

BERNOULLIS TAFELRUNDE

GRADUATE STUDENT SEMINAR

Monday, 24 April 2023, 12:15-13:00
Seminarraum 05.002, Spiegelgasse 5

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“Non-local” calculus for beginners

ABSTRACT

Differential calculus, as developed by Newton and Leibniz, determines the concept of a derivative from the definition of limit. Since this approach depends only “locally” on the point where it is defined, classical differential calculus can be narrow to represent many physical phenomena. Fractional derivatives are one of the oldest and most known approaches to overcome this issue. In the last century, substantial progress has been developed in establishing “non-local” alternatives.

The aim of this seminar is to present a rigorous approach to define “non-local” operators and a “non-local” vector calculus, introduced by Du et al. in 2011. The goal is to show the analogy with classical differential operators and classical formulas of differential calculus. In this setting, we arrange some models corresponding to the ones known in elementary physics. In particular, we introduce a “non-local” balance law which leads to the study of a basic elliptic equation. In the last part, we give a brief overview on the study of a more complex model, specifically a “non-local” version of the Cahn–Hilliard–Oono equation.