A three-stage model to support capacity decisions in intermodal transport under uncertainty

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Intermodal transport is the transport of freight with multiple modes whereby freight remains in the same loading unit. The combination of road transport with other modes is potentially more sustainable than unimodal road transport for long-haul freight shipping. Transport networks are subjected to uncertainty and an important hindrance to the modal shift is the lower flexibility of other transport modes compared to trucks following uncertain events. This work proposes a decision support model to assist intermodal transport planning under uncertainty and presents experimental results from small artificial instances.

The proposed stochastic optimization model supports capacity decisions on railway links. Included uncertainties are stochastic demand, available train slots that can be booked at each stage and variations between actual capacity and booked capacity. In the considered context, initial capacity decisions should be made before demand is known and updated later on when more information becomes available. Our model differs from existing two-stage models for service network design by including a third stage, allowing to more accurately imitate real-life decision making.