Universität Hamburg
DER FORSCHUNG | DER LEHRE | DER BILDUNG

Fakultät für Mathematik, Informatik
und Naturwissenschaften
Fachbereich Mathematik

Lothar-Collatz-Kolloquium für Angewandte Mathematik

Donnerstag, den 20. Oktober 2022, um 17:15 Uhr, im Hörsaal 5

Dr. Cordula Reisch*
(Technische Universität Braunschweig, Institut für Partielle Differentialgleichungen)

Analytical results for reaction-diffusion equations and their impact on modeling inflammation

Zusammenfassung/Abstract:

Reaction-diffusion equations are a popular field of research as their qualitative solutions vary significantly, depending on the interplay of reaction and diffusion. Solutions can show effects such as traveling waves, segregation phenomena, leveling solutions or blow ups. While there are some well known results predicting the solution type for special reaction-diffusion equations, there are still many white spots in predicting the qualitative solution properties of other equations.

Applications in mathematical biology are often based on microscopic cell scale effects. However, the time and space-dependent mechanisms on this scale can rarely be observed and quantified. To solve this issue, reaction-diffusion equations can be applied to create mesoscopic scale models. Those models act on a larger cell scale and abstract from unknown mechanisms or processes with various involved cells. The foundation on a smaller scale leads to reaction-diffusion equations including space-dependent and non-local reaction terms. For these types of equations, analytical methods for predicting the qualitative behavior of solutions are still an open field of research.

In this talk, I will present a reaction diffusion model family for describing inflammations and use analytical results for justifying the choice of mechanisms. The adaptation of results on this equation type allows ranking the mechanisms with respect to qualitative observations of infection courses. The combination of different approaches such as the analysis of the underlying dynamical system, reduced models with fewer components or linearized models allow to chose a model out of a model family. The selected model is then used for investigating medication strategies.

Kontakt:
Prof. Dr. Hendrik Ranocha
Angewandte Mathematik
Raum 114, Tel.: 040 42838-4942
E-Mail: hendrik.ranocha@uni-hamburg.de
Web: https://www.math.uni-hamburg.de/forschung/bereiche/am/struct-num/personen/ranocha-hendrik.html

* **Dr. Cordula Reisch**
Technische Universität Braunschweig, Institut für Partielle Differentialgleichungen
Universitätsplatz 2, 38106 Braunschweig
E-Mail: c.reisch@tu-bs.de
Web: https://www.tu-braunschweig.de/ipde/personal/creisch

Stand: 11.10.2022 (Katrin Kopp)