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~~Abstract. We discuss existence, uniqueness, and structural stability of solutions of nonlinear differential equations of fractional order.~~

# Acces PDF The Analysis Of Fractional Differential Equations An Application Oriented Exposition Using Different

The differential operators are taken in the Riemann-Liouville sense and the initial conditions are specified according to Caputo's suggestion, thus allowing for interpretation in a physically meaningful way. We investigate in particular the dependence of the solution on the order of the differential equation and on the initial condition, and we relate ...

Analysis of Fractional Differential Equations - ScienceDirect  
Journal of Mathematical Analysis and Applications. Abstract We discuss existence, uniqueness, and structural stability of solutions of nonlinear differential equations of fractional order. The differential operators are taken in the Riemann-Liouville sense and the initial conditions are specified according to Caputo's suggestion, thus allowing for interpretation in a physically meaningful way.

[PDF] Analysis of Fractional Differential Equations ...

The Analysis of Fractional Differential Equations Provides a detailed mathematical description of the class fractional differential operators that is most important in applications in physics, engineering, etc.

The Analysis of Fractional Differential Equations - An ...

Then, the fractal-fractional derivative of  $u$  of order  $\alpha$  in Riemann-Liouville sense with power law is presented by : (2.1)  $D_t^\alpha u(t) = \int_a^t (t-y)^{\alpha-1} u'(y) dy$ ,  $0 < \alpha < 1$ , where (2.2)  $du(y) = \lim_{t \rightarrow y} \frac{u(t) - u(y)}{t - y}$ .

Analysis of fractal fractional differential equations ...

It concentrates on the class of fractional derivatives most important in applications, the Caputo operators, and provides a self-contained, thorough and mathematically rigorous study of their properties and of the corresponding differential equations. The text is a useful tool for mathematicians and researchers from the applied sciences alike.

The Analysis of Fractional Differential Equations ...

We discuss existence, uniqueness, and structural stability of solutions of nonlinear differential equations of fractional order. The differential operators are taken in the Riemann-Liouville sense...

Analysis of Fractional Differential Equations | Request PDF

A multi-order fractional differential equations (M-OFDEs) can be presented in the following form , , (16)  $D_t^\alpha u(t) = f(t, u(t), D_t^{\alpha_1} u(t), D_t^{\alpha_2} u(t), \dots, D_t^{\alpha_{n-1}} u(t))$ ,  $u(0) = c_k$ ,  $n \in \mathbb{N}$ ,  $k = 0, 1, 2, \dots$ , where  $\alpha_i \in \mathbb{R}$ ,  $0 < \alpha_1 < \alpha_2 < \dots < \alpha_{n-1} < \alpha < n$  and  $D_t^{\alpha_i}$  is used to represent the Caputo fractional derivative of order  $\alpha_i$ .

Analysis of differential equations of fractional order ...

By applying fractal fractional differential operator to , we have (4.14)  $D_t^\alpha u(x, t) = \int_0^t u(x, \tau) d\tau + a u(x, t) + u^2(x, t)$

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$v(x, t) D_t^\alpha, \alpha > 0$  FFD  $v(x, t) = d_1 \nabla^2 v(x, t) + b - u^2(x, t) v(x, t)$ , where  $a$  and  $b$  are positive parameters,  $d = d_1 / d_2$  is the diffusion coefficient ratio.

Modelling and analysis of fractal-fractional partial ...

IET Digital Library: Stability analysis of fractional differential time-delay equations. This study provides a novel analytical approach to studying the solutions and stability of fractional differential delay equations without using Lyapunov function method. By applying the properties of Caputo fractional derivatives, the Laplace transform and the Mittag-Leffler function, the authors first provide an explicit formula and solution bounds for the solutions of linear fractional differential ...

Stability analysis of fractional differential time-delay ...

In the present study, we analyze the following Caputo-Fabrizio fractional differential equations (C-FFDE) to obtain uniqueness and existence criteria of solutions [ 5, 7, 35 ]: 
$$\begin{cases} {}^{\text{CF}}D^\alpha u(t) = f(t, u(t)), & \text{quad } 0 < \alpha < 1, \\ u(0) = u_0. \end{cases} \quad (1)$$

Analysis of differential equations involving Caputo ...

Fractional calculus is a branch of mathematical analysis that studies the several different possibilities of defining real number powers or complex number powers of the differentiation operator  $D$ .  $Df(x) = \frac{d}{dx}f(x)$ , and of the integration operator  $J$ .

Fractional calculus - Wikipedia

ABSTRACT. In this paper, we study finite-time stability of fractional differential systems with variable coefficients, which includes the homogeneous and nonhomogeneous delayed cases. Based on the theories of fractional differential equations, we obtain three theorems on the finite-time stability, which give some sufficient conditions on finite-time stability, respectively, for homogeneous systems without and with time delay and for the nonhomogeneous system with time delay.

Finite-time stability analysis of fractional differential ...

Equations involving fractional differential operators are called Fractional Differential Equations (FDE). One can consider various types of FDEs, such as heat and diffusion type FDE, including fractional derivatives instead of integer order ones in time, or any evolution system with fractional derivatives in time and with fractional operators in space variable, as for example fractional (sub-)Laplacian.

Fractional derivatives - Ghent Analysis & PDE Center

This paper aims to study the stability of the fractional differential equations without inputs. The fractional differential equations without inputs considered in this paper are defined with the...

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(PDF) STABILITY ANALYSIS OF THE FRACTIONAL DIFFERENTIAL ...

This paper aims to present the existence, uniqueness, and Hyers-Ulam stability of the coupled system of nonlinear fractional differential equations (FDEs) with multipoint and nonlocal integral boundary conditions.

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Recently there has been an increasing interest in and widely-extended use of differential equations and systems of fractional order (that is, of arbitrary order) as better models of phenomena in various physics, engineering, automatization, biology and biomedicine, chemistry, earth science, economics, nature, and so on.

Special Functions and Analysis of Differential Equations ...

Consider the following system of impulsive fractional functional differential equations (2.1)  ${}^c D^q x(t) = f(t, x(t))$ ,  $t \in [t_k, t_{k+1})$ ,  $x(t_k) = I_k(x(t_k))$ ,  $k = 1, 2, \dots$ , where  $f: [t_0, \infty) \times PC \rightarrow \mathbb{R}^n$ ,  ${}^c D^q$  is the Caputo's fractional derivative of order  $q$ ,  $0 < q < 1$ ,  $x(t_k) = x(t_k^+) - x(t_k^-)$ ,  $I_k: \mathbb{R}^n \rightarrow \mathbb{R}^n$ ,  $k = 1, 2, \dots$ ,  $t_0 < t_1 < t_2 < \dots < t_k < t_{k+1} < \dots$  and  $\lim_{k \rightarrow \infty} t_k = \infty$ .

Stability analysis of impulsive functional systems of ...

Fractional differential equations (FDEs) [1-7] have been successfully confirmed to be useful tools in various fields such as electrical circuits, diffusion, economy, and control problem. Recently, many authors try to find new fractional operators with different kernels in order to better describe these phenomena.

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