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A Machine Learning Approach to Non-uniform Spatial Downscaling of Climate Variables

Soukayna Mouatadid[1], Steve Easterbrook[1],and Andre R. Erler[2]

[1]Department of Computer Science, University of Toronto, Toronto, Canada
[2]Aquanty Inc. / Department of Physics, University of Toronto, Toronto, Canada

This study presents a scalable and robust approach to spatial downscaling in the context of climate downscaling. We explore the ability of four techniques to downscale a climate variable to a given location of interest. As an example, we focus on downscaling daily mean air temperature at twelve stations located across the topographically complex province of British Columbia, Canada. The techniques include multi-linear regression (MLR), artificial neural networks (ANN), extreme learning machines (ELM) and long-short term memory networks (LSTM). Our method based on LSTM generalizes well to different locations and leads to higher downscaling accuracy compared to MLR and ELM. The performance of the models is measured based on statistical metrics, including the coefficient of determination, and the root mean square error.