Oberseminar
Analysis und Theoretische Physik

Prof. Dr. Jürgen Saal
(Universität Düsseldorf)

Is the Helmholtz decomposition necessary for well-posedness of the Stokes equations?

(Incomressible) Fluid flow in a domain is described by the fundamental Stokes (linear) and Navier-Stokes (nonlinear) equations.The Helmholtz decomposition into solenoidal and gradient fields serves as a helpful tool to analyze these systems. It has been an open question for some decades, whether the existence of the Helmholtz decomposition (which is equivalent to weak well-posedness of the Neumann problem) is necessary for well-posedness of Stokes and Navier-Stokes equations in the L^q-setting for $1<q<\infty$. Note that by a classical result of Bogovski\u{i} and Maslennikova there are (uniformly) smooth domains, so-called non-Helmholtz domains, such that the Helmholtz decomposition does not exist. In my talk, I intent to present positive and negative results on well-posedness of the Stokes and Navier-Stokes equations in $L^q$for a large class of uniform $C^{2,1}$-domains.
In particular, classes of non-Helmholtz domains are addressed. This will include a comprehensive answer to the open question for the case of partial slip type boundary conditions. The project is a joint work with Pascal Hobus.

Dienstag, 15.06.2021, 15:00 Uhr
Die Veranstaltung findet online statt.

Interessierte erhalten die Zugangsinformationen von Prof. Walker (walker@ifam.uni-hannover.de). Mitglieder des Oberseminars haben Zugang über die Meetings der StudIP-Veranstaltung „Oberseminar Analysis und Theoretische Physik".

Veranstalter:

Prof. Dr. Wolfram Bauer
Prof. Dr. Joachim Escher
Prof. Dr. Johannes Lankeit
Prof. Dr. Elmar Schrohe
Prof. Dr. Christoph Walker