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## Using neural networks for postprocessing of numerical weather predictions in complex terrain

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Weather forecasts have been steadily improving in quality over the last decades. These ongoing improvements are due to advances in numerical weather prediction (NWP) and the advent of ever more powerful supercomputers that allow simulating future weather and its uncertainty with increasing resolution and using ensemble approaches. Such physics-based computer models, however, are not free of systematic errors. Statistical postprocessing can be used to calibrate NWP forecasts to further improve forecast quality and better exploit the available information. Here we present results from several explorative deep learning studies using artificial neural networks (ANN) to calibrate high resolution forecasts of temperature, precipitation, wind, and cloud cover in Switzerland. These first attempts at ANN-based postprocessing help us to understand the strengths and weaknesses of machine learning and are the basis to build more complex and comprehensive statistical models accounting for local effects in complex terrain such as the Swiss Alps. In all cases, ANN leads to significant improvements over the direct NWP output. While the improvement is comparable in magnitude with improvements achieved with conventional postprocessing approaches, ANN-based postprocessing is easier to generalize in space for a calibration of forecasts also at unobserved sites. In addition to the results of the postprocessing, we will also discuss the lessons learned so far in using machine learning for this particular problem.