How Big Data changes Statistical Machine Learning

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Abstract

This presentation illustrates how big data forces change on algorithmic techniques and the goals of machine learning, bringing along challenges and opportunities.

1. The theoretical foundations of statistical machine learning traditionally assume that training data is scarce. If one assumes instead that data is abundant and that the bottleneck is the computation time, stochastic algorithms with poor optimization performance become very attractive learning algorithms. These algorithms quickly became the backbone of large-scale machine learning and are the object of very active research.

2. Increasing the training set size cannot improve average errors indefinitely. However this diminishing returns problem vanishes if we measure instead the diversity of conditions in which the trained system performs well. In other words, big data is not an opportunity to increase the average accuracy, but an opportunity to increase coverage. Machine learning research must broaden its statistical framework in order to embrace all the (changing) aspects of real big data problems. Transfer learning, causal inference, and deep learning are successful steps in this direction.

Biography

Léon Bottou received the Diplôme d'Ingénieur de l'École Polytechnique (X84) in 1987, the Magistère de Mathématiques Fondamentales et Appliquées et d'Informatique from École Normale Supérieure in 1988, and a doctorat from Université de Paris-Sud in 1991. His research career took him to AT&T Bell Laboratories, AT&T Labs Research, NEC Labs America and Microsoft. He joined Facebook AI Research in 2015.

The long term goal of Léon's research is to understand how to build human-level intelligence. Although reaching this goal requires conceptual advances that cannot be anticipated at this point, it certainly entails clarifying how to learn and how to reason. Leon Bottou best known contributions are his work on neural networks in the 90s, his work on large scale learning in the 00's, and possibly his more recent work on causal inference in learning systems. Léon is also known for the DjVu document compression technology.