

Energy Aware Scheduling for Weighted Completion Time and Weighted Tardiness

DE-FG02-08ER25856: Algorithms for Mathematical Programming with emphasis on bi-level models

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Abstract

The ever increasing adoption of mobile devices with limited energy storage capacity, on the one hand, and more awareness of the environmental impact of massive data centres and server pools, on the other hand, have both led to an increased interest in energy management algorithms.

In this talk we will present several new constant factor approximation algorithms for energy aware scheduling problems where the objective is to minimize a weighted sum of the weighted completion time of the jobs and the total cost of energy consumed, in a one machine non-preemptive setting, while allowing release dates and deadlines. Unlike previous known algorithms these new algorithms can handle general job-dependent energy cost functions, in particular these functions can be non-monotonic and even non-convex. Our algorithms also extend to approximating weighted tardiness plus energy cost, an inherently more difficult problem that has not been addressed in the literature.

We also present experimental results that show that our algorithms perform very close to optimal, and that they can be improved and extended to the on-line setting.

Keywords: energy aware scheduling, approximation algorithms, α -points, weighted tardiness