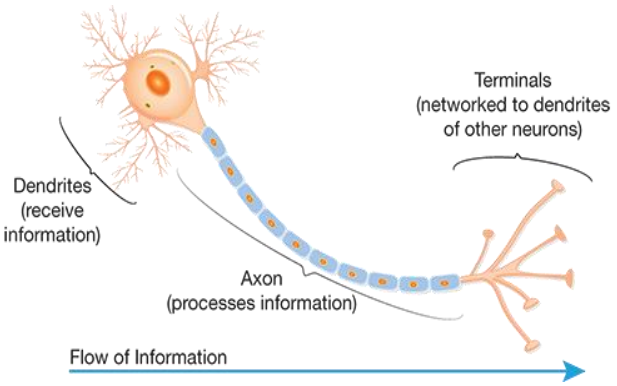
Master Thesis – Chemical and Process Engineering

Exploiting Artificial Intelligence in in Gas-Particle Flow Simulations

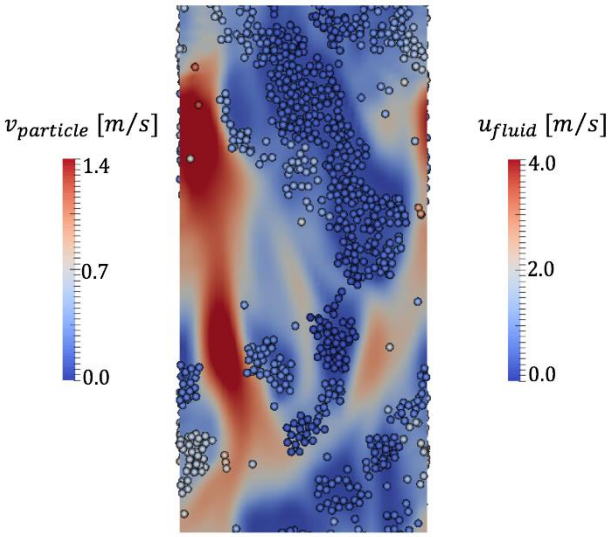
Current trends in advanced multiphase flow prediction aim at the usage of machine learning algorithms and deep neural networks to improve the accuracy and to speed-up numerical simulations. Overall, it can be expected that these tools (and artificial intelligence, AI, in a wider context) will become an important part of numerical modelling used in chemical engineering applications.

The overarching goal of this Master Thesis project is to increase the speed of gas-particle flow simulations (see the right panel in the Figure below) by using an AI-powered prediction algorithm.

Your tasks will include (i) a literature review on the usage of deep learning in numerical simulations, (ii) an investigation related to key parameters of a neural net structure to speed up a widely-used gas-particle flow simulator, and (iii) application of the improved simulator to a use case. The machine learning and deep neural nets will be based on existing open source AI platforms (e.g., Tensorflow), for which expert knowledge is already available at our institute.



A. Gupta, "Introduction to Deep Learning Algorithms," *Chem. Eng. Prog.*, vol. 114, no. 6, pp. 22–29, 2018.



Qualification

- Interest in Computational Fluid Dynamics (CFD), Discrete Element Method (DEM)
- Basics programming skills (Matlab/octave, Python, C/C++ or other), and interest to refine your programming skills during the Master Thesis project

We offer

- Extremely high scientific and industrial relevance
- Introduction to the leading open-source gas-particle simulation tools OpenFOAM® and CFDEM®. Support with the AI platform, as well as with respect to programming.
- Computer power, desk and office space
- Possibility to publish the results and findings in a scientific journal

Contact

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