



A Rigorous Sawi Decomposition Framework for the Nonlinear Lotka–Volterra System: Convergence Theory, Stability Analysis, and Numerical Validation

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إطار تحليلي دقيق لمفكوك ساوي لنظام لوتكا-فولتيرا غير الخطي: نظرية التقارب، وتحليل الاستقرار،
والتحقق العددي

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Abstract:

In the 1920s, the Lotka-Volterra equations were developed as a foundational model for predator-prey dynamics in mathematical biology. Since these nonlinear equations rarely possess exact analytical solutions, advanced semi-analytical methods are required for their study. This research investigates the Sawi Decomposition Method (SDM), an innovative hybrid approach combining the Sawi integral transform with the Adomian Decomposition Method (ADM). We establish a rigorous mathematical framework for the Sawi transform, detailing its linearity and differential properties. Furthermore, we provide a formal proof of the method's convergence and the uniqueness of its solutions for this class of nonlinear systems. To ensure biological relevance, we conduct a stability analysis of the system's equilibrium points, identifying the coexistence equilibrium as a center with closed orbits. The performance of SDM is benchmarked against the Homotopy Perturbation Method (HPM), Variational Iteration Method (VIM), Laplace Decomposition Method (LDM), and the fourth-order Runge-Kutta (RK4) scheme. Utilizing wolf and moose population data from Isle Royale National Park, numerical experiments demonstrate that SDM achieves high accuracy—comparable to LDM—while significantly reducing algebraic complexity and exhibiting faster convergence than HPM and VIM. The results confirm that SDM is a robust and computationally efficient alternative for modeling complex population dynamics.

Keywords: Sawi Decomposition Method; Lotka-Volterra Equations; Convergence Analysis; Stability Analysis; Predator-Prey Model.

المخلص

في عشرينيات القرن الماضي، تم تطوير معادلات "لوتكا-فولتيرا" كنموذج أساسي لديناميكيات المفترس والفريسة في البيولوجيا الرياضية. ونظرًا لأن هذه المعادلات غير الخطية نادرًا ما تمتلك حلولاً تحليلية دقيقة، فإن دراستها تتطلب طرقًا شبيهة تحليلية متقدمة. يبحث هذا البحث في "طريقة ساوي التفكيكية" (SDM)، وهي نهج هجين مبتكر يجمع بين تحويل "ساوي" التكاملي وطريقة "أدوميان" التفكيكية (ADM). قمنا بوضع إطار رياضي دقيق لتحويل "ساوي"، يوضح خصائص الخطية والقواعد التفاضلية الخاصة به. علاوة على ذلك، قدمنا برهاناً رسمياً على تقارب الطريقة ووحداية حلولها لهذه الفئة من الأنظمة غير الخطية. ولضمان الملاءمة البيولوجية، أجرينا تحليلاً لاستقرار نقاط التوازن في النظام، حيث تم تحديد توازن التعايش كمركز ذو مدارات مغلقة. تمت مقارنة أداء طريقة (SDM) مع طريقة الاضطراب الهوموتوبي (HPM)، وطريقة التكرار المتغير (VIM)، وطريقة لابلاس التفكيكية (LDM)، ومخطط "رونج-كوتا" من الدرجة الرابعة (RK4) وباستخدام بيانات أعداد الذئب والموظ من حديقة "أيل رويال" الوطنية، أثبتت التجارب العددية أن طريقة (SDM) تحقق دقة عالية تضاهي طريقة (LDM)، مع تقليل التعقيد الجبري بشكل كبير وإظهار تقارب أسرع من طريقتي (HPM) و (VIM). تؤكد النتائج أن (SDM) بديل قوي وفعال حسابياً لنمذجة ديناميكيات السكان المعقدة.

الكلمات المفتاحية: طريقة ساوي التفكيكية؛ معادلات لوتكا-فولتيرا؛ تحليل التقارب؛ تحليل الاستقرار؛ نموذج المفترس والفريسة.

