

Kernel-based approximation methods on graphs

Wolfgang Erb

University of Padova

wolfgang.erb@unipd.it

We study how the concept of positive definite functions can be transferred to a graph setting in order to approximate graph signals with generalized shifts of a graph basis function (GBF). This concept merges kernel-based approximation with spectral theory on graphs and can be regarded as a graph analog of radial basis function methods in euclidean spaces or on the sphere. We provide several descriptions of positive definite functions on graphs, the most relevant one is a Bochner- type characterization in terms of positive Fourier coefficients. These descriptions allow us to design GBF's and to study GBF approximation in more detail: we are able to characterize the native spaces of the interpolants, we give explicit estimates for the approximation error and provide ways on how to calculate the approximants in an efficient manner. As a final application, we show how GBFs can be used for classification tasks on graphs.