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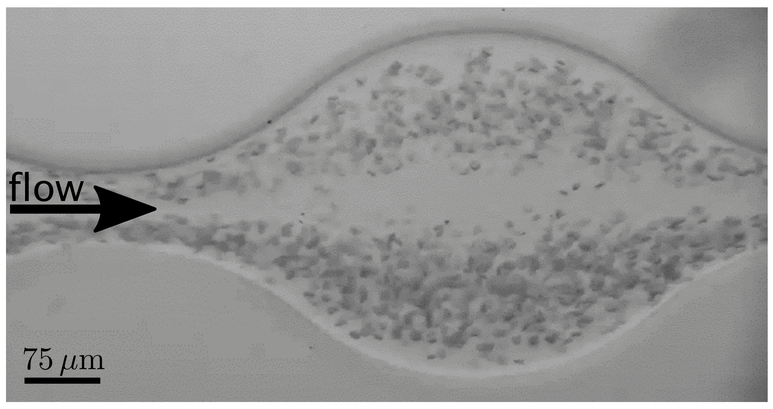
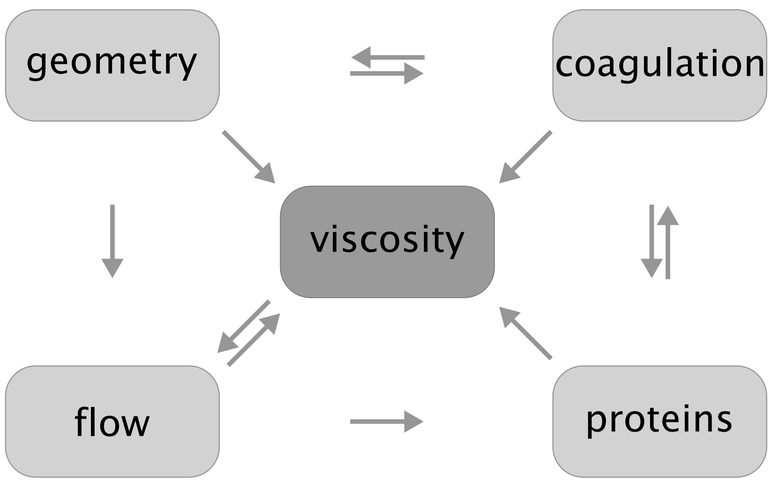
Boosting CFD with AI

Flow mechanics inside membrane oxygenators are of great interest, since observed coagulation phenomena are believed to be mediated by prevaltent flow.