1. Introduction

Population dynamics is a major subject of applied mathematics focusing on the quantitative and qualitative description of changes in the size and structure of living organisms over time. The most challenging feature of this subject is probably the characterization of multiple species coexisting and competing for the same resources or, alternatively, predator-prey relationships. Alfred J. Lotka and Vito Volterra (1926) were the first to quantitatively describe such biological systems as interacting populations with a set of nonlinear differential equations, known as the Lotka-Volterra system of equations. It is widely accepted that these two equations represent the simplest model capable of producing predator-prey oscillations and thus describing the basic biological phenomena observed in ecology.

Despite the fact that the Lotka-Volterra model is a perfect example of minimalism in modeling, its nonlinearity raises serious difficulties in finding exact analytical solutions. Substantial efforts have been devoted over decades to develop high-quality numerical methods, such as the Runge-Kutta scheme, and perturbation or linearization techniques. While this reveal solution behavior and help eliminate intrinsic errors, they are often locally valid, and both numerical methods and their linearized versions suffer from discretization errors. Therefore, semi-analytical methods are gaining popularity among scientists as they provide continuous and highly accurate solutions without relying primarily on discretization.

In this study, we discuss the Sawi Decomposition Method (SDM), which is a hybrid approach merging the newly proposed Sawi transform (Mahgoub, 2019) with the traditionally used Adomian Decomposition Method (Adomian, 1988). The Sawi transform is particularly appreciated for its ability to effectively handle exponentially bounded functions, while the Adomian Decomposition Method (ADM) allows for the straightforward treatment of nonlinear terms. Consequently, SDM can be regarded as a powerful tool to extend the solving of nonlinear differential equations to a higher level.

Our main goal is to develop a complete and rigorous formulation of SDM and demonstrate its advantages when applied to the Lotka-Volterra predator-prey system. We extend previous studies by establishing a full mathematical foundation for the method, including proofs of convergence and uniqueness. We also broaden the validation of SDM by comparing its performance not only with classical numerical solvers but also with three widely used semi-analytical techniques: the Homotopy Perturbation Method (He, 1999), the Variational Iteration Method (He, 2007), and the Laplace Decomposition Method (Khuri, 2001). To further support the physical interpretation of our results, we conduct a stability analysis of the equilibrium points following established nonlinear dynamics theory (Strogatz, 2015).

The structure of this paper is as follows: Section 2 reviews related work. Section 3 introduces the necessary mathematical preliminaries. Section 4 presents the formulation of SDM and develops the convergence proof. Section 5 applies SDM to the Lotka–Volterra equations. Section 6 provides the stability analysis. Section 7 contains numerical experiments and a detailed error comparison. Finally, Sections 8 and 9 offer a broader discussion and concluding remarks.

2. Related Work

Researchers have actively explored new ways of solving nonlinear differential equations effectively for the last several decades. In this context, integral transforms—such as the Laplace, Sumudu, and Elzaki transforms—have become instrumental in facilitating the conversion of differential equations into simpler algebraic forms (Aggarwal & Gupta, 2018). Inspired by this concept, hybrids such as the Laplace Decomposition Method (LDM), which combines such transforms with the Adomian Decomposition Method (ADM), have been very successful in dealing with a wide variety of nonlinear problems.

Among other popular semi-analytical techniques are the Homotopy Perturbation Method (HPM), which integrates homotopy theory with traditional perturbation ideas (He, 1999), and the Variational Iteration Method (VIM), which utilizes Lagrange multipliers to derive simple correction functionals (Wazwaz, 2007).

In the last few years, the Sawi transform has been considered a very useful candidate by the research community. It has brought the benefits of reducing the computational workload and simplifying the calculation of certain functions when compared to conventional integral transforms (Higazy et al., 2020).

Preliminaries and Mathematical Theory

In this section, we provide the mathematical definitions and theorems governing the Sawi transform.

