MODEL DEVELOPMENT FOR ESTIMATION OF SEDIMENT REMOVAL EFFICIENCY OF SETTLING BASINS USING GROUP METHOD OF DATA HANDLING

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Abstract

The surplus sediment which enters in the canal may be removed using settling basins. In the present study, the available relationships concerning sediment removal efficiency of settling basins are verified. It has been observed that efficiencies computed by different relationships are greatly varied and none of the relationships can accurately predict the efficiency. Hence a new non-linear regression model has been proposed in terms of settling basin parameters. On the basis of various performance parameters, it was observed that the present regression model has the highest accuracy as compared to available regression models. A new model based on the group method of data handling (GMDH) has also been developed for predicting the removal efficiency of the settling basin. It was observed that the efficiency estimated using the GMDH model is more accurate than those given by the regression model. Also, the ratio of the fall velocity of the particle to the average velocity of flow over the cross-section of the basin has been determined as the most effective parameter on efficiency through a sensitivity analysis. However, on the basis of variations in the outcome obtained from the application of different analytical methods, the GMDH model consisting all input variables may be used for generality. This work will help in quantifying and subsequently improving the management of surplus sediment in canals.

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TABLE-1 PERFORMANCE PARAMETERS OF EXISTING AND PROPOSED.docx available at https://authorea.com/users/298065/articles/427366-model-development-for-estimation-of-sediment-removal-efficiency-of-settling-basins-using-group-method-of-data-handling

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TABLE-2 RANGE OF DATA COLLECTED FROM LITERATURE.docx available at https://authorea.com/users/298065/articles/427366-model-development-for-estimation-of-sediment-removal-efficiency-of-settling-basins-using-group-method-of-data-handling

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TABLE-3 RESULTS OF GMDH MODELS.docx available at https://authorea.com/users/298065/articles/427366-model-development-for-estimation-of-sediment-removal-efficiency-of-settling-

basins-using-group-method-of-data-handling

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TABLE-4 SENSITIVITY ANALYSIS.docx available at https://authorea.com/users/298065/articles/427366-model-development-for-estimation-of-sediment-removal-efficiency-of-settling-basins-using-group-method-of-data-handling

