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Identification of Effective Covariates for Prediction of Drainage Discharge at Field Scale Using Machine-Learning Algorithms

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In order to study the nutrient transport through the drain pipes to the streams and surface water bodies, it is essential to quantify the water flowing from the soil to the drainage system. It has been more than a decade that the physically-based dynamic models are being used to reflect the natural conditions in a hydrologic system. However, these models require numerous input parameters to estimate the target output, which are laborious to obtain. The main objective of this study was to investigate the ability of machine-learning models to predict tile drainage discharge with the emphasis on the effective variables and their correlations. Two different Machine-Learning algorithms (Random Forest and Cubist) were trained to predict the tile drainage discharge at field-scale on a heterogeneous clay till using meteorological and hydraulic parameters, percolation, groundwater depth and field management data as covariates. The study area is located at southeast of Zealand, Denmark with an area of 3.93 ha. The field is divided into Well-Drained and Poorly-Drained areas 2.65 and 1.28 ha, respectively. The drainage flow is being measured every ten minutes in two different outlets in both parts of the field with the means of a magnetic flow-meter installed in each of the wells. Models were developed on a time-series of measured daily drainage discharge. Percolation out of the root zone was calculated with EVACROP, a simple water balance model. In addition to assess the performance of two models, it is expected to extract the importance of the spatial variability in some parameters as found in the two different parts of the field.