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Conditioned classification algorithm

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The atmospheric circulation (AC) typing is a marginal discretization of the atmosphere state which is broadly used in environmental applications. However, from a data mining point of view, this marginal discretization can be improved considering the relevant dependencies between AC and the corresponding environmental variables in order to analyze their impacts on surface weather, climate, and environment, avoiding the mixing of circulation states with different responses for the target variables. This issue is particularly important when dealing with extreme events.

In this paper, we show some applications of a novel conditioned classification algorithm that performs the classification in the AC state space and evaluates it in the environmental variables space. In this way, this is a hybrid optimization algorithm, as the fuzzy rules Bardossy's or Zorita's algorithms, but based on different methodology; note that the target variables are not integrated in the classification process.

The main characteristics of the algorithm are:

• robust and objective
• fast, easy to understand and to apply
• the AC patterns are real
• feasible for big domains and high resolution
• keeps the main advantages of the marginal classification algorithms
• transferable to different domains and targets

This algorithm has been successfully applied to different problems such as uncertainty estimation of EPS outputs, assessment of recent AC changes over Spain using weather types, downscaling in different domains and in the classification of wave extreme events in the North Atlantic European Coast with SWAN (Simulating WAves Nearshore) model.

To evaluate the performance of the algorithm it has been compared with other optimization standard algorithms such as SOM, k-means or SANDRA, showing better results when evaluated in the environmental variables space.