Personal Information

Name: **Dr. Muhammad Hamza Rafiq**
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Date of birth: August 1, 1997
Nationality: Pakistani
Sex: Male
Language: Urdu, English, Chinese

Professional Experience

- From 2021 to 2024, Department of Mathematics & Statistics, The University of Lahore (Pakistan), Assistant Professor.
- From 2024: Department of Physics, Zhejiang Normal University, China.

Research Interest

- Partial differential equations
- Stochastic partial differential equations
- Lie symmetry analysis
- Soliton theory
- Stability of nonlinear waves
- Nonlinear analysis of dynamical systems
- Bifurcation and chaos theory
- Coherent solitons with chaotic behavior
- Characterization of chaos with Lyapunov exponents
- Maximization of degree of hyper-chao
- Linear controls to chaotic continuous dynamical systems
- Multiple lumps, space-curved resonant solitons
- Data-driven soliton solutions via deep learning method
- Bell-like and peak-like loop solitons
- Dromion, dromion lattice excitations and ring solitons excitations

Academic Qualifications

Ph.D. Mathematics **Dec 2020-Mar 2024**
University of the Punjab, Lahore-Pakistan.
Thesis Title: **Dynamical Observations and a Variety of New Structures in Some Nonlinear Evolution Equations Using Lie Symmetry Analysis**

M.Phil. Mathematics **Sep 2018-Aug 2020**
University of the Punjab, Lahore-Pakistan.
Thesis Title: **Unified Method and its Variants for Travelling Wave Solutions of Nonlinear Evolution Equations**

B.S. Mathematics **Oct 2014-Jun 2018**
Bahauddin Zakariya University, Multan-Pakistan.

Intermediate (Science) **2012-2014**
BISE Dera Ghazi Khan, Pakistan.

Matriculation (Science) **2010-2012**
BISE Dera Ghazi Khan, Pakistan.

Scientific Computing Tool & Software

Well understanding of following tools;

1. Matlab
2. Maple
3. Mathematica
4. Python

Conferences & Training Seminars

- Participated in three days conference on International Conference on Gravitation and Cosmology (ICGC24) organized by The University of Lahore (UOL), Pakistan.
- Participated in three days online International Conference & Symposium on AI Advancement in Hyperbolic and Parabolic PDEs (ICS-AIPDEs23).
- 3rd Garrison International Conference on Pure and Applied Mathematics arranged by Department of Mathematics, Lahore Garrison University (LGU) on 21 & 22 June 2023.
- 1st international conference on Gravitation and Cosmology, organized by department of Mathematics, University of the Punjab, Pakistan.
- Two days conference on 1st UOL International Conference on Mathematics, organized by department of Mathematics, University of Lahore, Pakistan.
- One day Olympiad 5th CASPAM Regional Student Olympiad of Mathematics,organized by the National Mathematical Society of Pakistan.
- Three days seminar on MAT-LAB, organized by department of Mathematics, University of the Punjab, Pakistan.
- Presented talk on Travelling Wave Solutions for Temporal Fractional Nonlinear Evolution Equations in weekly departmental seminar, organized by department of Mathematics, University of the Punjab, Pakistan.
- Ph.D. talk on Bifurcations and Soliton Patterns for Nonlinear Model in Optical Fibre.
- Ph.D. talk on Multi-wave structures of the new negative-order (3+1)-dimensional KdV–Calogero-Bogoyavlenskii-Schiff equation using the Hereman-Nuseir method.

- Ph.D. talk on Lie symmetry analysis and multi-soliton solutions for the system of shallow water equations in ocean turbulence.

