Advanced Robotics -- Week 11 Workshop

Task 1: Stable Estimation of Dynamical System

For this task we will use the implementation of SEDS to learn non-linear dynamical systems with stability guarantees. SEDS is implemented in MATLAB. You can download and install MATLAB for free using the university license. You can find more information here. If you don't want to install it on your PC, you can use MATLAB Online. You can find it here

1. Download and extract the SEDS code and data. You will find the zip file under the workshop material
2. We will use the *demo_SEDS_learning.m* for the workshop. Familiarize yourself with the code.
3. You can find multiple demonstrations in the *models/recorded_motions* folder.
4. Choose demonstrations with various complexity (loading of demos is performed in line 10 of the *demo_SEDS_learning.m*)
5. For the chosen demonstrations test different number of Gaussian Components (line 19 of *demo_SEDS_learning.m*)
6. Choose the optimal number of components for each of the selected demonstrations. You can use both qualitative (stream-plots) and quantitative (MSE/BIC as derives from the optimization) criteria to support your decision.
7. Try to answer the following questions:
    a. Are all the demonstrations optimally modelled using the same number of Gaussian components? Why?
    b. What affects the optimal number of components?
    c. For the Line and C-Shape demonstrations, would you use a Linear model or SEDS? Why?