In two-phase flows, e.g. mold filling processes (injection molding, die casting), there is a complex interaction between the liquid and the gaseous phase. The rapidly moving interface and the entrapment of gas in the liquid provide a great challenge for numerical simulations of such two-phase flows. One can generally distinguish between two approaches when it comes to moving boundary problems. Interface tracking explicitly describes the interface with a mesh. Hence, the mesh nodes on the interface have to follow the movement of the interface. While this approach provides great accuracy its applicability is limited in the case of severe interface motion. In this case, typically interface capturing methods are used, e.g. the level-set method. Here, the interface is described implicitly using an artificial indicator function; often a signed-distance function. The motion of the interface is accounted for by means of a level-set transport equation. In order to maintain the signed-distance property of the level-set field, frequent reinitialization is necessary. The level-set method is inherently able to consider problems where the interface is subjected to topological changes.

We are looking for motivated students supporting us with the development of the level-set capabilities of our in-house, highly parallel finite element flow solver XNS.

Qualifications:
You will ideally have programming experience with either FORTAN or C. Knowledge about the finite element method would be helpful, but is not necessarily required.