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החוג למתמטיקה
הפקולטה למדעי הטבע

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Review on the doctoral thesis of Tomáš Ebenlendr.

It is my pleasure to write a review on this excellent thesis. The thesis contains a number of new scientific results which I specify below. In particular, several previously open problems are solved in this exceptional thesis. It is very clear that this is the work of a talented and hard working student, who invented some new approaches which enabled him to improve the state of the art in the field of online scheduling. There is no doubt that the student is capable of independent work of a top class researcher, and this thesis should be approved as his doctoral thesis in the submitted form.

Section 2 contains several general solutions to problems where jobs arrive one by one to be scheduled preemptively, that is, a job can be split to be run during (possibly) non-consecutive time slots. These time slots can be on one machine or on different machines. The jobs are to be assigned on uniformly related machines (that is, machine of arbitrary speeds) to minimize the makespan. In this model only algorithms for special cases were known prior to the current work. This section contains a comprehensive study of the problem with respect to two types of inputs. The first type is the class of arbitrary inputs, which is known as the purely online case. The second type covers a wide range of problems, where some information on the input is known in advance. Such models are known as semi-online models. The known information can be a pre-specified order of arrival, knowledge of the total processing time of jobs, similarity between processing times of jobs, and other properties. The student solved these problems skillfully, obtaining an algorithm of optimal competitive ratio for any set of machine speeds for each one of the variants.

Section 3 contains a study of the non-preemptive variant of the online problem of Section 2. In this case jobs cannot be split, and each job must be assigned to one of the machines. This is a problem where there are large gaps in the known upper bounds and lower bounds on the optimal competitive ratio, and there was no progress for many years. In this section, an improved lower bound is provided. To obtain this lower bound, the student used many different skills, combining algorithmic skills, mathematical skills and programming skills.

In summary, this is a remarkable thesis, showing that the student is capable of doing creative scientific work, and I strongly recommend to accept it in the present form as his doctoral thesis.

Best regards,
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