INTERNATIONAL SEMINAR

nell'ambito del PhD program on Analytics for Economics and Business (AEB) e del Progetto ITALY

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Planning and scheduling models that recognize human learning

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Abstract:

Cognitive psychologists have long recognized that individuals working in production or service settings learn when they perform a task, with this learning manifesting itself in the form of increased productivity. Managerial experts have also recognized this phenomenon, with Peter Senge writing in 2006 that the learning organization is "continually expanding its capacity to create its future." However, many planning and scheduling models do not recognize the impact of learning on capacity when evaluating the impact of prescribed decisions.

The psychology community has proposed various quantitative models that describe how experience translates to learning. Different models translate different measures of experience (time spent, units produced) to productivity. Some models explicitly measure the concept of forgetting. All are non-linear. As a result planning models that incorporate these representations of learning's impact on productivity are notoriously hard to solve. The existing research on such planning models usually involves solving very small-scale instances and sometimes only through approximation.

In this talk we address integrating quantitative models of human learning into planning models from both a computational optimization and management perspective. We present an algorithmic technique for dealing with non-linearities that enables the solution of significantly larger-sized instances than what has been seen to date. Because recognizing learning introduces a long-term effect to scheduling decisions we develop models and solution techniques where near-term decisions are made in anticipation of where future increases in productivity may be useful. We study the integration of these models into different operational settings, from assembly line scheduling to routing home service technicians. Finally, we examine how recognizing learning impacts decisions prescribed by scheduling models in order to derive managerial insights.