

## Potential of regression models in projecting sea level variability due to climate change at Haldia Port, India

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**Abstract.** Higher prediction efficacy is a very challenging task in any field of engineering. Due to global warming, there is a considerable increase in the global sea level. Through this work, an attempt has been made to find the sea level variability due to climate change impact at Haldia Port, India. Different statistical downscaling techniques are available and through this paper authors are intending to compare and illustrate the performances of three regression models. The models: Wavelet Neural Network (WNN), Minimax Probability Machine Regression (MPMR), Feed-Forward Neural Network (FFNN) are used for projecting the sea level variability due to climate change at Haldia Port, India. Model performance indices like PI, RMSE, NSE, MAPE, RSR etc were evaluated to get a clear picture on the model accuracy. All the indices are pointing towards the outperformance of WNN in projecting the sea level variability. The findings suggest a strong recommendation for ensembled models especially wavelet decomposed neural network to improve projecting efficiency in any time series modeling.

**Keywords:** WNN; MPMR; FFNN; sea-level; statistical downscaling

### 1. Introduction

Efficacy in the prediction of sea level variability are of prime importance to coastal and ocean engineers, as this will be one of the deciding factors for the off-shore structures, groundwater quality, saline water intrusion etc. As mentioned by the experts, sea level variations enact a great role in the groundwater levels of low lying coastal aquifers (Meyer 1981), coastal rivers (Thain *et al.* 2004) etc. Moreover, our fresh water resources are diminishing as reported by IPCC in the 5<sup>th</sup> report, and are severely affected by the sea level rise. Sea level rise could trigger the saline intrusion in the coastal aquifers and thereby it affects the groundwater quality, aquatic plants and animals (Chen *et al.* 2016). The climate change can be a dominant concern for the sea level variability and a few literatures (Goharnejad *et al.* 2013, Masciopinto and Liso 2016) remarks about the contribution on this. Worldwide investigations established a global temperature increase of both land and sea by 0.76°C from 1850-2005 (IPCC, 2007). As noted by Pfeffer *et al.* 2008, the global sea level rise will happen in between 0.18 m to 0.4 m towards the end of 21<sup>st</sup>

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