List of Publications (First author: FA & Corresponding author: CA)

Sr.	Title	Journal	FA/CA/Co-author	Year
1	Jhangeer A, Fatima S, Raza N, Rafiq MH, Shah NA, Bayram M. Numerical analysis of a novel mathematical model of measles-pneumonia co-infection with treated-vaccinated compartment. Ain Shams Engineering Journal. 2025;16(11):103659.	Ain Shams Engineering Journal	CA	2025
2	Meng Y, Rafiq MH, Lin J. Multihump fundamental solitons in the multi-component Mel'nikov system. Chaos, Solitons & Fractals. 2025;199:116602.	Chaos, Solitons & Fractals	Co-author	2025
3	Rafiq MN, Rafiq MH, Alsaud H. Diversity of soliton dynamics, positive multi-complexiton solutions and modulation instability for (3+ 1)-dimensional extended Kairat-X equation. Modern Physics Letters B. 2025;39(24):2550112.	Modern Physics Letters B	CA	2025
4	Alsaud H, Rafiq MN, Rafiq MH. A novel investigation of the extended (3+ 1)-dimensional B-type Kadomtsev–Petviashvili equation: analysis and simulations. International Journal of Theoretical Physics. 2025;64(8):1-9.	International Journal of Theoretical Physics	CA	2025
5	Rafiq MH, Lin J. Neural network-based explicit solutions to the (3+ 1)-dimensional Hirota-Satsuma-Ito-like equation: MH Rafiq, J. Lin. Nonlinear Dynamics. 2025:1-4.	Chaos, Solitons & Fractals	FA	2025
6	Raza N, Gandarias ML, Rafiq MH, Rana Z, Muhammad T. A deep analytical investigation of solitons and nonlinear dynamics in the (3+ 1)-dimensional hirota-type equation: N. Raza et al. Nonlinear Dynamics. 2025:1-5.	Nonlinear Dynamics	CA	2025
7	Raza N, Gandarias ML, Rafiq MH, Rana Z, Muhammad T. A deep analytical investigation of solitons and nonlinear dynamics in the (3+ 1)-dimensional hirota-type equation: N. Raza et al. Nonlinear Dynamics. 2025 Jul 17:1-5.	Nonlinear Dynamics	CA	2025
8	Rafiq MH, Lin J. Periodic breather waves, stripe-solitons and interaction solutions for the (3+ 1)-dimensional variable-coefficient Kadomtsev–Petviashvili-like equation. Chaos, Solitons & Fractals. 2025;194:116212.	Chaos, Solitons & Fractals	FA	2025
9	Rafiq MN, Rafiq MH, Alsaud H. New insights into the diversity of stochastic solutions and dynamical analysis for the complex cubic NLSE with δ-potential through brownian process.	Communications in Theoretical Physics	CA	2025

	Communications in Theoretical Physics. 2025;77(7):075001.			
10	Rafiq MN, Rafiq MH, Alsaud H. Chaotic response, multistability and new wave structures for the generalized coupled Whitham–Broer–Kaup–Boussinesq–Kupershmidt system with a novel methodology. Chaos, Solitons & Fractals. 2025;190:115755.	Chaos, Solitons & Fractals	CA	2025
11	Rafiq MH, Raza N, Jhangeer A, Zidan AM. Qualitative analysis, exact solutions and symmetry reduction for a generalized (2+ 1)-dimensional KP–MEW-Burgers equation. Chaos, Solitons & Fractals. 2024;181:114647.	Chaos, Solitons & Fractals	FA	2024
12	Jhangeer A, Raza N, Ejaz A, Rafiq MH, Baleanu D. Qualitative behavior and variant soliton profiles of the generalized P-type equation with its sensitivity visualization. Alexandria Engineering Journal. 2024;104:292-305.	Alexandria Engineering Journal	Co-author	2024
13	Rafiq MH, Riaz MB, Basendwah GA, Raza N, Rafiq MN. Dynamics of quasi-periodic, bifurcation, sensitivity and three-wave solutions for (n+ 1)-dimensional generalized Kadomtsev-Petviashvili equation. PloS one. 2024;19(8):e0305094.	PloS one	FA	2024
14	Chahlaoui Y, Rafiq MH, Deifalla A, Raza N, Shah NA. Lie symmetry analysis and propagation of new dynamics of a negative-order model describing fluid flow. Results in Physics. 2024 Mar 1;58:107408.	Results in Physics	Co-author	2024
15	Rafiq MH, Raza N, Jhangeer A. Dynamic study of bifurcation, chaotic behavior and multi-soliton profiles for the system of shallow water wave equations with their stability. Chaos, Solitons & Fractals. 2023;171:113436.	Chaos, Solitons & Fractals	FA	2023
16	Rafiq MH, Jhangeer A, Raza N. The analysis of solitonic, supernonlinear, periodic, quasiperiodic, bifurcation and chaotic patterns of perturbed Gerdjikov–Ivanov model with full nonlinearity. Communications in Nonlinear Science and Numerical Simulation. 2023;116:106818.	Communications in Nonlinear Science and Numerical Simulation.	FA	2023
17	Rafiq MN, Chen H, Rafiq MH. Stability analysis and multi-wave structures of the ill-posed Boussinesq equation arising in nonlinear physical science. Optical and Quantum Electronics. 2023;55(14):1243.	Optical and Quantum Electronics	Co-author	2023
18	Rafiq MH, Jhangeer A, Raza N. Symmetry and complexity: A Lie symmetry approach to bifurcation, chaos, stability and travelling wave solutions of the (3+ 1)-dimensional Kadomtsev-Petviashvili equation. Physica Scripta. 2023;98(11):115239.	Physica Scripta	FA	2023
19	Raza N, Rafiq MH, Alrebdi TA, Abdel-Aty AH.	Optical and	Co-author	2023

