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A deep learning enabled massive parallel simulator for porous media flow

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Due to the complex composition of oil and gas resources, reservoir engineers usually switch between different mathematical models when describing the properties of petroleum reservoirs. In addition to the commonly used black oil model, various compositional models have been proposed. Some EOR techniques, such as polymer flooding, must be simulated based on the framework of compositional models. Some other applications of porous media flow, such as CO₂ sequestration, groundwater contamination, and geothermal resource development, can also be simulated using compositional models. But the compositional models tend to be associated with more complex PDEs, more variables, and higher computational costs. In this talk, we will discuss a general-purpose compositional framework and our efforts in developing its solution methods, including discretizations, nonlinear solvers, linear solvers, parallelization and AI capabilities. Furthermore, we will introduce an open-source software project for simulating multi-component multi-phase porous media flow.

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References

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