عنوان مقاله:

Information Bottleneck and its Applications in Deep Learning

محل انتشار:

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خلاصه مقاله:

Information Theory (IT) has been used in Machine Learning (ML) from early days of this field. In the last decade, advances in Deep Neural Networks (DNNs) have led to surprising improvements in many applications of ML. The result has been a paradigm shift in the community toward revisiting previous ideas and applications in this new framework. Ideas from IT are no exception. One of the ideas which is being revisited by many researchers in this new era, is Information Bottleneck (IB); a formulation of information extraction based on IT. The IB is promising in both analyzing and improving DNNs. The goal of this survey is to review the IB concept and demonstrate its applications in deep learning. The information theoretic natureof IB, makes it also a good candidate in showing the more general concept of how IT can be used in ML. Two important concepts are highlighted in this narrative on the subject, i) the concise and universal view that IT provides on seemingly unrelated methods of ML, demonstrated by explaining how IB relates to minimal sufficient statistics, stochastic gradient descent, and variational auto-encoders, and ii) the common technical mistakes and problems caused by applying ideas from IT, which is discussed by a careful study of some recent methods suffering from them.

کلمات کلیدی:

Machine Learning; Information Theory; Information Bottleneck; Deep Learning; Variational Auto-Encoder

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