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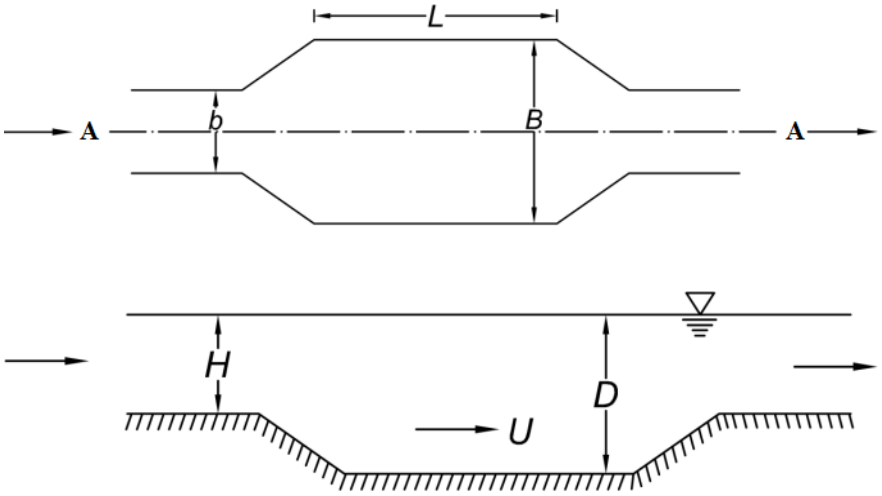
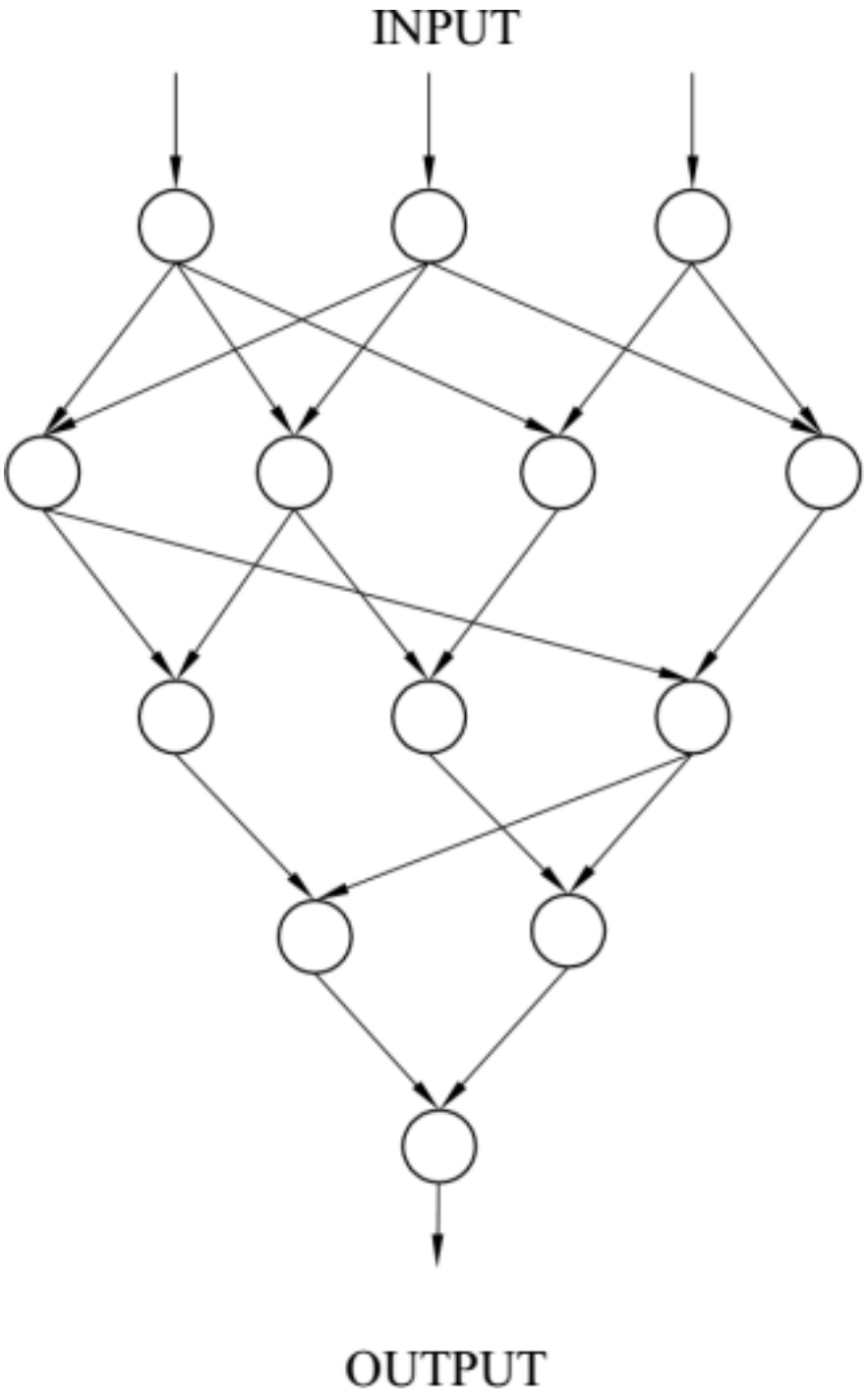
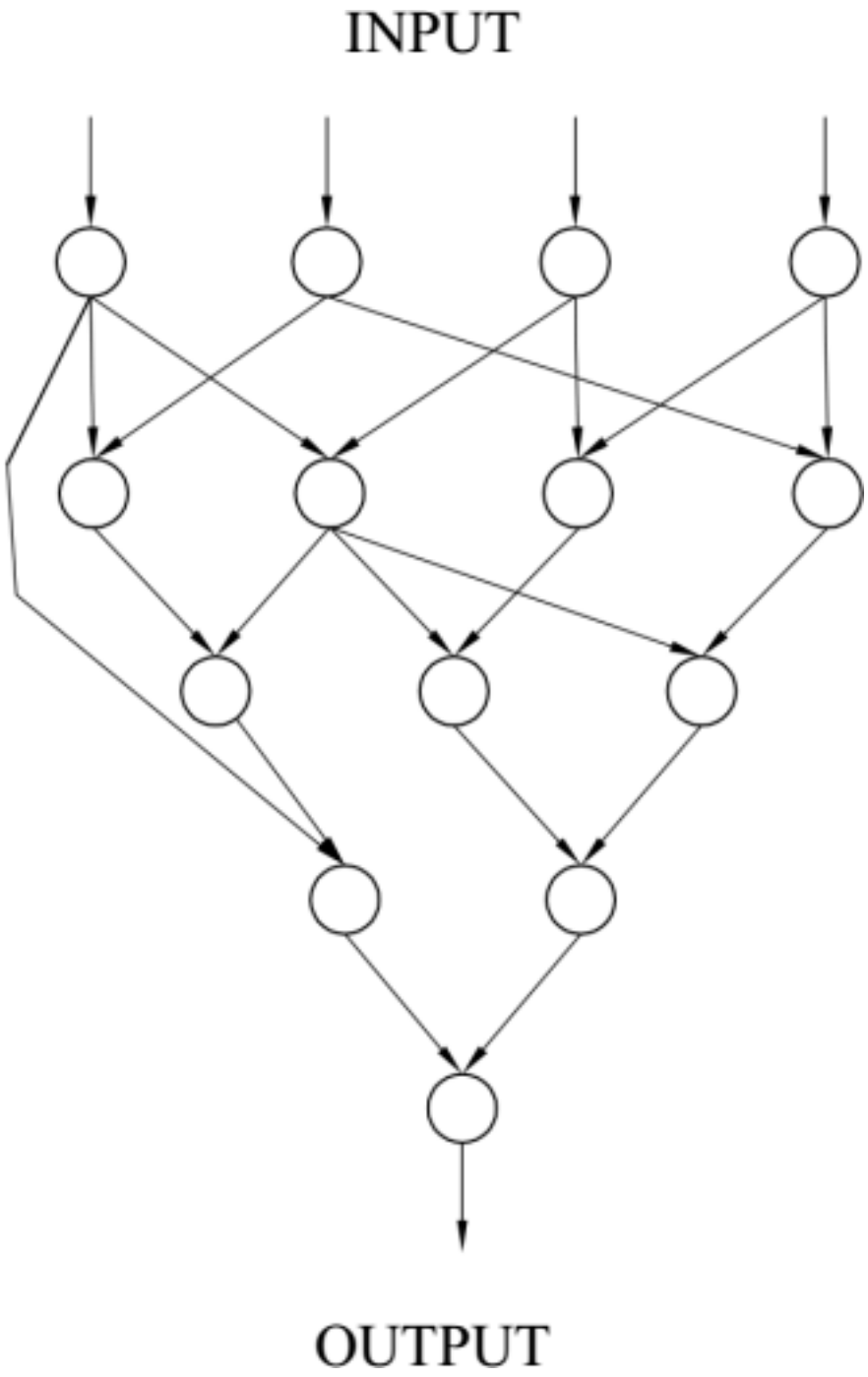
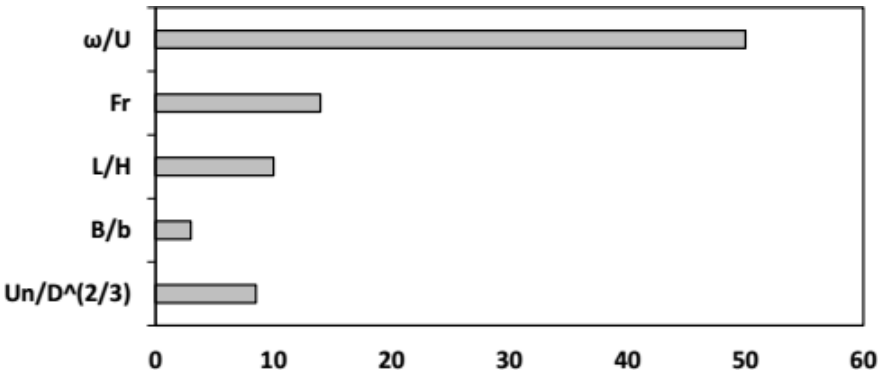
