Generation of High Hematocrit Red Blood Cell Solutions in Complex Geometries

Automatic generation of Red Blood Cells (RBCs) configuration with desired volume fraction in complex geometries.

Blood flow is involved in most of the fundamental functions of living organisms in health and disease.

In the last few decades simulations have complemented experiments and have become an essential tool for investigations of blood flow in animal research and patient care.

CSE lab has developed a high-performance particle-based software tool uDeviceX for efficient blood flow simulations in complex microfluidic devices and capillaries.

Initial conditions of the simulations with uDeviceX require the blood to have specific RBC volume fraction, which is not a trivial task, especially for high fractions and complex and large geometries.

The project task is to efficiently distribute non-overlapping RBCs with little to no deformation in the specified channel. Different algorithmic approaches must be combined with the best HPC practices to result in a fast and robust code.

Specific project requirements and duration may be adjusted to meet the student’s requests.

PREREQUISITES

Programming in C/C++/Java/Python
Independent worker

CONTACT

Prof. Petros Koumoutsakos
Dmitry Alexeev

e-mail: petros@ethz.ch
alexeedm@ethz.ch