Aalborg Universitet

UPPAAL STRATEGO

David, Alexandre; Jensen, Peter Gjøl; Larsen, Kim Guldstrand; Mikuionis, Marius; Taankvist, Jakob Haahr

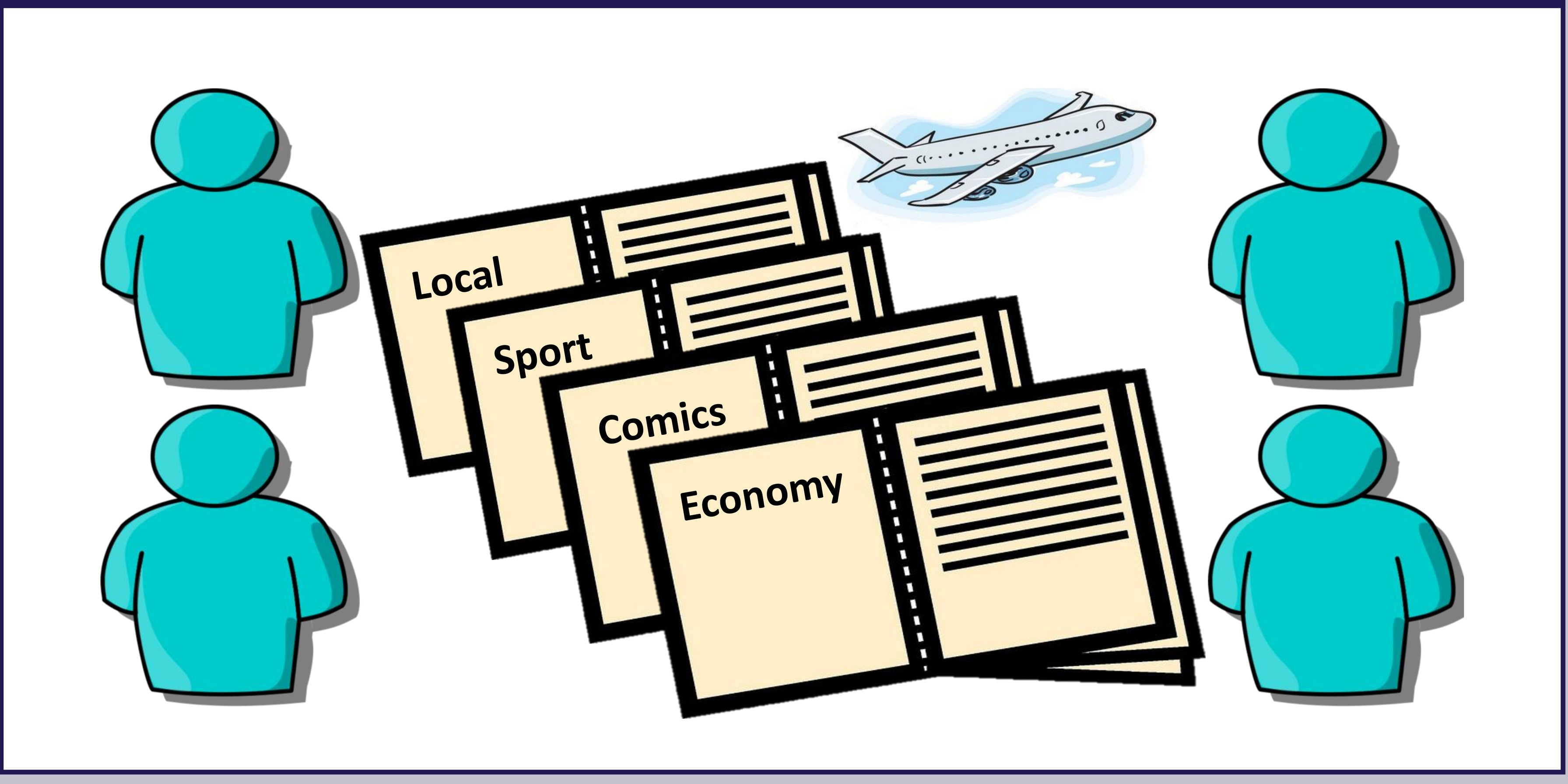
Publication date:
2019

UPPAAL STRATEGO

