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## PDE & Dynamical Systems | Department of Mathematics

The complete mathematical model consisting of the conservation and balance laws and the constitutive theories is a system of non-linear partial differential equations (PDEs) in space and time.

## Nonlinear PDEs: A Dynamical Systems Approach

These patterns can be analysed on the mesoscopic and/or macroscopic level by studying the limiting mean field PDEs, which lead to nonlinear kinetic or hyperbolic equations. These PDEs are fairly well understood in classic applications like physics, far less is known in novel applications in socio-economic sciences posing significant challenges to researchers.

## Nonlinear Analysis - Theory and Methods | Nikolaos S ...

This motivates the mathematical study of the details of singularity formation in nonlinear PDEs. Our group focuses on the investigation of blowup dynamics in nonlinear wave equations and heat flows in the so-called energy supercritical case. We mainly use tools from functional analysis, operator theory and spectral analysis as well as ODE methods.

**Mathematical Modeling and Simulation of Nonlinear Process ...**

Introduces the basic methods used in the qualitative mathematical analysis of nonlinear models; Reveals a number of surprising interactions between several fields of mathematics, including topology, functional analysis, mathematical physics, and potential theory

**A thermodynamically consistent non-linear mathematical ...**

(with M. Ghergu) **Nonlinear PDEs: Mathematical Models in Biology, Chemistry and Population Genetics**, Springer Monographs in Mathematics, Springer Verlag, Heidelberg, 2012 (with D. Repovš) **Partial Differential Equations with Variable Exponents: Variational Methods and Qualitative Analysis**, CRC Press, Taylor & Francis Group, Boca Raton FL, 2015

**Emerging PDE models in Socio-Economic Sciences**

**Abstract.** The solution of nonlinear mathematical models has much importance and in soliton theory its worth has increased. In the present article, we have investigated the Caudrey-Dodd-Gibbon and Pochhammer-Chree equations, to discuss the physics of these equations and to attain soliton solutions.

**Nonlinear PDEs | SpringerLink**

**Nonlinear PDEs: Mathematical Models in Biology, Chemistry and Population Genetics.** January 2012; Springer Monographs in Mathematics 160; DOI: 10.1007/978-3-642-22664-9.

**Vicentiu D. Radulescu**

Home » Research » **Nonlinear and Nonlocal PDEs. Nonlinear and Nonlocal PDEs. Image Denoising. Noisy image. Denoised image using variable order fractional model. Denoised image using total variation regularization. ... Computational Methods in Applied Mathematics, 17, 2017. Links | BibTeX**

**Nachwuchsgruppe Singularity formation in nonlinear PDEs**

In mathematics and physics, a nonlinear partial differential equation is a partial differential equation with nonlinear terms. They describe many different physical systems, ranging from gravitation to fluid dynamics, and have been used in mathematics to solve problems such as the Poincaré conjecture and the Calabi conjecture. They are difficult to study: there are almost no general techniques ...

**Nonlinear PDEs: Mathematical Models in Biology, Chemistry ...**

Mathematical models of phenomena in the physical sciences or processes in the engineering and biological sciences invariably take the form of nonlinear dynamical systems and partial differential equations (PDEs). The expertise of the Nonlinear Dynamics and Applied PDEs group lies in attacking these systems with the modern techniques of applied ...

**Nonlinear Pdes Mathematical Models In Biology Chemistry ...**

This is an introductory textbook about nonlinear dynamics of PDEs, with a focus on problems over unbounded domains and modulation equations. The presentation is example-oriented, and new mathematical tools are developed step by step, giving insight into some important classes of nonlinear PDEs and nonlinear dynamics phenomena which may occur in PDEs.

### **Nonlinear partial differential equation - Wikipedia**

6 Multilevel Picard approximation methods for nonlinear PDEs22 7 Mathematical results for neural network approximations for PDEs25 8 Conclusion29 1 Introduction The mathematical models for many problems around us are in the form of partial differential equations (PDEs) in high dimensions. Notable examples include:

### **Nonlinear and Nonlocal PDEs – CMAI**

It will appeal to both beginners and seasoned researchers in nonlinear science, numerous areas of physics (optics, quantum physics, biophysics), and applied mathematics (ODEs, PDEs, dynamical systems, machine learning) as well as engineering.

### **Nonlinear Pdes Mathematical Models In**

It addresses researchers and post-graduate students working at the interplay between mathematics and other fields of science and technology and is a comprehensive introduction to the theory of nonlinear partial differential equations and its main principles also presents their real-life applications in various contexts: mathematical physics, chemistry, mathematical biology, and population ...

### **Nonlinear PDEs: Mathematical Models in Biology, Chemistry ...**

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### **Algorithms for Solving High Dimensional PDEs: From ...**

Nonlinear Pdes Mathematical Models In It addresses researchers and post-graduate students working at the interplay between mathematics and other fields of science and technology and is a comprehensive introduction to the theory of nonlinear partial differential equations and its main principles also

### **Solitary Wave Solution of Nonlinear PDEs Arising in ...**

For example, PDEs are used in mathematical models of weather and climate, in medical imaging technologies, in the design of new composite materials, in models of elementary particle interaction and of the formation of galaxies, in models of cancerous tumor growth or of blood flow in the heart, in simulating semiconductor devices, in models of bacterial colonies, in models of financial markets ...

### **Nonlinear PDEs - Mathematical Models in Biology, Chemistry ...**

The chapter on reaction-diffusion models has challenging mathematical problems coming from various models, with the nonlinearities being derived from chemical reaction formulas and pattern-formation of spatial tissue structures in morphogenesis. The appendix includes technical results and is extremely useful.

### **Nonlinear Dynamics & Applied PDEs - Institute of Applied ...**

Most mathematical models of enzyme kinetics are based on reaction diffusion equations or rate equations containing nonlinear terms related to the kinetics of the

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enzyme reaction. Powerful and accurate analytical (HPM, HAM, ADM, etc.) and numerical mathematical methods have been employed for their resolution under steady and nonsteady state conditions.

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