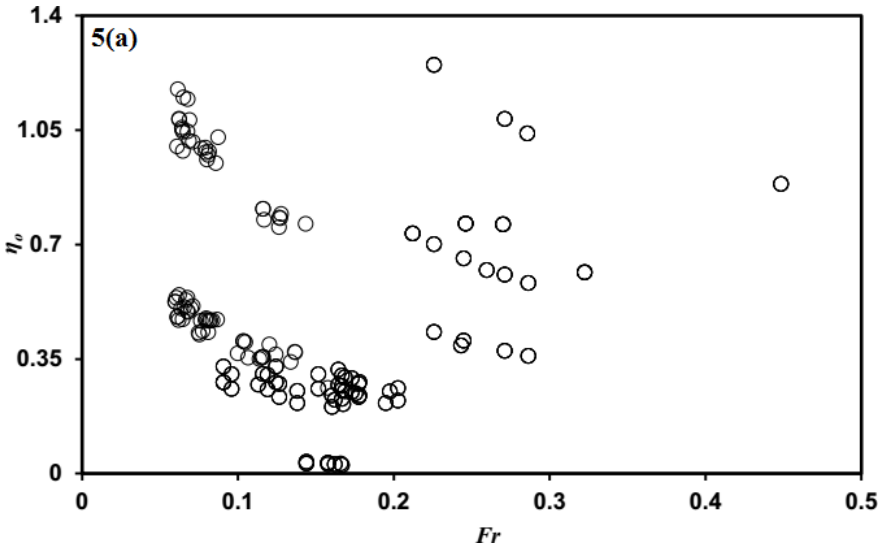
Figure notations.docx available at https://authorea.com/users/298065/articles/427366-model-development-for-estimation-of-sediment-removal-efficiency-of-settling-basins-using-group-method-of-data-handling