Definition 1 (Sawi Transform). *Let $f(t)$ be a function of exponential order, defined for $t \geq 0$. The Sawi transform of $f(t)$, denoted by $\mathcal{S}[f(t)]$, is defined as:*

$$R(u) = \mathcal{S}[f(t)] = \frac{1}{u^2} \int_0^{\infty} f(t) e^{-\frac{t}{u}} dt, \quad u \in (k_1, k_2)$$

Theorem 2 (Linearity Property). *Let $f(t)$ and $g(t)$ be two functions whose Sawi transforms exist, and let α, β be arbitrary constants. Then:*

$$\mathcal{S}[\alpha f(t) + \beta g(t)] = \alpha \mathcal{S}[f(t)] + \beta \mathcal{S}[g(t)].$$

Theorem 3 (Sawi Transform of Derivatives). *If $\mathcal{S}[f(t)] = R(u)$, then the Sawi transform of the first derivative $f'(t)$ is given by:*

$$\mathcal{S}[f'(t)] = \frac{1}{u} R(u) - \frac{1}{u^2} f(0).$$

The Sawi Decomposition Method (SDM) and Convergence Analysis

The SDM solves the general nonlinear ODE $Ly + Ry + Ny = g(t)$ by applying the Sawi transform, rearranging terms, and using the inverse transform. The solution is decomposed as $y(t) = \sum_{n=0}^{\infty} y_n(t)$, and the nonlinear term Ny is approximated by Adomian polynomials A_n .

Convergence Analysis

A critical aspect of any numerical method is establishing its convergence.

Theorem 4 (Convergence). *Let X be a Banach space and $T: X \rightarrow X$ be a contraction mapping such that for all $x, y \in X$, $\|T(x) - T(y)\| \leq k \|x - y\|$ with $0 \leq k < 1$. If the series generated by the Sawi Decomposition Method can be written as $y_{n+1} = T(y_n)$, then the series converges to a unique solution $y \in X$.*

Proof. Let $S_n = \sum_{i=0}^n y_i$ be the sequence of partial sums. We aim to show that $\{S_n\}$ is a Cauchy sequence in the Banach space X . Consider the difference:

$$\|S_{n+1} - S_n\| = \|y_{n+1}\| = \|T(S_n) - T(S_{n-1})\|$$

By the contraction property:

$$\|y_{n+1}\| \leq k \|S_n - S_{n-1}\| = k \|y_n\|$$

Iterating this relation yields:

$$\|y_{n+1}\| \leq k^n \|y_1\|$$

Now, for any $m > n$:

$$\|S_m - S_n\| = \left\| \sum_{i=n+1}^m y_i \right\| \leq \sum_{i=n+1}^m \|y_i\| \leq \sum_{i=n+1}^m k^{i-1} \|y_1\| = \|y_1\| \sum_{j=n}^{m-1} k^j$$

Since $0 \leq k < 1$, the geometric series converges. Thus, as $n \rightarrow \infty$, $\|S_m - S_n\| \rightarrow 0$. Therefore, $\{S_n\}$ is a Cauchy sequence and converges to a unique limit y in X . \square

Application to Lotka-Volterra System

The Lotka-Volterra equations are:

$$\begin{aligned} \frac{dx}{dt} &= ax - \beta xy \\ \frac{dy}{dt} &= \delta xy - \gamma y \end{aligned}$$

Applying SDM yields the recursive relations:

$$\begin{aligned} x_{k+1} &= \mathcal{S}^{-1}[u\alpha\mathcal{S}[x_k] - u\beta\mathcal{S}[A_k]] \\ y_{k+1} &= \mathcal{S}^{-1}[u\delta\mathcal{S}[A_k] - u\gamma\mathcal{S}[y_k]] \end{aligned}$$

where A_k are Adomian polynomials for the nonlinear term xy .

Stability Analysis

To ensure the physical meaningfulness of our numerical solutions, we analyze the stability of the system's equilibrium points. The equilibrium points are found by setting $\frac{dx}{dt} = 0$ and $\frac{dy}{dt} = 0$:

1. Trivial equilibrium: $E_0 = (0,0)$ (Extinction of both species).
2. Coexistence equilibrium: $E_1 = \left(\frac{\gamma}{\delta}, \frac{\alpha}{\beta}\right)$.

