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# Predicting Behaviours of Some Nonlinear Evolutionary Models with Artificial Intelligence

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**Abstract.** The discovery of the behaviours of various physical processes has attracted the attention of researchers all over the world throughout the ages. Depending on the variety of advances in science, these discoveries have proven costly in a variety of ways. The main aim of this study is to best predict the behaviours represented by the processes in question through artificial intelligence, which is a challenging alternative to numerical methods that face many difficulties such as computational cost or economic cost. To provide a more in-depth understanding, the Kudryashov-Sinelshchikov equation with variable coefficients has been taken into account, which is a typical model for predicting physical parameters that play an important role. In conclusion, this research not only improves our understanding of nonlinear wave mechanisms, but also offers promising findings to make artificial intelligence modelling more realistic and optimized. Ultimately, it is expected that the study will contribute to the development of new approaches to examine and model various physical processes relatively cost-effectively.

**Keywords:** Artificial Intelligence, Shock wave, Steep behaviour, Kudryashov-Sinelshchikov equation.

## References

1. Adam, J. A. (2003). Mathematics in Nature: Modeling Patterns in the Natural World. Princeton: Princeton University Press.
2. Billingham, J., King, A. C. (2000). Wave Motion. Cambridge: Cambridge University Press.
3. Sousa Prado, M. G., Gardner, F., Damen, M., Polinder, H. (2006). Modelling and test results of the Archimedes wave swing. Proceedings of the Institution of Mechanical Engineers, Part A: Journal of Power and Energy, 220(8), 855-868.
4. Fellmann, E. A. (2007). Leonhard Euler. Berlin: Springer Science & Business Media.
5. Buchwald, J. Z. (1989). The Rise of the Wave Theory of Light: Optical Theory and Experiment in the Early Nineteenth Century. University of Chicago Press.
6. Guicciardini, N. (2009). Isaac Newton on Mathematical Certainty and Method (No. 4). MIT Press.
7. Olver, P. J. (2014). Introduction to Partial Differential Equations (Vol. 1). Berlin: Springer.
8. Nahin, P. J. (2002). Oliver Heaviside: The Life, Work, and Times of an Electrical Genius of the Victorian Age. Johns Hopkins University Press.
9. Loske, A. M. (2010). What are shock waves? In Urinary Tract Stone Disease (pp. 253-262). London: Springer London.
10. Loske, A. M., & Loske, A. M. (2017). Shock waves as used in biomedical applications. In Medical and Biomedical Applications of Shock Waves (pp. 19-42). Springer.