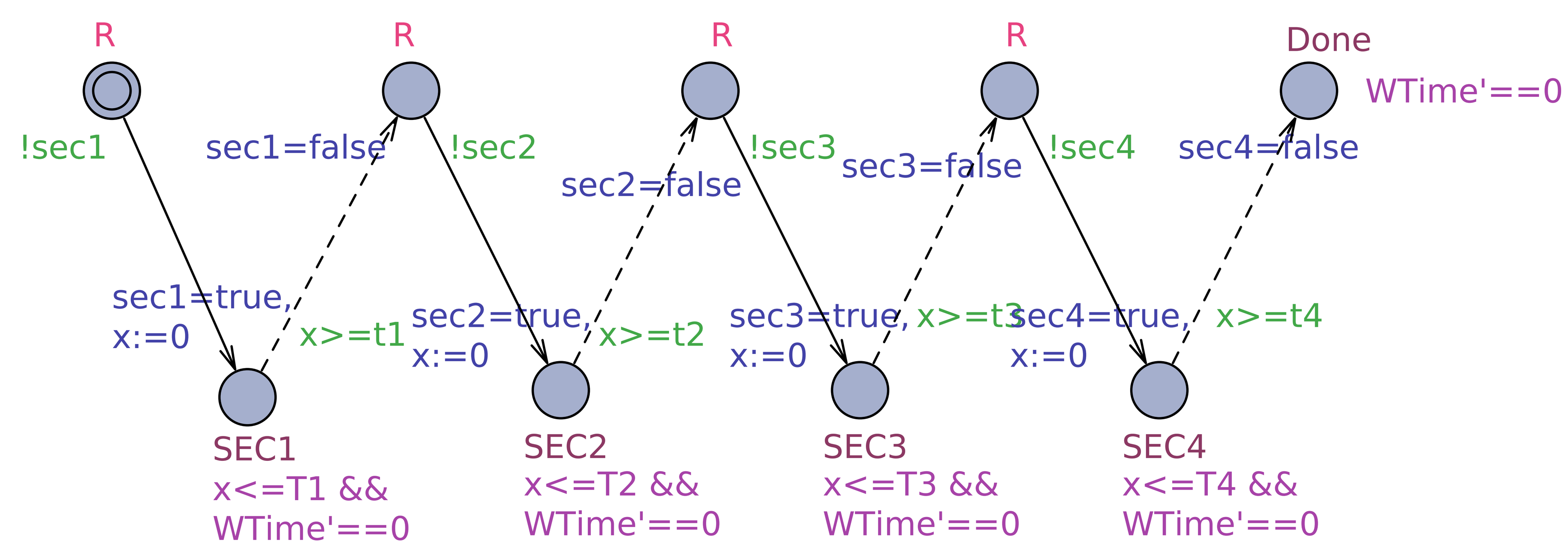
Alexandre David, Peter Gjøl Jensen, Kim G. Larsen, Marius Mikučionis and Jakob Haahr Taankvist
Department of Computer Science, Aalborg University
http://people.cs.aau.dk/~marius/stratego/

