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Abstract Title: *Machine learning for reservoir inflow temperature prediction in water resources management models*

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Topic

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Abstract Submission

A model predicting water temperatures in a river reach enables water resource managers to investigate various mechanisms for water temperature improvements through operational and structural measures. Traditional temperature models are physically based; given user described system characteristics (e. g. , channel geometry, slope, flow, climate conditions), they use governing equations for heat conservation and fluid flow to predict water

temperatures. On the other hand, machine-learning models use statistical techniques that generally run fast, when modeling a large or complex watershed for water quality, and require little expert intervention in calibrating or tweaking parameters. This study develops a random forest model, a tree based machine-learning algorithm, for hourly streamflow temperatures in some California basins, using meteorological and basin characteristics as the predictor variables. The model is trained on historical estimates of streamflow temperatures, and its uncertainty is determined using a cross-validation approach. The test error from this comparison reflects the model's ability to capture the variations in temperature with 1-hour resolution. All predictor variables that contribute to modeling streamflow temperatures are ranked based on their relative importance (i. e. contribution to reducing the prediction errors). The model is also used to predict temperatures for a different river reach, which then serve as input into HEC-5Q, a reservoir water quality model developed by the Army Corp of Engineers. The output from HEC-5Q is benchmarked against traditional methods. The results of this study show the value of a machine learning approach to improve streamflow temperature prediction in California watersheds.

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Ellie White 10/07/17

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