FABRIZIO COLOMBO, Politecnico di Milano

The nonlocal Fourier law and the fractional heat equation

In this talk, we discuss fractional powers of vector operators, focusing on the gradient operator with nonconstant coefficients, which turns out to be bisectorial. Our approach is based on the spectral theory on the S-spectrum. The main difficulty is that, unlike in the case of sectorial operators, the spectrum of a bisectorial operator extends to the negative real axis, where the fractional power function is not analytic. To overcome this, we introduce a new definition of fractional powers adapted to the bisectorial setting. Building on previous results for bisectorial vector operators and weak solutions, we extend this definition to abstract vector operators. Finally, we apply it to the gradient operator and show that its fractional powers provide a rigorous foundation for nonlocal Fourier laws in heat propagation.