GENEL SEMİNER

"Mathematical foundations of computational statistics and machine learning"

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Özet: Learning from data has become a great research challenge in science, engineering and OR. Data mining is a key research field in applied sciences and technology, and is an indispensable tool for analyzing real world problems. Developing technology brings multitudes of data sources to be analyzed which require the integration of the theoretical sciences and applied sciences in an interdisciplinary environment. Mathematical modeling is one of the major components of applied mathematics that provides understanding of the behavior of the data in real world scenarios such as in engineering and biology.

Machine learning (ML) is one of the emerging fields of predictive modeling that incorporates different subfields of applied mathematics and statistical learning, e.g., optimization, probability. Classification is still a major conundrum and central research topic in machine learning as the real-world data become more complex and the number of data sources increases. One of the important steps in classification is to determine the similarity metric (or function) of data points which is defined by a kernel function. The kernel function has two major impacts on classification problems. First, it reflects the similarity between each pair of points in an n by n positive semi-definite matrix. Secondly, it provides the mapping of data by a nonlinear function to a higher dimensional space in which the data is linearly separable.

In this talk, mathematical foundations of learning from multiple sources, and our novel method called Infinite Kernel Learning (IKL) and the recent developments of IKL will be discussed. Furthermore, applications on bioinformatics and other domains will be given by numerical results with error analysis and statistical analysis. The necessary and sufficient conditions for the existence and uniqueness of the solution will be addressed.

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