



Séminaire organisé par le Comité étudiant CIRRELT-UL

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ANALYTICS IN MARITIME WEATHER ROUTING

Abstract: Maritime weather routing requires the integration of vessel-specific performance, changing weather conditions, geographical and operational constraints, safety considerations, and commercial objectives. This seminar describes the development and implementation of OptiNav, an analytics-based decision-support system used by True North Marine for planning and replanning ocean-going vessel voyages. The system combines vessel-performance models, weather forecasts and historical weather information, geographical feasibility maps, safety models, and multiobjective network optimization to jointly determine route and speed decisions. A central challenge is transforming large volumes of heterogeneous data into a vessel- and voyage-specific optimization problem that can be solved rapidly enough for operational use. Preprocessing estimates weather effects on vessel speed and fuel consumption, determines geographical and operational feasibility, and represents conditions beyond the forecast horizon through historical delay maps. The resulting time-space network contains more than 100 million potential arcs. A hierarchical solution procedure progressively restricts and refines this network, generating solutions within seconds. This computational performance enables planners to interactively compare objectives and replan voyages as weather information is updated, while the delay maps support voyage-duration and ETA estimation for multiweek voyages extending beyond the detailed forecast horizon. OptiNav has been developed and implemented through close collaboration among maritime specialists, analytical experts, software developers, and experienced route planners. Its operational value arises from integrating predictive modeling, data processing, optimization, and human expertise rather than from a single analytical method. A detailed voyage analysis demonstrates potential fuel savings of approximately 3% relative to an already speed-optimized preferred route, while broader operational verification reports average fuel savings of approximately 3.5% since deployment. The implementation demonstrates how complementary analytical methods can be integrated into a responsive decision-support system for complex transportation decisions under evolving and uncertain conditions.

Biography: Mikael Rönnqvist is a professor in industrial engineering at Université Laval (Département de génie mécanique et génie industriel). He currently holds a Canada Research Chair (tier 1) in Operations Research in Natural Resources. He is a member of the research organisations/networks CIRRELT, FORAC, IID, and CRDM. His research interests are in the areas of industrial and practical use of Operations Research and analytics. He has been involved in the development of many industrial decision support systems based on optimization, in particular in the forest industry. He has successfully participated in many academic competitions. Professor Rönnqvist completed his Ph.D. in optimization at Linköping University (Sweden) in 1993. He has held academic positions in Sweden, New Zealand, Norway and Canada.

This talk will be in English.

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Ouvert à tous
Café et viennoiseries

Organisateur:
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