

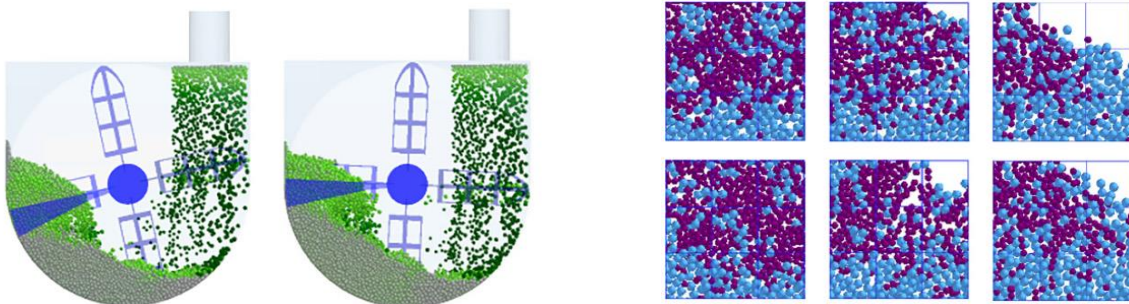
Interdisciplinary project (IDP)

Machine Learning-Based Prediction of Pharmaceutical Particle Mixing Status in Rotary Drums [100% remote work possible]

Motivation

The mixing of powders of different sizes is widespread in the chemical, pharmaceutical, and food industries. Many types of mixers, such as V-mixers, cone mixers, container mixers, conventional rotary drums, etc., are commonly used for mixing particles. Among these mixers, the rotary drum mixer is the simplest and can be easily improved to achieve a better mixing degree. Hence, mixing powders with rotary drums is very popular in industry. The study of the particle mixing process in rotary drums can help in optimizing mixing schemes or designing mixing equipment.

However, the mixing mechanism of pharmaceutical particles, which is largely influenced by fundamental factors such as particle size distribution, particle morphology and cohesion, is not well understood. In addition, the local mixing state is difficult to obtain experimentally, so DEM simulations are the state of the art in this application area, although they are very time-consuming. Therefore, the need for a robust and adaptable machine learning approach for predicting mixing status of pharmaceutical particles remains a matter of utmost importance.



Work packages:

- Generate a synthetic training dataset of the mixing status (global and local) and particle characteristics (Data from DEM simulation will be provided);
- Establish and train a suitable learning model with the generated data (Several papers/algorithms will be provided to you as an inspiration, but the choice of method and implementation will be up to you).
- Run simple DEM simulation to evaluate the prediction of the mixing state by trained model
- Analysis of data and Documentation of results

Desired skills

- Strong coding skills in Python or C/C++
- Experience with Machine Learning

Supporting courses (selection)

Modellierung und Simulation disperser Systeme (in english), Wissenschaftlich-Technisches Rechnen

You may expect

Within the scope of this thesis, you can get in touch with on the fantastic numerical method for study on powder. In addition, this work allows you to practice your know in machine learning by solving problems, which is both in scientific research and industry intensively investigated. We also provide possibility of publication as a scientific paper, If you are interested to make contribution in it and your works are suitable.

Are you interested? Then get in touch with me!

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