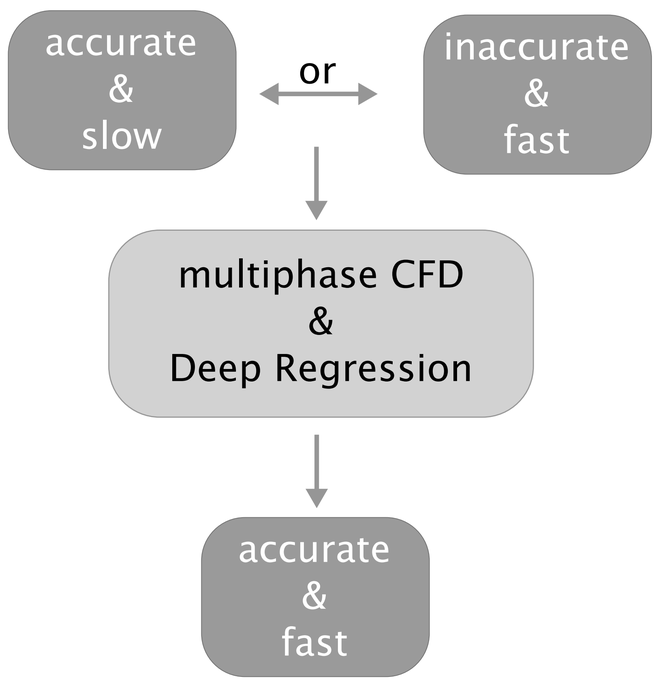


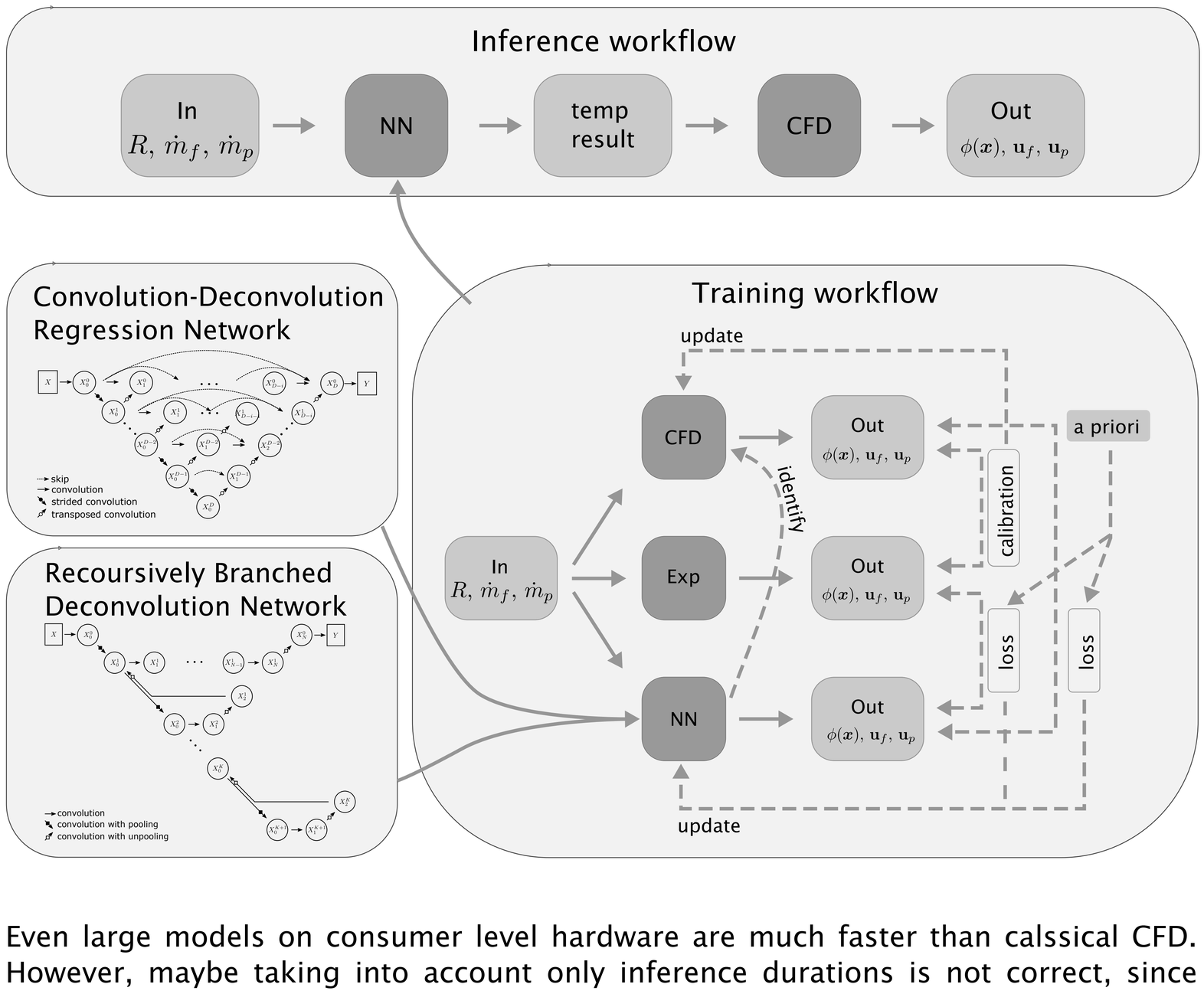
Blood flowing in small channels exhibit strong non-linear effects that can be very costly to compute. The mutal dependencies are quite complex and very patient specific. Hence, classical CFD can be laborious.



