION OF SINGULARITIES

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We will consider the maximum pole of the zeta function, which is the integral of the Kullback function and a certain a priori probability density function. Recently, Watanabe proved that the maximum pole of the zeta function asymptotically gives the stochastic complexity of non-regular learning machine. In order to calculate the maximum pole of the zeta function, first we obtain the desingularization of the Kullback function. The main problems in obtaining the desingularization is that most of the Kullback functions are degenerate with respect to their Newton polyhedrons. We note that there are many classical results to calculate the maximum poles of the zeta functions using the desingularization of plane curves in the dimension two. Also there have been many investigations for the case of the prehomogenious spaces, which corresponds a special case. The Kullback functions do not occur in the prehomogenious spaces.

In this talk, we use the inductive method to obtain the exact maximum pole of the zeta functions for layered neural networks, and give the asymptotic form of the stochastic complexity explicitly.

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