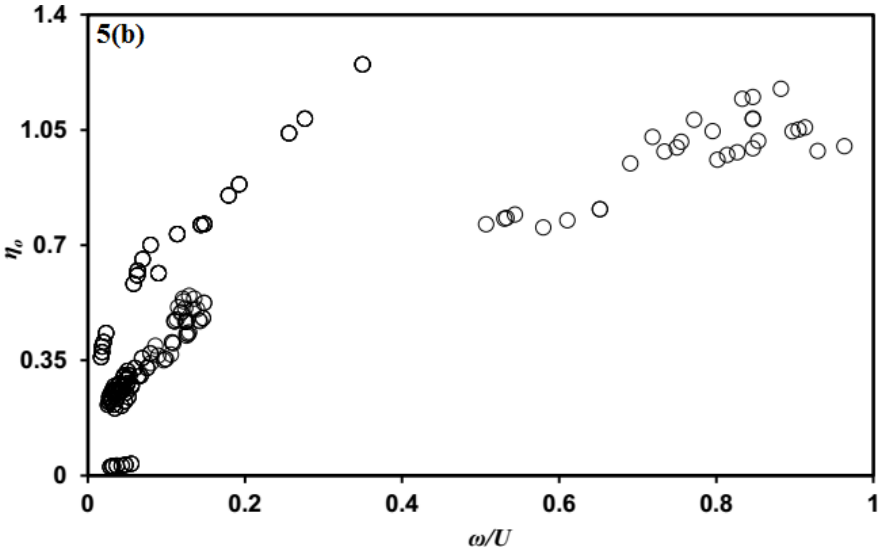


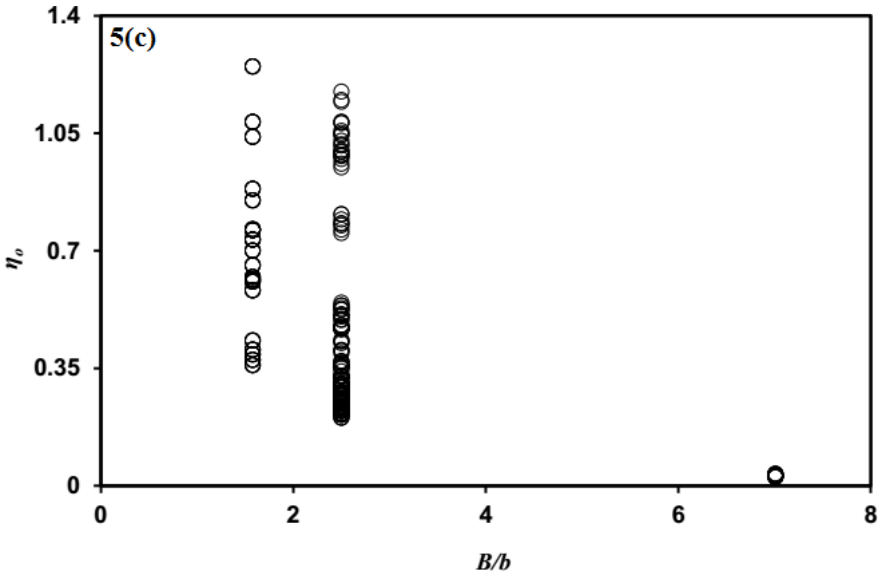


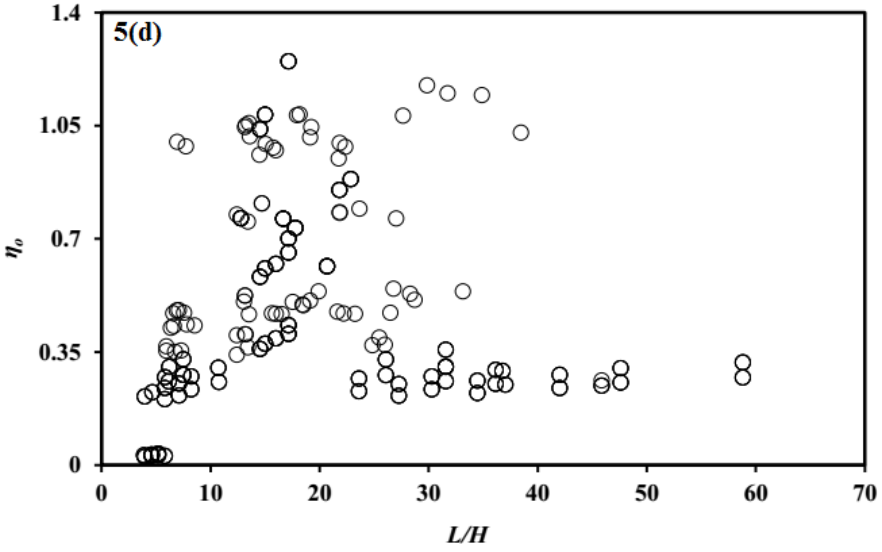


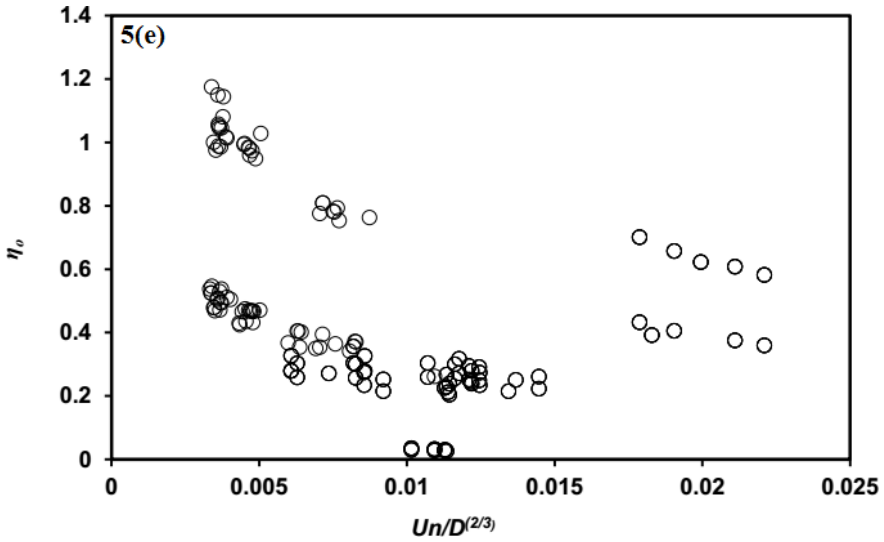




