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**Methodology for DNS Data-driven Machine Learning Bubble Drag Model and Its Integration to OpenFOAM** CHENG-KAI TAI, Dept. of Nuclear Engineering, North Carolina State University, ILYA EVDOKIMOV, FABIAN SCHLEGEL, DIRK LUCAS, Helmholtz-Zentrum Dresden Rossendorf, IGOR BOLOTNOV, Dept. of Nuclear Engineering, North Carolina State University — This work aims to develop a two-phase DNS data-driven bubble drag model and to implement it into a multiphase CFD simulation. To achieve the goal, a Tensorflow (TF)-OpenFOAM(OF) integration interface has been established. The interface can call and make machine learning model predict quantities of interest on the fly. A benchmark case for the bubble drag coefficient is proposed to validate the interface. A feedforward neural network was utilized to approximate the drag correlation (Tomiyama et al., 1998) using artificially generated data. Results of the integration show good consistency in radial void fraction and velocity profiles. Next, actual DNS bubble tracking datasets are used as a data source (Fang et al., 2017, Cambareri et al., 2019). The data segments where bubbles have quasi-stable main-stream velocity were filtered out for drag coefficient calculation. The DNS-informed model predicts drag coefficient by taking bubble Reynolds and Etvs number as input. The model is applied in an Euler-Euler two-phase flow simulation of a bubbly pipe flow in OF. The closure terms, except the drag model, utilize the baseline model of Liao et al. (2020). The results of radial void fraction and velocity profiles are compared to reference by baseline.

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