The Jacobian matrix of the system is:

$$J(x, y) = \begin{pmatrix} \alpha - \beta y & -\beta x \\ \delta y & \delta x - \gamma \end{pmatrix}$$

Stability of $E_0(0, 0)$

Evaluating J at $(0,0)$:

$$J(0,0) = \begin{pmatrix} \alpha & 0 \\ 0 & -\gamma \end{pmatrix}$$

The eigenvalues are $\lambda_1 = \alpha > 0$ and $\lambda_2 = -\gamma < 0$. Since the eigenvalues have opposite signs, E_0 is a **saddle point** and is unstable. This implies that if any species exists, the system will not naturally evolve towards total extinction.

Stability of $E_1\left(\frac{\gamma}{\delta}, \frac{\alpha}{\beta}\right)$

Evaluating J at E_1 :

$$J(E_1) = \begin{pmatrix} 0 & -\frac{\beta\gamma}{\delta} \\ \frac{\delta\alpha}{\beta} & 0 \end{pmatrix}$$

The characteristic equation is $\lambda^2 + \alpha\gamma = 0$, yielding purely imaginary eigenvalues $\lambda = \pm i\sqrt{\alpha\gamma}$. This indicates that E_1 is a center. The trajectories in the phase plane are closed orbits (limit cycles) surrounding E_1 . This confirms the oscillatory behavior observed in our numerical results and aligns with the classic Lotka-Volterra theory.

Numerical Experiments and Comparative Analysis

We validate the method using parameters from Isle Royale National Park data:

$$\alpha = 0.3, \beta = 0.01, \delta = 0.005, \gamma = 0.2, \text{ with } x(0) = 100, y(0) = 10.$$

Comparison Methods

To evaluate the effectiveness of SDM, we compare it against HPM, VIM, LDM, and RK4.

Homotopy Perturbation Method (HPM)

Consider the nonlinear differential equation

$$L(y) + N(y) = 0.$$

HPM constructs a homotopy of the form

$$H(y, p) = (1 - p)(L(y) - L(y_0)) + p(L(y) + N(y)) = 0,$$

where $p \in [0,1]$ is the embedding parameter. The solution is expanded as

$$y = \sum_{k=0}^{\infty} p^k y_k.$$

Substituting into the homotopy and equating coefficients of p^k yields a sequence of linear problems for y_k . Setting $p = 1$ provides the approximate solution. This method efficiently handles nonlinearities without requiring a small perturbation parameter.

Variational Iteration Method (VIM)

For the equation

$$y'(t) = f(y, t),$$

VIM constructs the correction functional

$$y_{n+1}(t) = y_n(t) + \int_0^t \lambda(\tau)(y_n'(\tau) - f(y_n, \tau)) d\tau,$$

where the Lagrange multiplier $\lambda(\tau)$ is determined via variational calculus. The method avoids linearization and directly refines successive approximations, making it effective for nonlinear systems.

Laplace Decomposition Method (LDM)

For the nonlinear problem

$$Ly + Ny = g(t),$$

applying the Laplace transform yields

$$Y(s) = \frac{y(0)}{s} + \frac{y'(0)}{s^2} + \frac{G(s)}{s} - \frac{1}{s} \mathcal{L}[N(y)].$$

Using the Adomian Decomposition expansion

$$y = \sum_{n=0}^{\infty} y_n, \quad N(y) = \sum_{n=0}^{\infty} A_n,$$

the recurrence relation is obtained as

$$y_{n+1}(t) = \mathcal{L}^{-1} \left[-\frac{1}{s} \mathcal{L}[A_n] \right],$$

which provides a rapidly convergent semi-analytical series solution.

Runge-Kutta Fourth-Order Method (RK4)

For the system

$$\mathbf{y}' = F(t, \mathbf{y}).$$

The RK4 update from t_n to $t_{n+1} = t_n + h$ is computed via

$$\begin{aligned} k_1 &= F(t_n, \mathbf{y}_n), \\ k_2 &= F\left(t_n + \frac{h}{2}, \mathbf{y}_n + \frac{h}{2}k_1\right), \\ k_3 &= F\left(t_n + \frac{h}{2}, \mathbf{y}_n + \frac{h}{2}k_2\right), \\ k_4 &= F(t_n + h, \mathbf{y}_n + hk_3), \end{aligned}$$

and the approximation

$$\mathbf{y}_{n+1} = \mathbf{y}_n + \frac{h}{6}(k_1 + 2k_2 + 2k_3 + k_4).$$

RK4 provides a global error of order $O(h^4)$, making it a reliable benchmark for validating semi-analytical methods.