	New solitary waves, bifurcation and chaotic patterns of Coupled Nonlinear Schrodinger System arising in fibre optics. Optical and Quantum Electronics. 2023;55(10):853.	Quantum Electronics		
20	Rafiq MH, Jannat N, Rafiq MN. Sensitivity analysis and analytical study of the three-component coupled NLS-type equations in fiber optics. Optical and Quantum Electronics. 2023;55(7):637.	Optical and Quantum Electronics	FA	2023
21	Rafiq MH, Raza N, Jhangeer A. Nonlinear dynamics of the generalized unstable nonlinear Schrödinger equation: a graphical perspective. Optical and Quantum Electronics. 2023;55(7):628.	Optical and Quantum Electronics	FA	2023
22	Alotaibi MF, Raza N, Rafiq MH, Soltani A. New solitary waves, bifurcation and chaotic patterns of Fokas system arising in monomode fiber communication system. Alexandria Engineering Journal. 2023;67:583-95.	Alexandria Engineering Journal	Co-author	2023
23	Alrebdi HI, Rafiq MH, Fatima N, Raza N, Rafiq MN, Alshahrani B, Abdel-Aty AH. Soliton structures and dynamical behaviors for the integrable system of Drinfel'd–Sokolov–Wilson equations in dispersive media. Results in Physics. 2023;46:106269.	Results in Physics	Co-author	2023
24	Raza N, Rafiq MH, Bekir A, Rezazadeh H. Optical solitons related to (2+ 1)-dimensional Kundu–Mukherjee–Naskar model using an innovative integration architecture. Journal of Nonlinear Optical Physics & Materials. 2022;31(03):2250014.	Journal of Nonlinear Optical Physics & Materials	Co-author	2022
25	Raza N, Seadawy AR, Arshed S, Rafiq MH. A variety of soliton solutions for the Mikhailov-Novikov-Wang dynamical equation via three analytical methods. Journal of Geometry and Physics. 2022;176:104515.	Journal of Geometry and Physics	Co-author	2022
26	Rafiq MN, Majeed A, Yao SW, Kamran M, Rafiq MH, Inc M. Analytical solutions of nonlinear time fractional evaluation equations via unified method with different derivatives and their comparison. Results in Physics. 2021;26:104357.	Results in Physics	Co-author	2021
27	Rafiq MN, Majeed A, Yao SW, Kamran M, Rafiq MH, Inc M. Analytical solutions of nonlinear time fractional evaluation equations via unified method with different derivatives and their comparison. Results in Physics. 2021;26:104357.	Results in Physics	Co-author	2021