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Data-driven discovery of the mechanism of the Belousov-Zhabotinski reaction

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An important inverse problem in physics is the discovery of laws that determine the behavior of a given system, described by temporal and spatial data. Recently, Rudy and co-authors introduced deep learning techniques to fit observed data, with and without noise, with models based on space-time partial differential equations. Several benchmark tests were performed with the Navier-Stokes equations, reaction-diffusion equations, Korteweg-de Vries equations, among others.
In this project, the main goal is to infer the kinetic mechanism associated with reaction- diffusion waves and Turing patterns observed in the Belousov-Zhabotinski reaction. The data is obtained by analyzing images of reaction-diffusion traveling waves during successive instants of time and observed in the laboratory. After the calibration of the reaction diffusion model, we compare the properties of the fitted model with the properties of the real system.

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