AALBORG UNIVERSITY DENMARK

Problem: Sharing a Newspaper



Model of the Problem

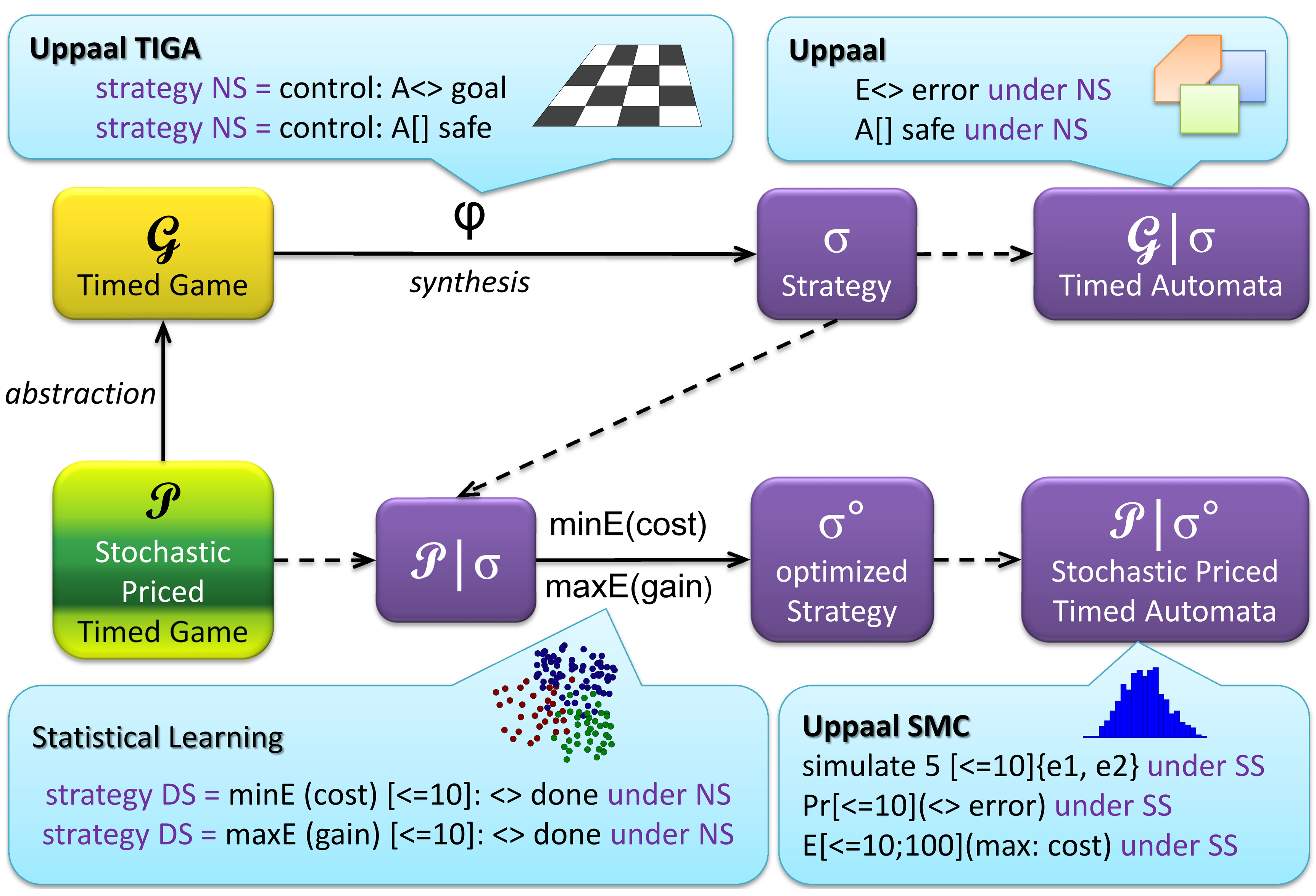


- Reading a section takes time (uniformly distributed).
- Decide the order of sections to be read.