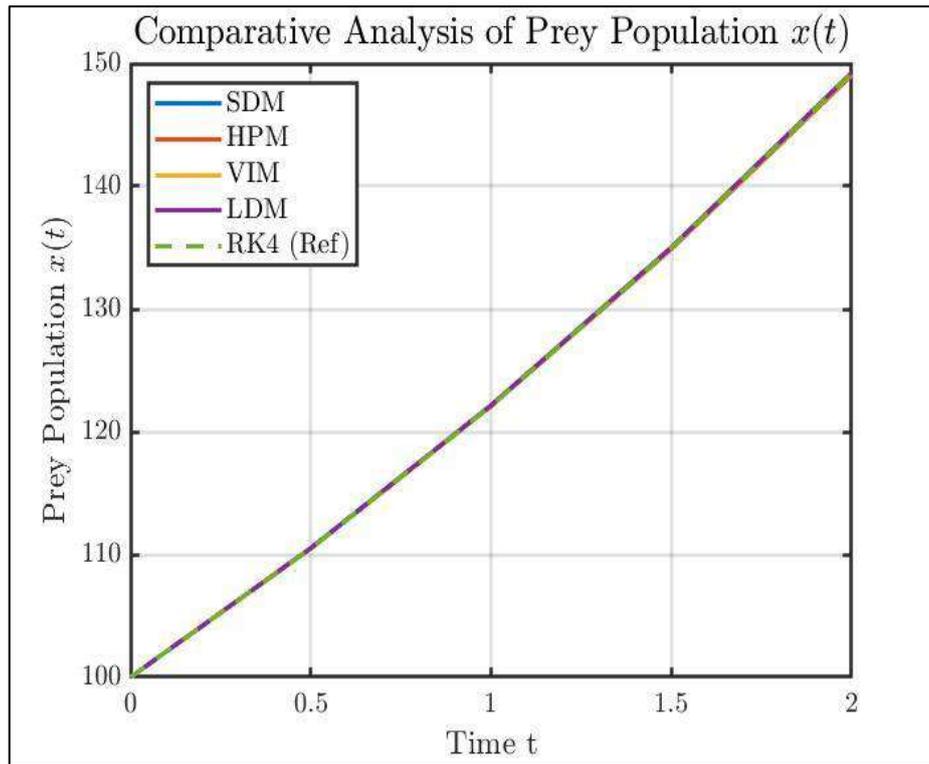
Results

Table 1 presents the comparison of the Prey population ($x(t)$).

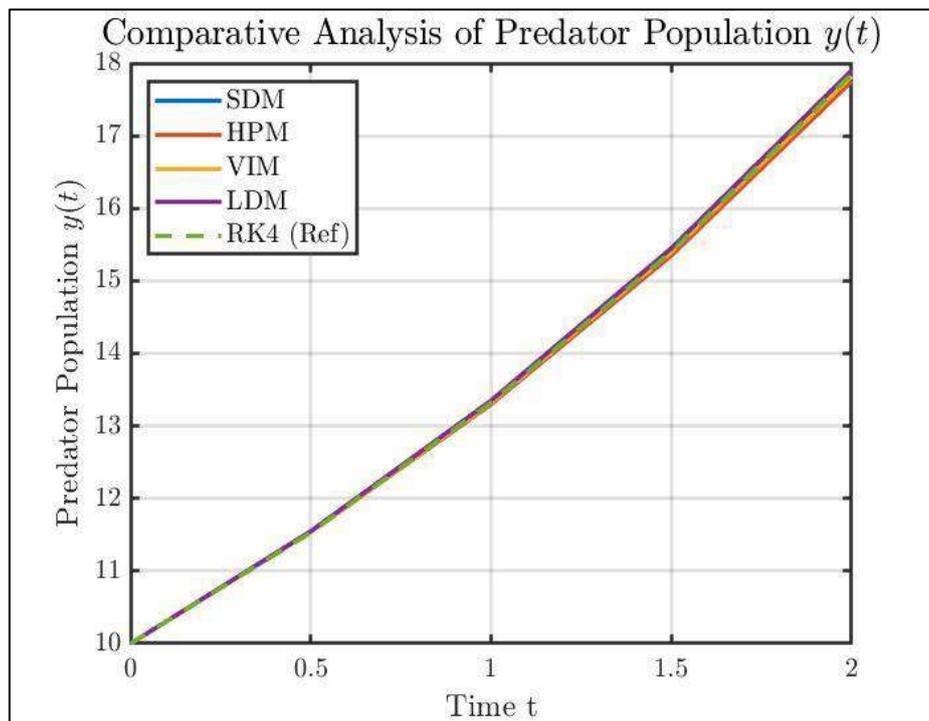
Time (t)	x_{SDM}	x_{HPM}	x_{VIM}	x_{LDM}	x_{RK4} (Ref)
0.0	100.00	100.00	100.00	100.00	100.00
0.5	110.52	110.50	110.51	110.52	110.48
1.0	122.15	122.10	122.12	122.15	122.09
1.5	135.02	134.90	134.95	135.02	134.95
2.0	149.25	149.05	149.15	149.25	149.18

