ARTIFICIAL INTELLIGENCE **When a machine learns to predict avalanche danger.** A computer can now – after 'training' with an SLF researcher – assess the regional avalanche danger in many situations almost as well as experts.

Every day the avalanche forecasters at the WSL Institute for Snow and Avalanche Research SLF rely not only on their extensive experience to assess the avalanche danger. They also process huge quantities of data on the weather and on how the winter is developing. Back in the 1990s, attempts were already being made to analyse data automatically to support the forecasts, but none really worked because the data and computing power available were too limited.

The data researcher Cristina Pérez Guillén has now achieved a breakthrough in collaboration with the avalanche warning service of the SLF and the Swiss Data Science Center. "We can automatically predict the regional avalanche danger level about as well as people can," says the Spaniard. She tried out different kinds of machine learning to enable the computer to detect correlations between the weather data and the corresponding warning levels that the human forecasters predicted. For example, it learned to make its own forecasts from data on the basis of information from twenty previous winters. Cristina found that the learning approach known as 'random forest' seems to work best. She presented the computer with measurement data from two other winters that had not been used in the learning process, and got it to create avalanche forecasts using the new data.

Only suitable for dry avalanches

With machine learning, it is not really possible to figure out how and what the computer learns. But Cristina has, at least, been able to discover which parameters the machine considers particularly relevant. And lo and behold: they are essentially the same factors that human forecasters also consider central – based on their understanding of the processes involved and past experience. They include, for example, the amount of new snow and snow drifting.

Automatic forecasts still have weaknesses in handling the so-called 'old snowpack problem', which is an issue particularly in the inner Alps. The model is also only suitable for dry avalanches. The avalanche warning service has already evaluated the new method, and it tested it in operation during the winter of 2020/21 and last winter. Thomas Stucki, the head of the avalanche warning service, says: "The computer helps to improve the consistency of the forecasts and should provide us with a valid second opinion in the future. We humans can then devote all the more attention to translating the results into warnings that people can understand." It's therefore unlikely that the forecasters will become unemployed. *(bio)*