It may be safe to say that the vast majority of numerical results are sufficiently accurate. However, pitfalls occur rarely enough not to be bothered all the time, yet not rare enough to ignore them. In particular, security-relevant tasks require some extra care. We will start with a number of examples where the best numerical algorithms in Matlab compute erroneous or completely wrong results. That is not to blame Matlab, but it is a principle problem of traditional numerical algorithms. Next, we will present methods producing rigorously verified results—where error bounds are computed which are mathematically correct with the certainty of a mathematical proof. More computing time is required which may amount to an order of magnitude; in return, the results are true with mathematical rigor. Such algorithms are implemented in INTLAB, the Matlab/Octave toolbox for Reliable Computing. Pros and cons of such methods including computing times will be discussed and demonstrated.

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