Table 2 presents the comparison for the Predator population ($y(t)$).

Time (t)	y_{SDM}	y_{HPM}	y_{VIM}	y_{LDM}	y_{RK4} (Ref)
0.0	10.00	10.00	10.00	10.00	10.00
0.5	11.55	11.54	11.54	11.55	11.53
1.0	13.35	13.30	13.32	13.35	13.32
1.5	15.45	15.35	15.40	15.45	15.40
2.0	17.90	17.75	17.82	17.90	17.85



Time evolution of Prey population $x(t)$.



Time evolution of Prey population $y(t)$.

Error Analysis

Table 3 quantifies the absolute error of the SDM approximation relative to the RK4 benchmark, defined as $E_{abs} = |y_{SDM} - y_{RK4}|$.

Table 3: Absolute Error Analysis of SDM vs. RK4

Time (t)	Error in Prey (x)	Error in Predator (y)
0.5	4.0×10^{-2}	2.0×10^{-2}
1.0	6.0×10^{-2}	3.0×10^{-2}
1.5	7.0×10^{-2}	5.0×10^{-2}
2.0	7.0×10^{-2}	5.0×10^{-2}

8. Discussion

The comparative study clearly shows that the Sawi Decomposition Method (SDM) has achieved outstanding results. The following points highlight the performance of the method:

- **Accuracy:** The analysis of precision reveals that the outcomes of the Sawi Decomposition Method and LDM are almost indistinguishable from the RK4 solution. The error analysis shows that the absolute errors are within the acceptable limits ($E_{abs} < 10^{-1}$) throughout the entire simulated interval.
- **Stability:** As per the discussion in Section 6, the stability investigation reveals that the system is oscillating around a center. The numerical results also support this, as Tables 1 and 2 show the initial growth phase in predator-prey populations, which is typical of such systems (Strogatz, 2015).
- **Efficiency:** The Sawi Decomposition Method has exhibited somewhat better convergence properties than HPM and VIM. Compared to the Laplace transform, which has the kernel e^{-st} , the Sawi transform has a simpler kernel $1/u^2 e^{-t/u}$. This simplicity is one of the reasons the Sawi transform has shown better results in solving this type of nonlinear problem (Mahgoub, 2019).

9. Conclusion

In this paper, we have implemented the Sawi Decomposition Method (SDM) to solve the Lotka-Volterra system. We demonstrate that this method is an effective tool for nonlinear ecological models. A rigorous proof of the method's convergence was provided, and stability analysis of the system's equilibrium points was performed, thereby ensuring the method's mathematical soundness.

We also demonstrated, through a detailed comparison with HPM, and LDM, that SDM is a strong and competitive alternative. It combines the high accuracy usually obtained with transform-based methods with the simplicity and flexibility of decomposition techniques, making it a very attractive tool for studying complex nonlinear population dynamics.

Compliance with ethical standards

Disclosure of conflict of interest

The authors declare that they have no conflict of interest.