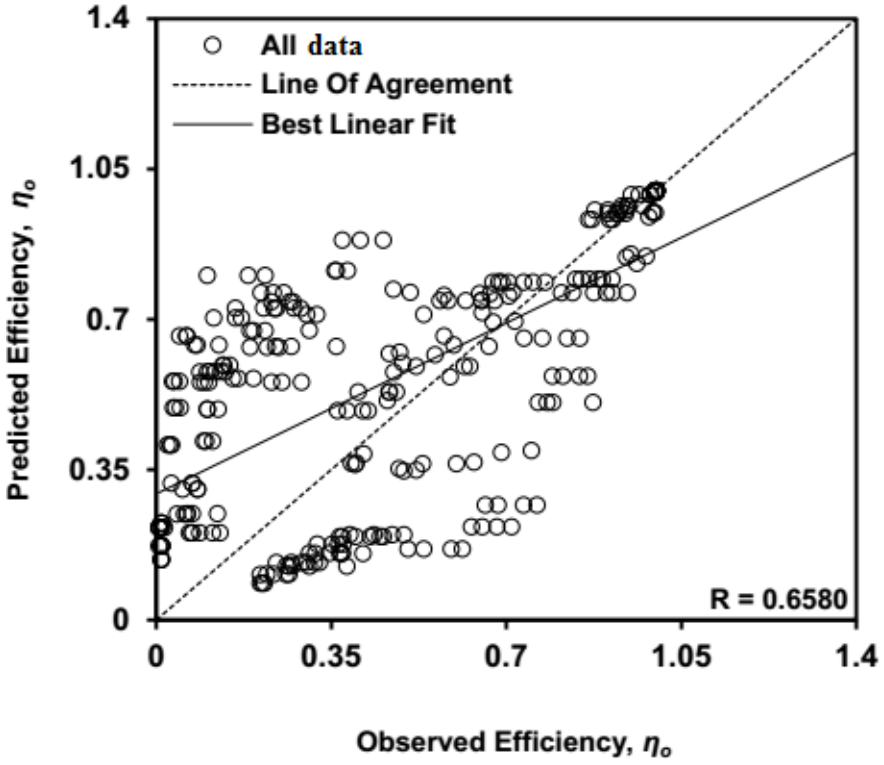








$$(\eta_o)_{\text{predicted}} = 0.568(\eta_o)_{\text{observed}} + 0.2936$$