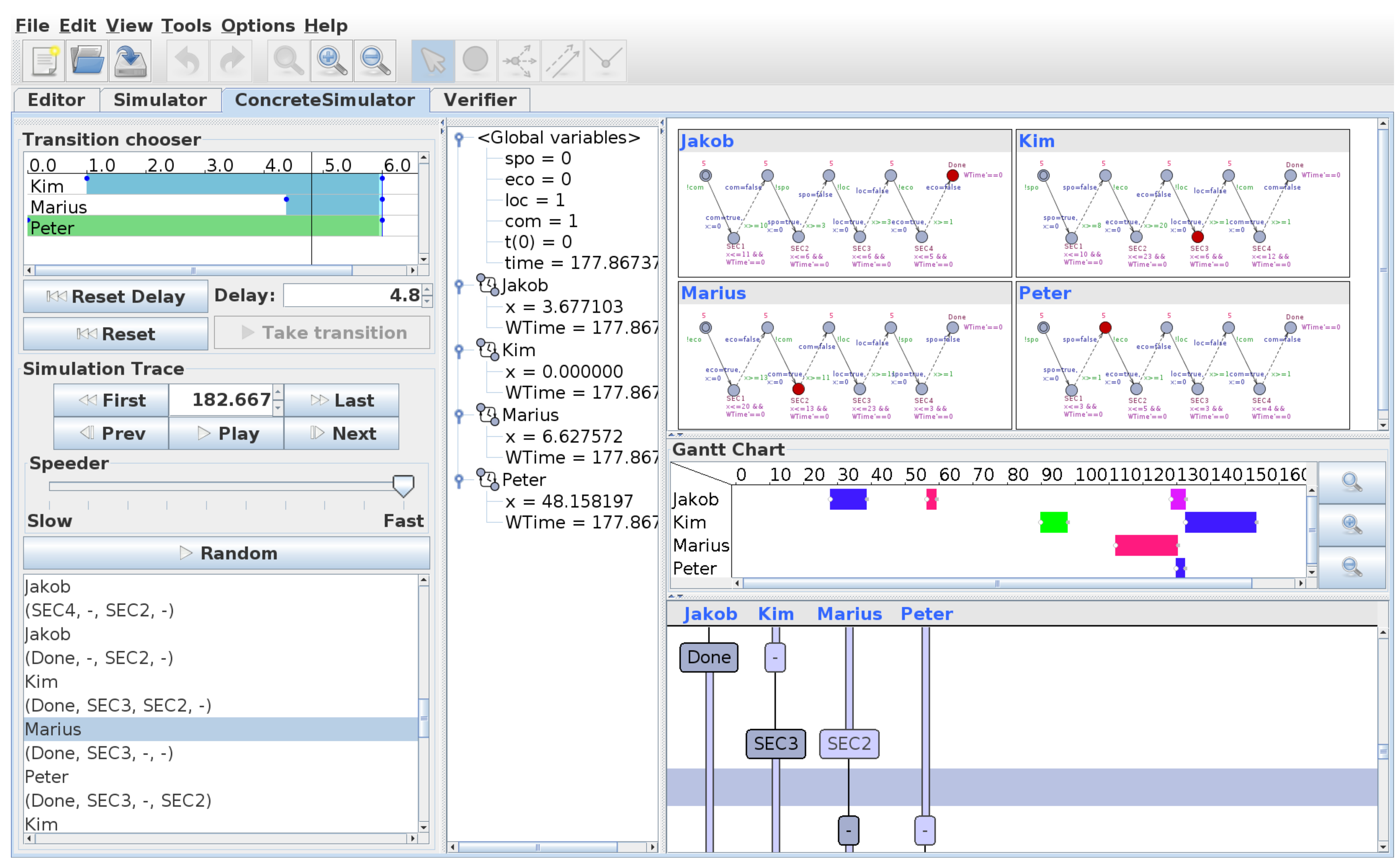
Questions and Queries

If the readers chose randomly who will read a section, what is the expected time to completion?	`Pr[<=100] (<> Jakob.Done && Kim.Done && Marius.Done && Peter.Done)`
What is a better strategy for the readers for finishing faster?	`strategy Opt = minE[<=100]: <> Jakob.Done && Kim.Done && Marius.Done && Peter.Done`
What are the expected times to completion with the strategy?	`Pr[<=100] (<> Jakob.Done && Kim.Done && Marius.Done && Peter.Done) under Opt`
Can the readers ensure Kim can catch a plane in 60 min?	`strategy Travel = control: A<> Kim.Done && time <= 60`
Will Peter ever be able to go with Kim on the plane?	`E<> Peter.Done && time <= 60 under Travel`
How to minimize the expected Peter's time, while still guaranteeing that Kim can catch the plane?	`strategy PeterTravel = minE [<=60]: <>Peter.Done under Travel`

