Study of Chaotic Dynamics

It is a well-known fact that when a function performs the geometric stretching and folding it frequently leads to chaotic dynamics on some part of the phase space. A classical example is the Smale Horseshoe map (see Figure 1).
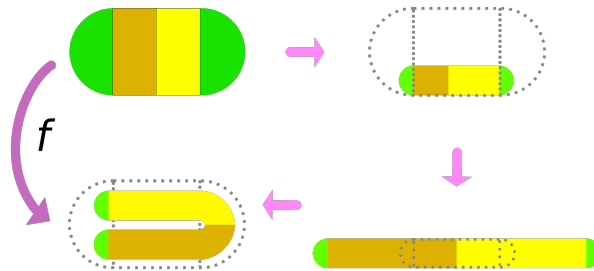

Figure 1: Source: `https://en.wikipedia.org/wiki/Horseshoe_map`

It has been recently shown that chaotic systems can be also constructed by a continuous function that geometrically performs shifting and stretching. The work would study the properties of such functions.

Skills needed:

1. A course in ordinary differential equations and mathematical analysis.

2. Appetite to understand some mathematical results.

3. To be able to complete a free online course in dynamical systems to enhance knowledge in the field in the first semester (it takes about a couple of hours a week for about six weeks to complete this).

4. To be able ts write computer programs in Matlab/Python to support mathematical ideas.