

# How to Avoid Communication in Linear Algebra and Beyond

Laura Grigori  
Inria

## Abstract

The cost of moving data in an algorithm can surpass by several orders of magnitude the cost of performing arithmetics, and this gap has been steadily and exponentially growing over time. In this talk I will argue that this communication problem needs to be addressed by the numerical software community directly at the mathematical formulation and the algorithmic design level. This requires a paradigm shift in the way the numerical algorithms are devised, which now need to aim at keeping the number of communication instances to a minimum, while retaining their numerical efficiency.

Communication avoiding algorithms provide such a novel perspective on designing algorithms that provably minimize communication in numerical linear algebra. The novel numerical schemes employed, the speedups obtained with respect to conventional algorithms, as well as their impact on applications in computational science will be also discussed.