# Mathematical Modeling and Simulation of Migration Dynamics of Ukrainian Refugees Due to War in Ukraine 2022-2023

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Russia's unprovoked, full-scale invasion of Ukraine, which unfolded in February 2022, had a significant impact on Ukrainians and neighboring countries. This war resulted in the world's fastest-growing displacement crisis since the Second World War, forcing nearly one third of Ukrainians to flee their country. This project focuses on mathematically modeling and simulating the migration of Ukrainians evacuated to neighboring Poland due to the 2022-2023 war. We employ autonomous ordinary differential equations (ODEs) to create a mathematical model of this migration. A certain assumption on coefficients of this model results in the well-known logistic growth. While an exact solution of this particular model is available, numerical studies using both Euler's method and the fourth-order Runge-Kutta method is conducted allowing for future studies when coefficients could be assumed to be variable. These numerical studies are performed using synthetic data. Additionally, stability analyses of equilibrium solutions for these ODEs are performed, and we employ parameter estimation techniques to identify coefficients using online datasets. Our findings indicate that over time, the daily influx of Ukrainian refugees to Poland stabilizes at a constant rate, represented by an asymptotically stable equilibrium solution.