
Universal Learning vs. No Free Lunch results - can there be learners that do not require task-specific knowledge?

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Abstract. The so called No-Free-Lunch principle is a basic insight of machine learning. It may be viewed as stating that in the lack of prior knowledge (or inductive bias), every learning algorithm may fail on some *learnable* task.

In recent years, several paradigms for "universal learning" have been proposed and advocated. These range from paradigms of almost science-fictional nature, like "Automation of science", through practically oriented Deep Belief Networks, to theoretical constructs like Universal Kernels, Universal Priors and Universal Coding for MDL-based learning.

In this talk I address this apparent contradiction by examining and analyzing several possible definitions of universal learning. I will show a basic no-free-lunch theorem for such generic learning and discuss how it applies to the above mentioned universal learning paradigms.

Keywords

THEORY, UNIVERSAL LEARNING, NO-FREE-LUNCH