Overview of Various Transformations

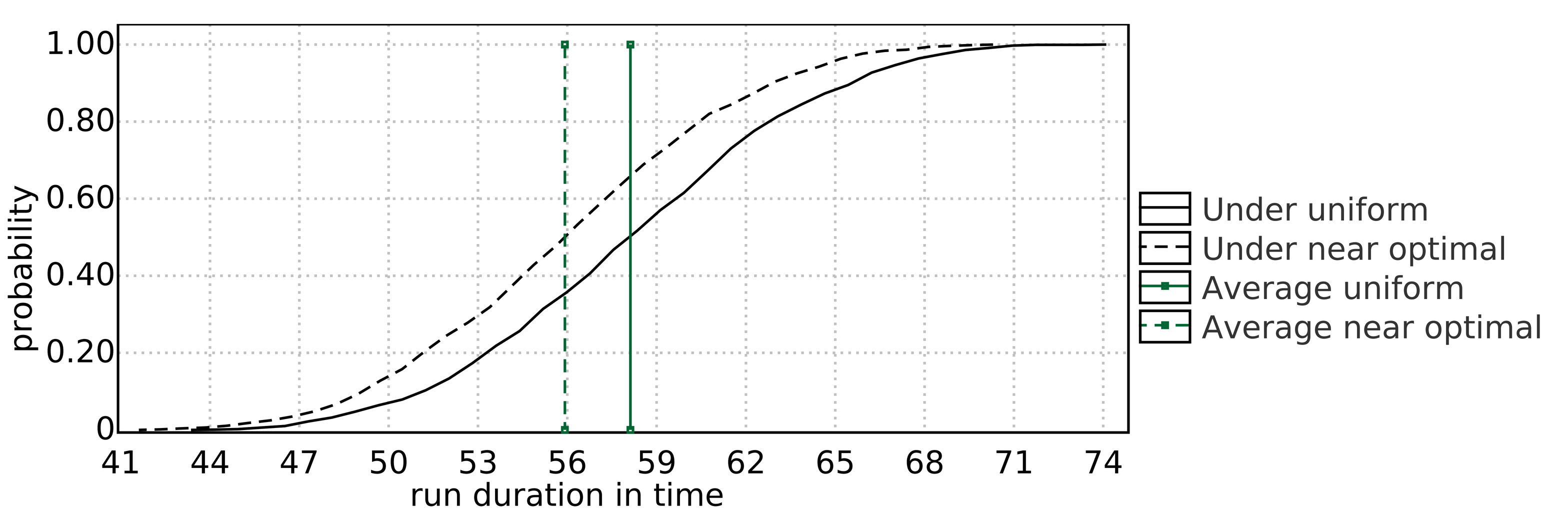


Simulator Interface



Compute and Improve the Strategy

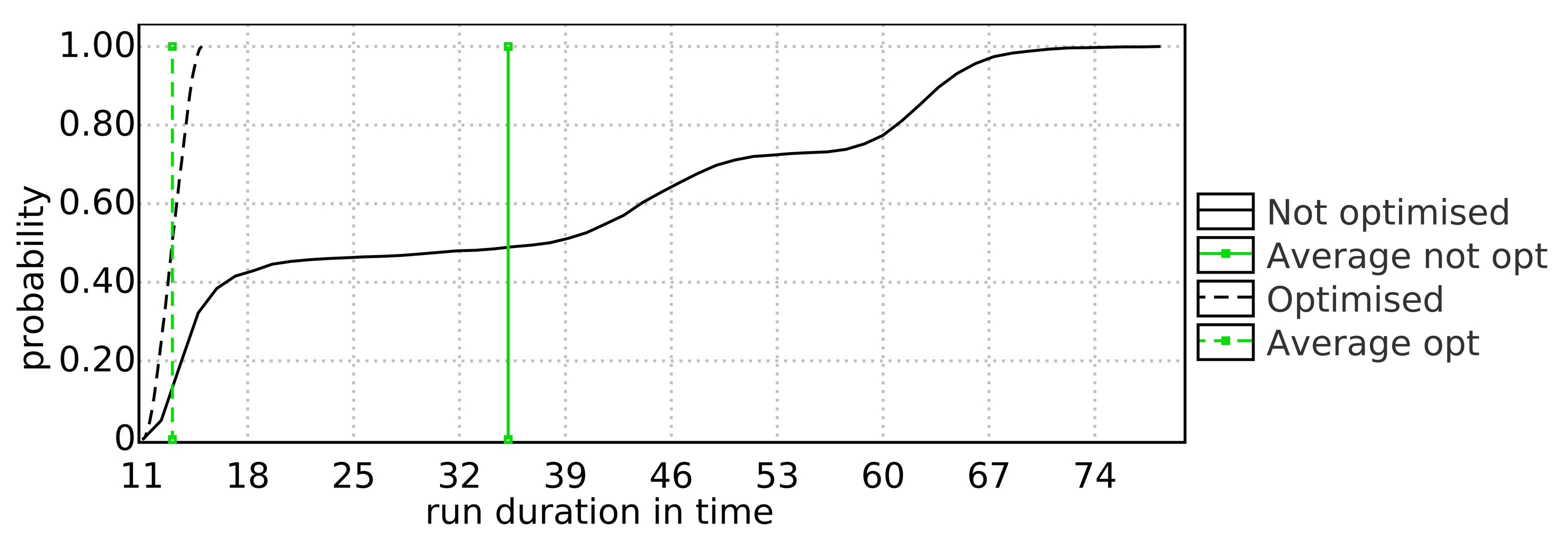
- Estimate the probability of being done (solid lines).
- Compute the strategy `Opt` minimizing the overall time.
- Estimate the probability of being done under `Opt` (dashed lines).



By learning the optimal strategy we have improved the time distribution by 3 min in average.

Can Peter finish early under travel?

- Compute a strategy `Travel` so that Kim travels in time.
- Estimate the probability of Peter being done under `Travel` (solid lines).
- Compute the strategy `PeterTravel` minimizing Peter's time under `Travel`.
- Estimate the probability of Peter being done under `PeterTravel` (dashed lines).



By optimizing the synthesized strategy we improved Peter's time while maintaining the goal of Kim's deadline.