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Assessing classification uncertainty of multi-temporal SAR imagery through Random Forests

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Knowledge on the spatial distribution of crops in a watershed is of high importance when running spatially distributed hydrologic models. Remote sensing may provide such crop maps through classification of the obtained imagery. Although crop classification is mainly performed on optical imagery, some studies have investigated the potential of SAR to discriminate between crops, however, classification accuracies are generally reported to be inferior to what is obtained through optical remote sensing. In this presentation, multi-temporal and multi-polarized SAR data from the Foulum site (Denmark) obtained by the Danish EMISAR sensor are applied to a Random Forests classifier. Random Forests, which is an ensemble learning technique, generated many classification trees and individual results are aggregated. Results demonstrate that Random Forests is able to classify the SAR imagery with a similar accuracy as the state-of-the-art classification techniques. Additionally, Random Forests allows for uncertainty assessment of the crop classification at pixel level. The impact of uncertain crop mapping on hydrological models is discussed.