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Compactness results for a class of limiting interpolation methods

Boundedness and compactness problems in Banach function spaces for classical operators and integral transforms arise naturally in many different areas of mathematical analysis as boundary value problems for PDE's, spectral theory for differential operators, stochastic processes, etc...

The usual settings study boundedness or compactness of these operators when they act between Lebesgue spaces. However, these operators frequently appear acting between more general function spaces such as Orlicz or Lorentz spaces. At this point, interpolation theory is a useful tool.

If we wish to obtain spaces that are very close to L_1 or L_∞ by means of interpolation, or if we need to refine the interpolation scale, renewed interpolation methods are required. In this lecture, we will use the interpolation methods defined by means of slowly varying functions and rearrangement invariant spaces. Our goal is to study how compact operators behave when they are interpolated by these methods. We will present a series of theorems that describe how these methods preserve compact operators. Finally, we will show applications to integral operators acting between grand and small Lebesgue spaces and to Fourier Transform related operators.