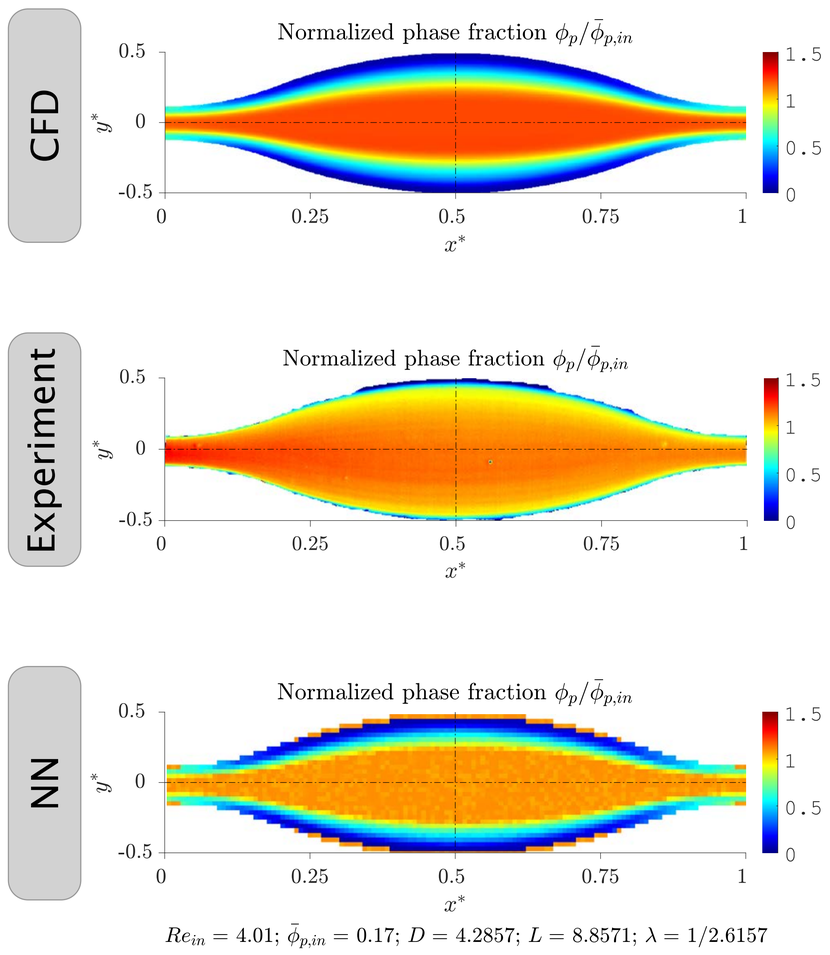
Neural Networks as alternative method for universal approximation of differential equationshave proven to be computationally efficient and still sufficiently accurate compared to established methods, such as the finite volume method. Additionally, analysing weights can give insightsinto underlying phsical laws.

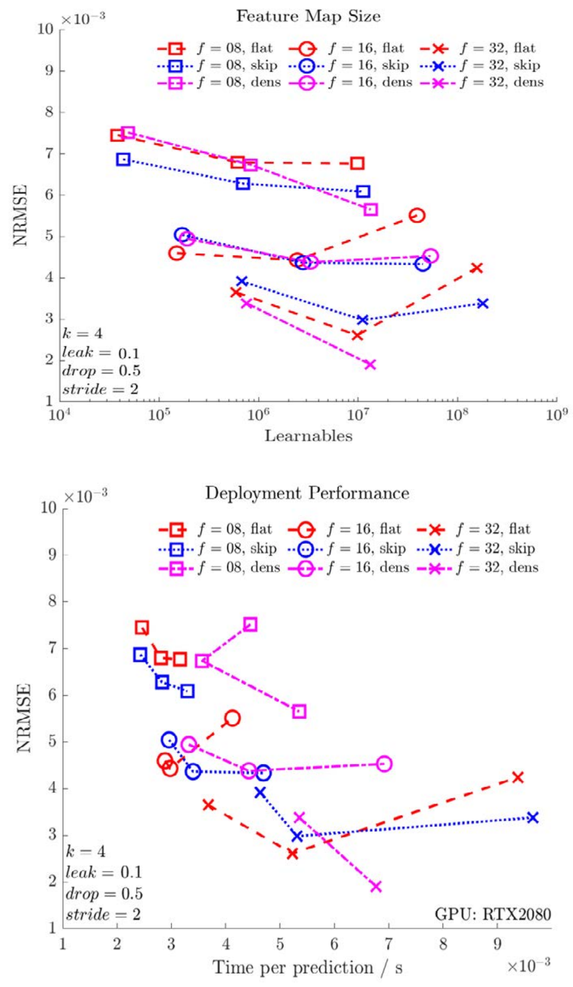
computing complex blood flows is either





Even large models on consumer level hardware are much faster than calssical CFD. However, maybe taking into account only inference durations is not correct, since training the model is also computationally costly and predictions might perceived only as interpolation between elaborately trained cases.





Deep convolutional neural networks can accelerate complex flow computations significantly

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