Depth as Randomness Deficiency

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Abstract

Depth of an object concerns a trade-off between computation time and excess of program length over the shortest program length required to obtain the object. It gives an unconditional lower bound on the computation time from a given program in absence of auxiliary information. Variants known as "logical depth" and "computational depth", are expressed in Kolmogorov complexity theory. In this article we derive quantitative relation between logical depth and computational depth and unify the different "depth" notions by relating them to A. Kolmogorov and L. Levin's fruitful notion of "randomness deficiency". Subsequently, we revisit the computational depth of infinite strings, introducing the notion of *super deep* sequences and relate it with other approaches. Joint work with Armando Matos, André Souto e Paul Vitányi.