Dmitry PONOMAREV, Inria Centre Côte d'Azur

"Convolution integral equations on an interval and asymptotic solution of the related spectral problem"

Integral operators with kernels depending on difference of its arguments arise in various applied areas of physics and engineering in addition to being a subject of a purely theoretical interest. After reviewing the classical Wiener-Hopf method dealing with convolution equations on a half-line, we focus on the homogeneous integral equation on a finite interval. Restricting ourselves to the class of positive definite kernels given by decaying smooth even real-valued functions, we show how an extended Wiener-Hopf method can be used to construct asymptotic approximation to the solutions (i.e. eigenvalue-eigenfunction pairs) when the interval is large. The proposed method allows obtaining results which generalize those previously available for fast (mostly exponentially) decaying kernels. If time permits, we will also deal with the case of the small interval proposing an intuitive technique based on the approximation by a kernel admitting a commuting differential operator and furnishes the solution in terms of special functions (prolate spheroidal harmonics).