Walk the (Time-)Line: Scheduling and Execution

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At its core, a project scheduling problem consists in synthesizing functions that represent availability of resources over time (*resource timelines*) which are consistent with both resource bounds and temporal constraints specified in the problem.

This talk begins with a review of the artificial intelligence constraint-based approach to project scheduling, also referred to as *precedence-constraint posting*. This approach is based on the ability to solve the problem by reasoning on the representation of temporal constraints and, on top of it, of resource timelines and their current contention peaks.

The talk will then introduce the complementary problem of schedule execution under uncertainty, where the same type of reasoning can be used to obtain schedules which are resilient to execution-time contingencies. Here, two types of solutions are distinguished, namely *flexible* and *partial order* schedules, which lead to timelines with different degrees of robustness with respect to unexpected variations at execution time.

A third part of this talk will be dedicated to a survey of recent developments of our work, including relevant applications of the presented techniques in the context of space applications.

Keywords: Reasoning about Time and Resources, Constraint-based Scheduling, Contention-based Heuristics, Schedule Execution Uncertainty