Tensor Train Approximation of Multivariate Functions in Dynamic Programming: a method to break the curse of dimensionality.

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Abstract Dynamic programming has many applications in system identification and in econometrics. In it, one is looking for a so-called value function that obeys a functional equation called the Bellman equation. The difficulty is that the number of variables of the value function can be very high, and a brute force iteration of the Bellman equation is not feasible. In this talk, I propose to handle the (sampled) value function in terms of a tensor train. Traditional tensor train approximations are based on a skeleton decomposition. They provide high order models with low accuracy if the tensor is noisy, in general. Instead, we propose to use a novel alternating least squares algorithm to find a suitable low order tensor approximation of the value function at each step. In this way it is possible to find approximate solutions of the Bellman equation in dimensions where the traditional methods fail.