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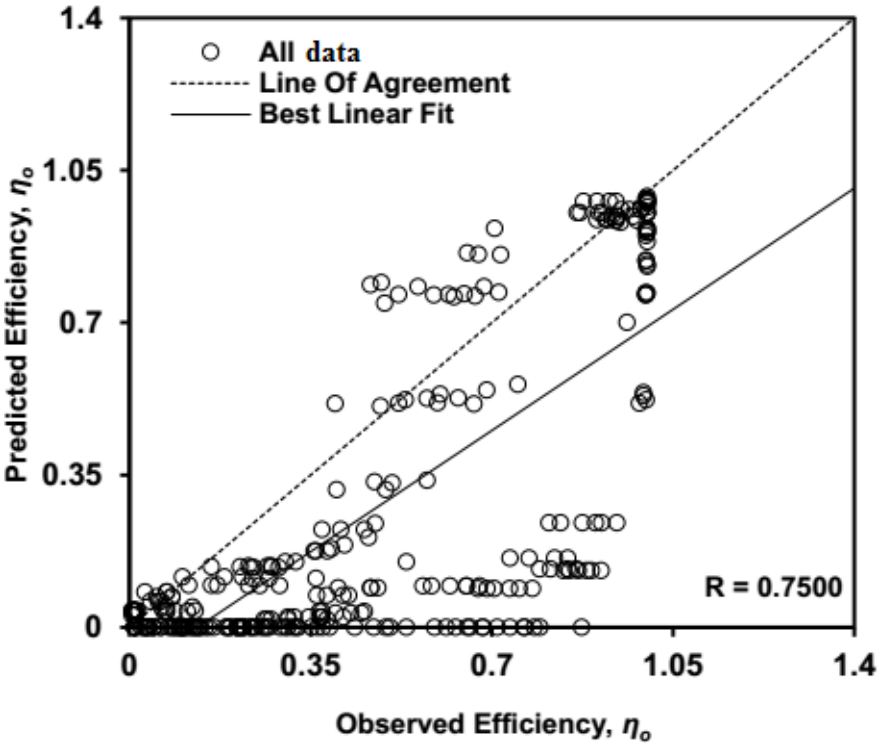
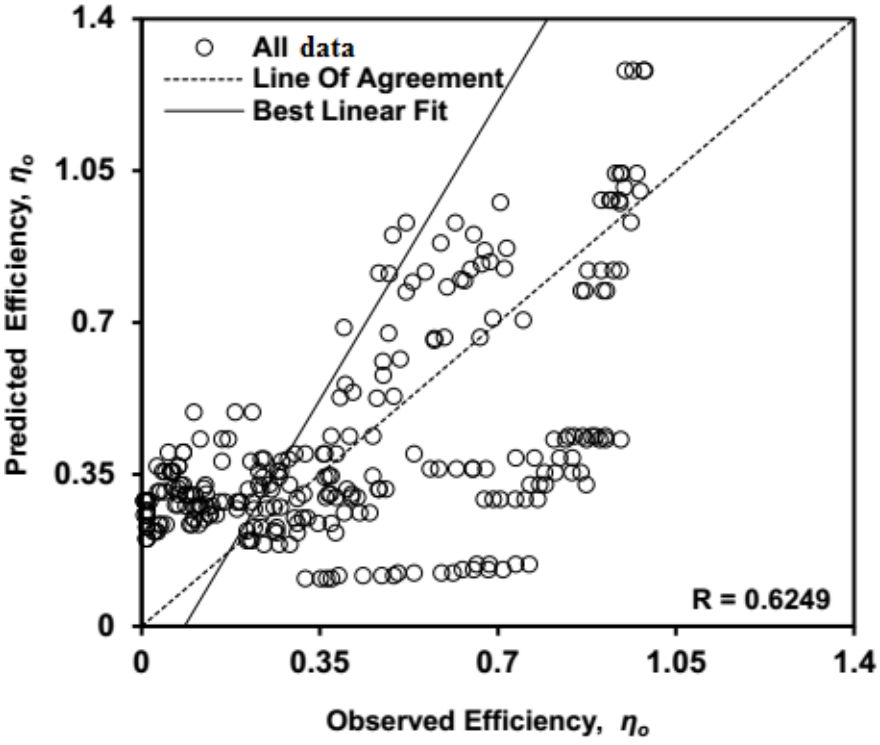
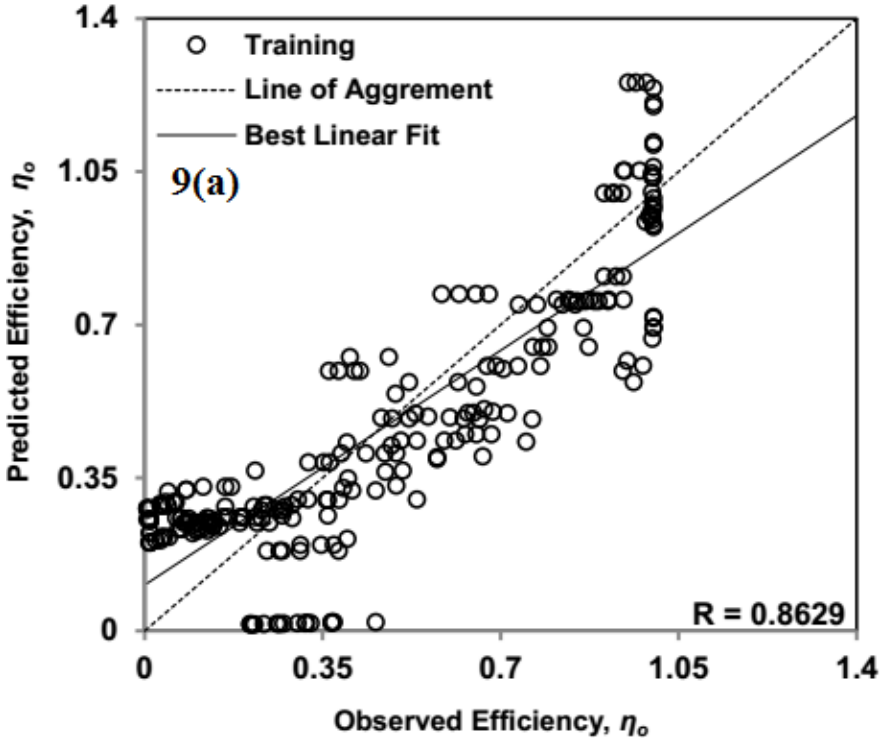