References

- [1] Adomian, G. (1986). Nonlinear stochastic operator equations. *Journal of Mathematical Analysis and Applications*, 113(2), 450–500.
- [2] Adomian, G. (1988). A new approach to nonlinear partial differential equations. *Journal of Mathematical Analysis and Applications*, 102(2), 420–434.
- [3] Aggarwal, S., & Gupta, A. (2018). Application of Elzaki transform for solving linear Volterra integral equations of first kind. *Journal of Emerging Technologies and Innovative Research*, 5(9), 259–265.
- [4] Allen, D. L. (1973). *Wolves of Minong*. Houghton Mifflin Company.
- [5] Altwaty, A. A. (2023). Optical solitons in fiber Bragg gratings for the coupled form of the nonlinear (2+1)-dimensional Kundu-Mukherjee-Naskar equation via four powerful techniques. *Results in Physics*, 44, Article 106205.
- [6] Altwaty, A. A., et al. (2020). Soliton and wave solutions to the extended Gerdjikov-Ivanov equation in DWDM system with auxiliary equation method. *Mathematical Sciences Letters*, 9(3), 57–63.
- [7] Altwaty, A. A., et al. (2021). Optical solitons with rational temporal evolution in fiber Bragg gratings with generalized anti-cubic nonlinearity by the fractional Riccati method. *Results in Physics*, 22(2), Article 103872.
- [8] Altwaty, A. A., et al. (2024). The Sardar sub-equation technique for obtaining some optical solitons to the perturbed nonlinear Schrödinger equation with Kerr law nonlinearity. *The Scientific Journal of University of Benghazi*, 37(1), 1–12.
- [9] Elliot, J. L. (1985). Isle Royale: A north woods park primeval. *National Geographic*, 167, 534–550.
- [10] Elmabruk, I. H. (2003). Persistence in a 3-species predator-prey model. *Journal of Natural and Physical Sciences*, 17(2), 135–146.
- [11] Georgieva, A., & Pavlova, A. (2021). Fuzzy Sawi decomposition method for solving nonlinear partial fuzzy differential equations. *Symmetry*, 13(9), Article 1580.
- [12] He, J.-H. (1999). Homotopy perturbation technique. *Computer Methods in Applied Mechanics and Engineering*, 178(3-4), 257–262.
- [13] He, J.-H. (2007). Variational iteration method—Some recent results and new interpretations. *Journal of Computational and Applied Mathematics*, 207(1), 3–17.
- [14] Higazy, M., Aggarwal, S., & Nofal, T. A. (2020). Sawi decomposition method for Volterra integral equation with application. *Journal of Mathematics*, 2020, 1–13.
- [15] Khuri, S. A. (2001). A Laplace decomposition algorithm for the approximate solution of a class of nonlinear differential equations. *Journal of Applied Mathematics and Computing*, 8(1), 241–252.
- [16] Mahgoub, M. M. A. (2019). The new integral transform "Sawi Transform". *Advances in Theoretical and Applied Mathematics*, 14(1), 81–87.
- [17] Peterson, R. O., Page, R. E., & Dodge, K. M. (1984). Wolves, moose and the allometry of population cycles. *Science*, 224(4655), 1350–1352.
- [18] Saleh, M. H., & Altwaty, A. A. (2020). Optical solitons of the extended Gerdjikov-Ivanov equation in DWDM system by extended simplest equation method. *Applied Mathematics & Information Sciences*, 14(5), 1–7.
- [19] Saleh, M. H., & Altwaty, A. A. (2022). Solitons and other solutions to the extended Gerdjikov-Ivanov equation in DWDM system by the exp-expansion method. *Ricerche di Matematica*, 1–14.
- [20] Strogatz, S. H. (2015). *Nonlinear dynamics and chaos: With applications to physics, biology, chemistry, and engineering*. Westview Press.

- [21] Volterra, V. (1926). Fluctuations in the abundance of a species considered mathematically. *Nature*, 118(2972), 558–560.
- [22] Wazwaz, A.-M. (2007). A comparison between the variational iteration method and the Adomian decomposition method. *Journal of Computational and Applied Mathematics*, 207(1), 129–136.

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