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Title: Accelerating scientific software applications: exploring the major bottleneck of current computer architectures with a simple model, the roofline model.

Abstract: Newly hired at LMAP, I am a CNRS engineer in High Performance Computing. I help physicists and mathematicians to accelerate the execution of their algorithms by considering computer architectures. Indeed, current computers are very complex objects and the way data structures in memory are designed and traversed by algorithms can lead to very poor processor usage when computer architecture is overlooked. Especially memory bandwidth, the data transfer rate between the memory and the processor, is currently one of the major bottleneck for scientific applications. The roofline model is a very coarse and simple model. It models with a good accuracy the performance an application can reach when its performance is limited by the memory bandwidth. The talk will be centred around these notions with some simple algorithmic examples. We will be able to evaluate how fast they should run on several types of processors, from most recent GPUs to very old systems of the 90s.