Muhammad Sinan

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sinanlab.github.io

Education

Institute of Fundamental and Technological Research IPPT, Poland, PhD
Polish Academy of Sciences PAS January, 2029
Biomedical Engineering.
Dissertation title: Computational analysis of multi-scale innate immune defences against bacterial pathogens
Supervisor: Prof. Dr. hab. PawełPaszek
Research area: Systems biology of antibacterial innate immune responses

University of Electronic Science And Technology of China - UESTC China, Master of Science
Mathematics. GPA: 3.87/4.0 June, 2024
Supervisor: Prof. Dr. Leng Jinsong

University of Swat Pakistan, BS
Mathematics. GPA: 3.17/4.0 November, 2020

Experience

Institute of Fundamental and Technological Research IPPT, Warsaw, Poland
Polish Academy of Sciences PAS February 2025 - September 2027
First Stage Researcher (R1)

- Mathematical and numerical system biology
- Ordinary and partial differential equations
- Stochastic processes.
- Image analysis, segmentation, quantification, hypothesis testing.

Talks/ Presentations

Fever modulates antibacterial innate immune response Toruń, Poland
Conference: 19th Copernican Doctoral Seminar 25-26 June, 2026
Venue: Nicolaus Copernicus University in Toruń

Research interest

Systems biology. Signaling pathways. Mathematical modelling. Data Science.
Image segmentation, quantification and characterization. Machine Learning Algorithms

Awards & Achievements

Scholarships
Fully Funded University Scholarship Chengdu, China
School of Mathematical Sciences, September 2021 - June 2024
University of Electronic Science and Technology of China - UESTC

Academic Achievement Award (First rank)
School of Mathematical Sciences, University of Electronic Science and Technology of China - UESTC

Outstanding Graduate Student Award (Second rank)
International Student Office - ISO, University of Electronic Science and Technology of China - UESTC

Skills & Interests

Technical: MATLAB. Octave. Python (Pandas: multiIndexed DataFrames & OOP). LaTeX
Language: Urdu (Native language). English (Fluent)

Certifications

Data analysis with python - Freecodecamp October, 2026

- Acquired practical skills in data processing, visualization, and statistical analysis.
- Tools & Libraries: Python, NumPy, Pandas, Matplotlib, Seaborn.

Contacts

Contacts to supervisors are available by request.

Peer-Reviewed Research Articles

Ali, A., Khan, M. Y., Sinan, M., Allehiany, F., Mahmoud, E. E., Abdel-Aty, A.-H., & Ali, G. (2020). Theoretical and numerical analysis of novel covid-19 via fractional order mathematical model. *Results in Physics*, 103676.

Gunasekar, T., Manikandan, S., Suba, M., Akgül, A., & Sinan, M. (2026). Atangana-baleanu fractal-fractional operator for analyzing dengue fever dynamics. *Journal of Environmental Accounting and Management*, *14*(02), 261–282.

Khan, A., Khan, A., & Sinan, M. (2022). Ion temperature gradient modes driven soliton and shock by reduction perturbation method for electron-ion magneto-plasma. *Mathematical Modelling and Numerical Simulation with Applications*, *2*(1), 1–12.

Khan, A., Sinan, M., Bibi, S., Shah, K., Hleili, M., Abdalla, B., & Abdeljawad, T. (2024). Dust acoustic nonlinearity of nonlinear mode in plasma to compute temporal and spatial results. *Alexandria Engineering Journal*, *104*, 115–123.

Naz, F., She, L., Sinan, M., & Shao, J. (2024). Enhancing radar echo extrapolation by convlstm2d for precipitation nowcasting. *Sensors*, *24*(2), 459.

Rezapour, S., Etemad, S., Sinan, M., Alzabut, J., & Vinodkumar, A. (2022a). A mathematical analysis on the new fractal-fractional model of second-hand smokers via the power law type kernel: Numerical solutions, equilibrium points, and sensitivity analysis. *Journal of Function Spaces*, *2022*(1), 3553021.

Rezapour, S., Etemad, S., Sinan, M., Alzabut, J., & Vinodkumar, A. (2022b). A mathematical analysis on the new fractal-fractional model of second-hand smokers via the power law type kernel: Numerical solutions, equilibrium points, and sensitivity analysis. *Journal of Function Spaces*, *2022*(1), 3553021. https://doi.org/ https://doi.org/10.1155/2022/3553021

Shah, K., Sinan, M., Abdeljawad, T., El-Shorbagy, M. A., Abdalla, B., & Abualrub, M. S. (2022). A detailed study of a fractal-fractional transmission dynamical model of viral infectious disease with vaccination. *Complexity*, *2022*(1), 7236824.

Sinan, M. (2020). Analytic approximate solution of rabies transmission dynamics using homotopy perturbation method. *Matrix Science Mathematics (MSMK)*, *4*(1), 01–05.

Sinan, M., Ahmad, H., Ahmad, Z., Baili, J., Murtaza, S., Aiyashi, M., & Botmart, T. (2022). Fractional mathematical modeling of malaria disease with treatment & insecticides. *Results in Physics*, *34*, 105220.

Sinan, M., & Alharthi, N. H. (2023). Mathematical analysis of fractal-fractional mathematical model of covid-19. *Fractal and Fractional*, *7*(5), 358.

Sinan, M., Ali, A., Shah, K., Assiri, T. A., & Nofal, T. A. (2021). Stability analysis and optimal control of covid-19 pandemic seiqr fractional mathematical model with harmonic mean type incidence rate and treatment. *Results in Physics*, 103873.

Sinan, M., Ansari, K. J., Kanwal, A., Shah, K., Abdeljawad, T., Abdalla, B., et al. (2023). Analysis of the mathematical model of cutaneous leishmaniasis disease. *Alexandria Engineering Journal*, *72*, 117–134.

Sinan, M., Leng, J., Anjum, M., & Fiaz, M. (2022). Asymptotic behavior and semi-analytic solution of a novel compartmental biological model. *Mathematical Modelling and Numerical Simulation with Applications*, *2*(2), 88–107.

Sinan, M., Leng, J., Shah, K., & Abdeljawad, T. (2023). Advances in numerical simulation with a clustering method based on k–means algorithm and adams bashforth scheme for fractional order laser chaotic system. *Alexandria Engineering Journal*, *75*, 165–179.

Sinan, M., Shah, K., Abdeljawad, T., & Akgul, A. (2023). Analysis of nonlinear mathematical model of covid-19 via fractional-order piecewise derivative. *Chaos Theory and Applications*, *5*(1), 27–33.

Sinan, M., Shah, K., Khan, Z. A., Al-Mdallal, Q., & Rihan, F. (2021). On semianalytical study of fractional-order kawahara partial differential equation with the homotopy perturbation method. *Journal of Mathematics*, *2021*(1), 6045722.

Sinan, M., Shah, K., Kumam, P., Mahariq, I., Ansari, K. J., Ahmad, Z., & Shah, Z. (2022). Fractional order mathematical modeling of typhoid fever disease. *Results in Physics*, *32*, 105044.