An analysis scheme for one scheduling algorithm under arbitrary cost functions

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Abstract: The topic of this lecture is the analysis of the worst-case approximation factor of Smith’s rule for single-machine scheduling with nonlinear costs. Problem instances are given as a set of jobs, each having a weight and a processing time. The cost of a schedule calculates as the weighted sum of job completion costs, where the completion cost of a job is defined as some given function of its completion time. Smith’s rule is a scheduling method, which sorts the jobs by decreasing ratio of weight and processing time. In this lecture we will develop a method to determine the worst-case approximation factor of this algorithm for any particular concave or convex cost function. This will be achieved by stepwise reducing the class of problem instances where the worst-case approximation factor can occur. In the final instances class, each particular job will be characterized by a single continuous parameter, which reduces the search for the worst-case instance to a simple continuous optimization problem.

The lecture will cover mainly Section 3.1.

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