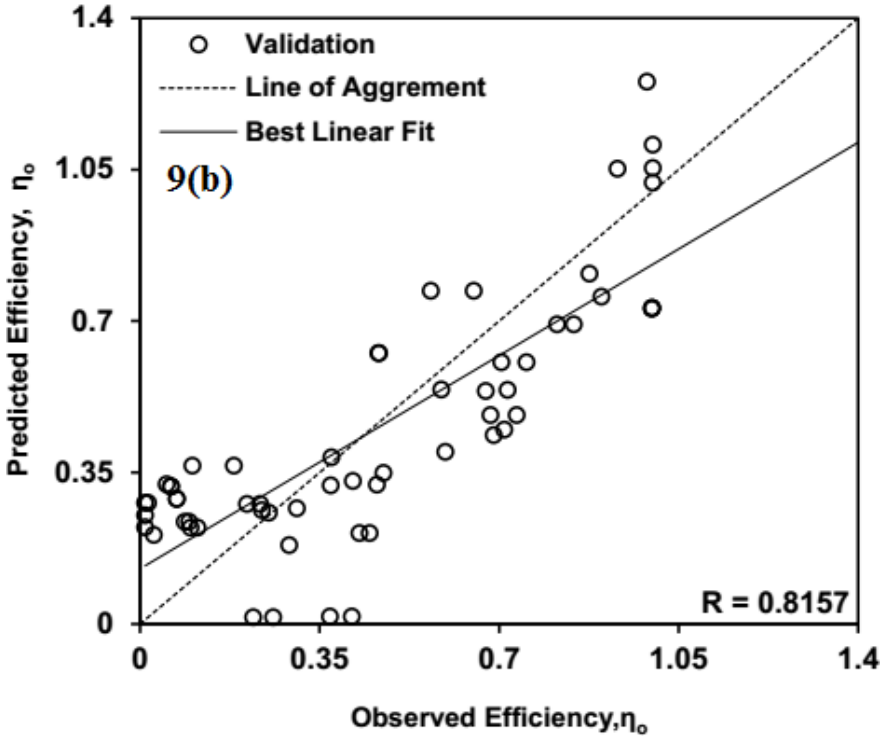
$$(\eta_o)_{\text{predicted}} = 1.962(\eta_o)_{\text{observed}} - 0.1656$$

