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Programa de Doutoramento em Matemática

Seminário / Seminar

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Zoom address: https://videoconf-colibri.zoom.us/j/5664652821?pwd=WXJBSWUxL25vR3hJUWRhWHpoWENSdz09

Mathematical Modeling of Infectious Diseases Dynamics

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Abstract: When we do mathematical modeling of infectious disease dynamics? Some statistics are given in [1]. Nearly 33 million people are infected with HIV in the world. About 36,000 people per year in the U.S. die from influenza and pneumonia. In the U.S., it is estimated that 700,000 to 1.4 million people have chronic hepatitis B infections. WHO estimates that 50 to 100 million Dengue infections occur yearly, including 500,000 DHF cases and 22,000 deaths, mostly among children. In Pakistan, 22000 people were infected, and 350 died of Dengue in 2011. In the year 2022, more than 40000 cases and 84 deaths were reported. The recent COVID-19 pandemic has infected almost 1.57 M individuals and more than 30000 deaths in Pakistan. Mathematical modeling of infectious disease dynamics plays a pivotal role in public health by offering a quantitative framework for understanding, predicting, and mitigating the impact of infectious diseases. These models provide early warnings for potential outbreaks by simulating various scenarios, aiding in timely and targeted interventions. Moreover, they optimize intervention strategies, helping policymakers allocate re-sources efficiently and evaluate the effectiveness of measures such as vaccinations, quarantine, and social distancing. These models' intricate insights into transmission dynamics are instrumental in devising strategies to interrupt disease spread. In a broader context, they assist in global health planning and preparedness, fostering international collaboration to address emerging infectious threats effectively. Furthermore, we learned how delay, stochastic, diffusive, fractional, and many more techniques are essential to model such real-world problems.

[1] World Health Organization (WHO). Available from: http://www.who.int/mediacentre/factsheets/fs211/en/.

Keywords: Infectious diseases; mathematical modeling; system of differential equations; dynamical properties; equilibrium; reproduction number; parameter estimations; stability results; numerical methods.

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