Fractal Fractional Order Derivative for HIV/AIDS Model with Mittag Leffler Kernel

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Description

The HIV/AIDS fractional-order model is examined in this paper. An antiretroviral treatment compartment is used in the Caputo-Fabrizio and Fractal fractional derivative operator analysis of this epidemic phenomenon. For the HIV/AIDS fractional-order model, the advanced method employs sumudu transformation to produce reliable results. In addition to confirming unique solutions, a qualitative analysis of the fractional-order HIV/AIDS model is conducted. Using proposed methods for a variety of fractional orders, numerical simulations are carried out to support the theoretical results and explain the effects of changing the fractional order. In addition, the proposed HIV/AIDS treatment has been compared to the classical order derivative to assess its efficacy.

In 1981, gay men in the United States were the first to be diagnosed with AIDS. More details about the spread of AIDS and its epidemiology were discovered in 1982. The etiological specialist established this in 1983 using recognizable evidence of human immunodeficiency virus (HIV). The emotional tissues and cells of the human immune system are contaminated by HIV, a retrovirus. The infection develops a medication that either moderates or prevents the infection from developing in the absence of antiretroviral treatment (ART). HIV typically spreads through blood diffusion, sexual transmission, and perinatal diffusion. Fever, chills, joint pain, muscle throbbing, sore throat, sweating (especially in the evening), enlarged organs, a red rash, weakness, and accidental thrush for weight loss are all symptoms of the initial HIV infection. Most people think that the HIV epidemic is the most obvious problem with health right now.

Nevertheless, despite these biomedical advancements, the plague continues to spread, and treatment is still unavailable to the mind-boggling number of people who require it. The NSFD methods developed by Micken were designed to be logically applicable to the numerical mixture of differential conditions. Variations in the fractional order's impact on the disease's spread are also examined in their model. The HIV epidemics model's various dynamics are discussed. When vaccination is the subject of the study and related work, a new COVID-19 model with an optimal control analysis is available. The arbitrary kernel functions that meet Robin's homogeneous conditions and related work are satisfied by these treatment-optimized solutions that rely on the Sobolev spaces and Schmidt orthogonalization process and can be directly implemented to generate Fourier expansion at a rapid convergence rate.

Due to the characterization of memory and hereditary properties, fractional order, which involves integration and transects differentiation with the assistance of fractional calculus, can also help to better understand the explanation of real-world problems than ordinary integer order, also in the modeling of real phenomena. Based on power law, Riemann Liouville introduced the fractional derivative concept. In, the exponential kernel-based new fractional derivative is proposed. Some issues with the non-singular kernel fractional derivative, including the exponential and trigonometric functions, as well as some related strategies for epidemic models. The COVID-19 disease conceptual model's timeline is effectively captured by the proposed virus outbreak. The work-study and existence of Sobolev-type Hilfer fractional integrodifferential systems with infinite delay Using a polynomial function and a related work-study, the operational matrix of fractional differentiation of the Mittag-Leffler kernel fractional derivative is numerically determined. Section 2 contains some fundamental fractional-order derivatives that can be used to solve the epidemiological model. 3 The mathematical model for HIV/AIDS, 4 the Caputo Fabrizio derivative with Sumudu, is made up of the model's uniqueness, stability, and generalized form. Techniques for fractional fractals, including the Mittag-Leffler kernel and the exponential decay kernel, respectively, in Section 5. Sections 6 and 7 respectively cover the results and conclusion [1-5].

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Conflict of Interest

None.

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