The quality of nonwoven fabrics depends on the distribution of the fiber thickness, the fiber orientation, and the cloudiness. These properties are evaluated in the laboratory using image data. MAVIfiber2d meets the difficult challenge of automating this evaluation, while also ensuring that it is reproducible.

Diffusion filters have been the nucleus of image processing at ITWM and the VQC project, which measured the cloudiness of nonwovens was one of the first industry projects in the image processing department. MAVIfiber2d combines this experience with new tools of mathematical morphology and the typical point concept of stochastic geometry to create software for objective, reproducible evaluations of non-woven samples.

Local analysis without fiber separation
In a random closed set, the typical point concept makes it possible to measure the distributions of fiber thickness and fiber orientation without having to separate the fibers in the image. In ambiguous situations, it is not necessary to decide where each intersecting or looped fiber begins or ends. Rather a simple binarization suffices: for every image pixel, a decision is made as to where it belongs in the fiber system, i.e., the foreground or the background. Local thickness and orientation are defined for every foreground pixel. The result is an area-weighted distribution of thickness and orientation.

Measuring cloudiness from standardized grayscale variances
Cloudiness is mathematically not so easy to describe. MAVIfiber2d builds on the VQC project findings. The input image is smoothed step-by-step with approximated Gauss filters. The grayscale variances of the standardized filtered images reflect the cloudiness for the scale under consideration. The cloudiness index is calculated from the variances as a weighted average. The scales and weights are chosen in a manner that measuring results correspond as well as possible to the technical requirements and the subjective visual impressions.