errors, uncertainties, ...

"big picture":

reality → math. model → numer. simulation → evaluation

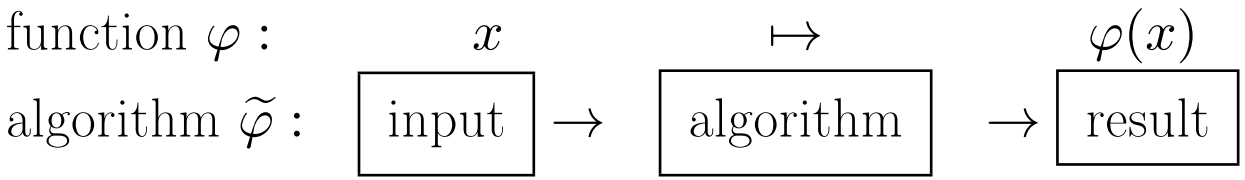
(A) sources of error "beyond" numerics:

- modelling errors & simplifications (e.g., Newtonian mechanics vs. relativity theory)
- data errors (models often contain parameter that are measured)

(B) sources of error numerics is "responsible" for:

- discretization errors (e.g., errors in quadrature formulas, stopping error in iterative zero-finding algorithms)
- rounding errors (effect of floating point arithmetic)

conditioning and stability



- conditioning of a function φ measures how errors/perturbations in the input data affect the result. For poorly conditioned φ one cannot expect to be able to design good algorithms $\widetilde{\varphi}$.

- stability of an algorithm $\widetilde{\varphi}$ measures how the algorithm influences perturbations in the input data. Numerics aims at stable algorithms.

simplistically:

- conditioning of a problem tells one whether it is at all possible to evaluate (on a computer) a function φ

- stability assesses algorithms and is used as a selection criterion for algorithms