Many algorithms and heuristics have a remarkable performance in practice, but theoretical analyses are negative or inconclusive. The reason for this is that algorithms are usually analyzed by worst-case or average-case analysis: Worst-case analysis is often dominated by artificially constructed instances that rarely show up in applications. Average-case analysis is dominated by random inputs, which also may not resemble realistic inputs.

Smoothed analysis has been invented to cope with this dilemma: We analyze the performance of algorithms on arbitrary inputs that are subject to slight random perturbations. These perturbations model, e.g., measurement errors or numerical imprecision. They rule out pathological worst-case instances, while most of the structure of the input is preserved and the instances are not fully random.

We will give a survey of smoothed analysis, highlight some of its successes, and point out future challenges.