**Project or Master Thesis**

Optimizing Sensor Networks for Future Technologies

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. Often, the system analysis requires a large amount of measurement data which is obtained from the system during operation. One key question that arises with this procedure is, are we measuring everything we need to measure? That is, are there enough sensors in place to accurately capture the dynamics of the system? Or, inversely, can we optimize the measurement process, because less sensors would suffice?

[1] Arne Nordmann (norro), CC BY-SA 3.0 <http://creativecommons.org/licenses/by-sa/3.0/>, via Wikimedia Commons
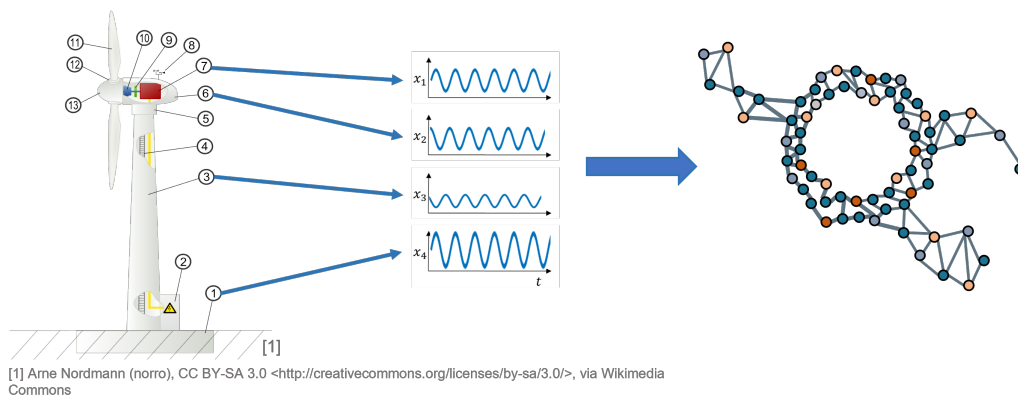
This project seeks to answer these questions by exploiting methods developed in network science. Previous work by Haehne et al.[1] demonstrates how measurements from a subset of the components of a dynamical system can be used to determine the dimension of the underlying system. In this project, the method will be applied to a system of coupled mechanical oscillators to determine how many sensors are required to capture the dynamics of the model.

Your tasks:

- brief literature review

- implementation of a mechanical model system

- application of a known method from network science to the model system, study advantages and potential pitfalls of the method

Your profile:

- no prior knowledge of networks or network methods necessary

- basic knowledge of structural dynamics helpful

- basic programming skills in Python or Matlab required

- curiosity, an independent work style and open communication - in English or German

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[1]Haehne et al.: Detecting hidden units and network size from perceptible dynamics. Phys. Rev. Lett., 2019

Contact:
M. Sc. Charlotte Geier
charlotte.geier@tuhh.de

Dynamics Group (M-14)
Hamburg University of Technology
www.tuhh.de/dyn