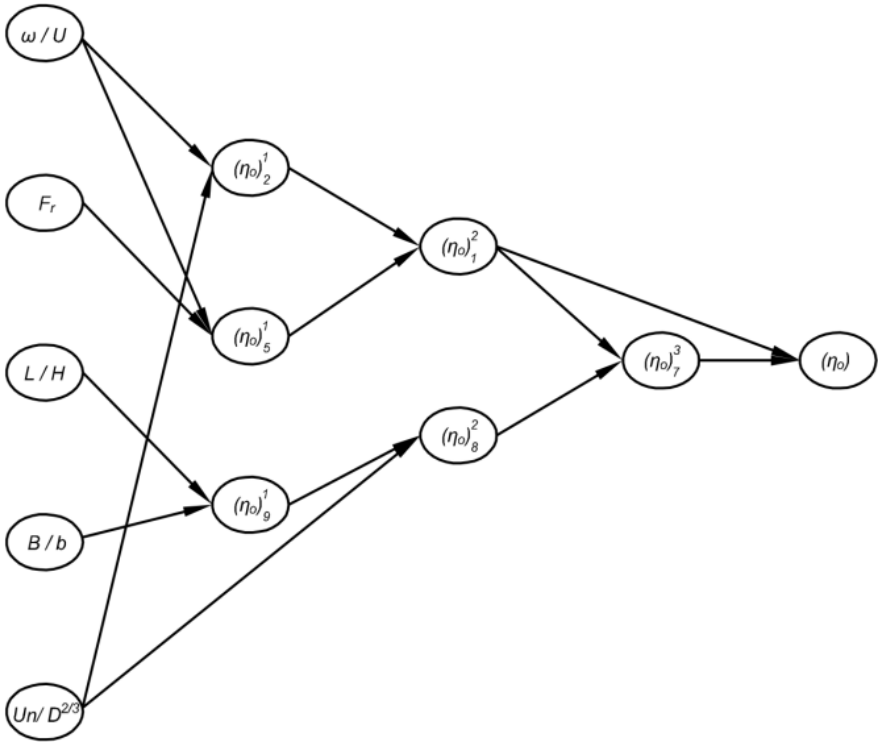


$$(\eta_o)_{\text{predicted}} = 0.7668(\eta_o)_{\text{observed}} + 0.1046$$

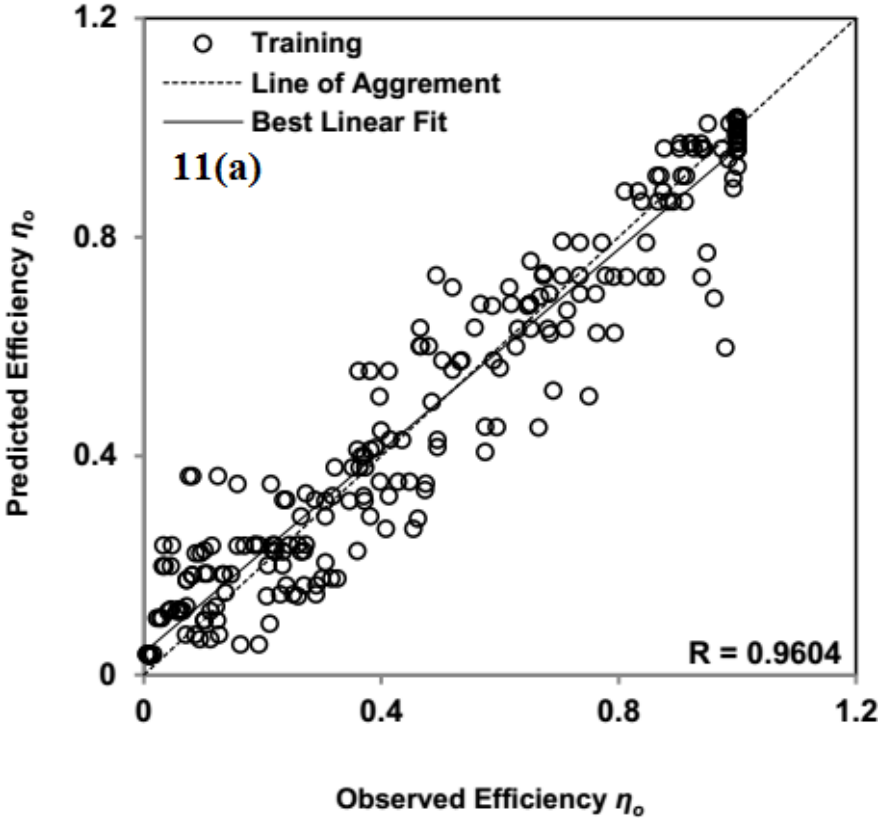


$$(\eta_o)_{\text{predicted}} = 0.704(\eta_o)_{\text{observed}} + 0.1274$$





$$(\eta_o)_{\text{predicted}} = 0.9215(\eta_o)_{\text{observed}} + 0.0408$$



$$(\eta_o)_{\text{predicted}} = 0.8921(\eta_o)_{\text{observed}} + 0.0575$$