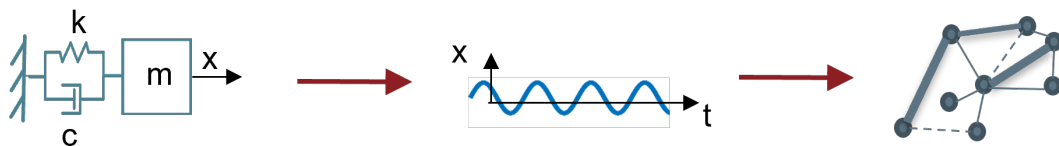


Project or Master Thesis

Complex network analysis of low-dimensional mechanical systems

Mechanical structures play an important role in the key technologies of the future. Due to ever-rising requirements in terms of light weight and robustness to a wide range of environmental conditions, these systems become more and more complex to design and analyze. Network analysis provides a variety of useful tools for the analysis of dynamical systems. While these methods are widely used in many disciplines of science, such as medicine and climate science, they are only just beginning to find their way into mechanical engineering.



The aim of this project is the application of one specific network method, for example the ordinal partition graph¹, to a low-dimensional mechanical system. Once a network is generated, its properties can be studied, especially regarding the information on the underlying dynamical system which can be extracted from it. Optionally, the work can be concluded with a sensitivity/robustness analysis.

Your tasks:

- brief literature review of a specific network method, e.g. ordinal partition networks
- implementation the method with small sample system
- application to low-dimensional mechanical systems

Your profile:

- no prior knowledge of networks or network method required
- basic knowledge of structural dynamics helpful
- good programming skills in Python necessary
- curiosity, an independent work style and open communication

¹M. Small, Complex networks from time series: Capturing dynamics. 2013 IEEE International Symposium on Circuits and Systems (ISCAS), Beijing, China, 2013, pp. 2509-2512, doi: 10.1109/ISCAS.2013.6572389.