Towards a more sensible theory of stability in Numerical Linear Algebra

Carlos Beltrán[1], *Vanni Noferini*[2], *Nick Vannieuwenhoven*[3]

[1] *Dpt. MATESCO, Universidad de Cantabria, Spain*
E-mail: beltranc@unican.es
[2] *Dpt. Mathematics and Systems Analysis, Aalto University, Finland*
E-mail: vanni.noferini@aalto.fi
[3] *Dpt. Computer Science, KU Leuven, Belgium*
E-mail: nick.vannieuwenhoven@kuleuven.be

Abstract

We are all used to the nowadays quite standard definitions of backward, mixed and forward stability. But, to which point are these definitions really sound? Spoiler: this is not a simple question. Here is an even harder to answer one: it is a basic procedure to use the output of a (presumably) stable algorithm as an input for another (presumably) stable algorithm. Under which hypotheses can we grant that the concatenation of both algorithms is itself a stable algorithm? We will discuss these questions and give reasonable answers to them.

Acknowledgements: Work (partially) supported by Grant PID2020-113887GB-I00 funded by MCIN/ AEI /10.13039/501100011033, Banco Santander and Universidad de Cantabria grant 21.SI01.64658, Academy of Finland grant (Suomen Akatemian päätös 331240), a Postdoctoral Fellowship of the Research Foundation—Flanders (FWO) with project 12E8119N and a FWO Grant for a long stay abroad V401518N.

References

[1] C. Beltrán, V. Noferini and N. Vannieuwenhoven *When can forward stable algorithms be composed stably?*. To appear.