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PROCEEDINGS

Neural Network-Based Bubble Interface Prediction

Junhua Gong[1], Yujie Chen[2,*], Bo Yu[2] and Bin Chen[1]

[1]State Key Laboratory of Multiphase Flow in Power Engineering, Xi'an Jiaotong University, Xi'an, 710049, China
[2]School of Mechanical Engineering, Beijing Institute of Petrochemical Technology, Beijing, 102617, China
[*]Corresponding Author: Yujie Chen. Email: yujiechen@bipt.edu.cn

ABSTRACT

Traditional interface reconstruction methods often rely on numerical approaches, which can be inefficient when dealing with large bubbles, requiring extensive computational resources. To address this issue, we propose a novel model based on convolutional neural networks aimed at rapidly and accurately predicting the equations governing circular bubbles. This model takes the volume fraction of the main-phase fluid surrounding each computational grid cell as input variables and is capable of precisely forecasting the coordinates and radii of bubbles. To further enhance model performance, we employ the Optuna hyperparameter optimizer to fine-tune the model's parameters. Upon training completion, the optimized model achieves prediction errors of less than 1%, demonstrating exceptional accuracy.

KEYWORDS

Neural network; interface construction; bubble

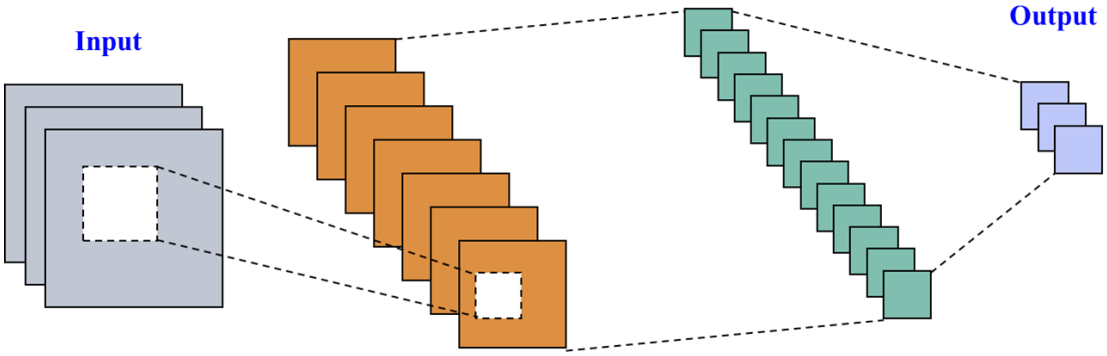

Fig. 1. The architecture of CNN

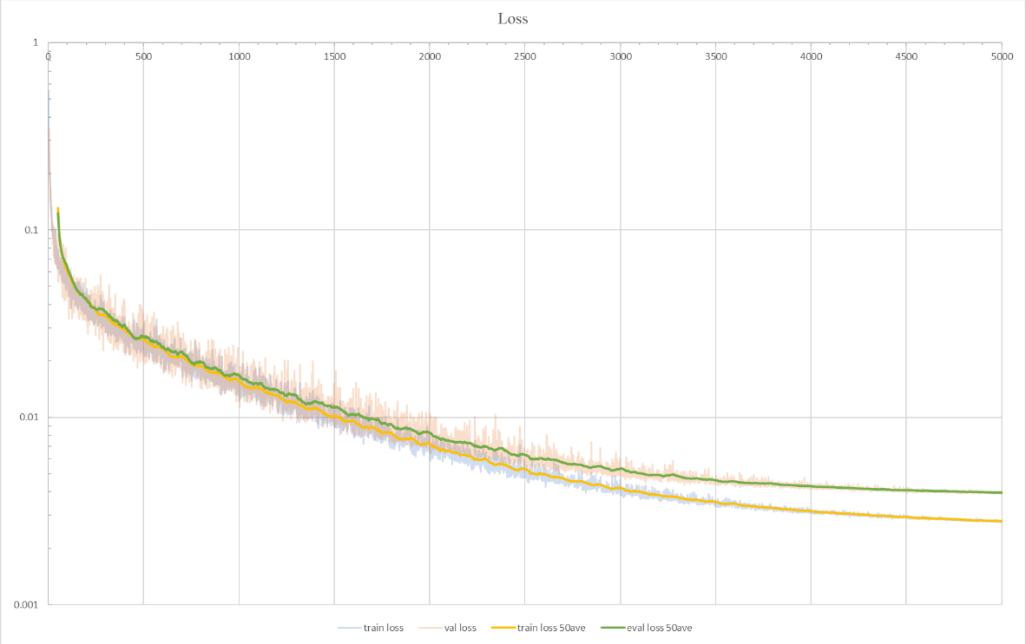

Fig. 2. Loss-descent curves for the CNN model in train and validation datasets.

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