Learning graphs from observed graph signals

Description: Graph Signal Processing (GSP) is a new and emerging field at the intersection of Signal Processing, Graph Theory, and Machine Learning. GSP manifestates the generalization of standard Signal Processing tools, for example sampling, filtering, recovery, to signals recorded in complex environments. Such an environment comprises of multiple entities whose interrelations, or interactions, can be encoded in a graph and specifically in the links between its nodes. In more formal terms, a graph signal is a function defined on the nodes of a graph and can be represented as a vector with one component per graph node. In order to enjoy the promised benefits of GSP methods, the knowledge of the underlying graph is needed, which is a strong requirement for many real-world problems where the graph may be little or not at all known.

In this work we are going to study the *data-driven Graph Learning* problem where the objective is to use Machine Learning techniques to infer the underlying graph based on observed graph signals. In nature, this is an ill-posed problem since many graphs may be able to explain equally well the data. Therefore, the challenge is to introduce the right assumptions regarding the graph signals, the graph, and the interrelation between the two in order to solve tractable optimization problems to reach meaningful solutions. A survey of existing works is part of the mission of the project, as for target applications, those include physiological data such as fMRI, epidemiological data, or complex data from several other sources.

Topic keywords: graph signal processesing, graph theory, sparse coding, graph inference

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