Using Existential Theory of the Reals to Bound VC-Dimension

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UUCS-20-008

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22 April 2020

Abstract

We solve the open problem of bounding the VC-dimension of inflated polynomials. To achieve this bound, we use the decidability algorithms for existential theory of the reals. Further, our results are generalized to give an upper bound on the VC-dimension for all semialgebraic sets constructed from a finite set of bounded degree polynomials. The VC-dimension of a geometric object, represented by a range space, encodes its geometric complexity. The VC-dimension of range spaces has applications towards the learnability of corresponding function classes within computational learning theory. Finally, VC-dimension is important in probability theory, computational geometry, and model theory.