

Dynamic optimization problems appear in many applications, spanning from chemical process control to aerospace, autonomous driving, physics, robotics, just to name a few. Dynamic optimization problems aim to optimize a dynamic system with respect to inputs and parameters and typically involve a dynamic system model, constraints to be satisfied, and a cost function(al) to be optimized. From a top-level perspective, one can roughly divide dynamic optimization approaches into two classes: deterministic and heuristic strategies. Deterministic optimization methods, often also related to mathematical programming, generate a sequence of points that converge to the optimum exploiting analytic properties of the problem. As they exploit the problem's analytical properties, they are typically used for problems where explicitly known and easy to evaluate models and constraints are present. Heuristic approaches often consider the problem as a black box and only progress by iterating a fitness function. Thus they are typically used for problems subject to complex, challenging to evaluate system models or problems that are subject to significant uncertainty.

In many industrial applications, however, parts of the problem/models are known accurately. They thus are suitable for deterministic optimization methods. In contrast, others are either very complex or have input-output data and are therefore ideal for heuristic optimization methods or machine learning motivated approaches. Driven by this challenge, recently, hybrid dynamic optimization methods have been proposed. They aim to exploit the two approaches' complementary characteristics, allowing them to optimize the complete process. This special issue focuses on the interplay and fusion of deterministic optimization approaches, heuristic optimization approaches, and machine learning approaches – hybrid intelligent optimization, from a theoretical, computational, and application perspective. It targets contributions from academia as well as industry.

Topics of interest are but are not limited to contributions at the interface of:

- Hybrid intelligent optimization
- The fusion of machine learning and dynamic optimization
- Mathematical programming
- Dynamic optimization
- Novel process control approaches
- Plant-wide optimization
- Applications of the approaches mentioned above

Important Dates

- October 31, 2021: Deadline for manuscript submission
- January 1, 2022: Reviewers' comments to authors
- February 15, 2022: Submission deadline of revisions
- March 31, 2022: Final decisions to authors

Guest Editors

Prof. Jun Fu, Northeastern University, China

Prof. Junfei Qiao, Beijing University of Technology, China

Prof. Kok Lay Teo, Curtin University, Australia

Prof. Rolf Findeisen, Otto-von-Guericke University Magdeburg, Germany

Submission Instructions

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- Early submissions are welcome. We will start the review process as soon as we receive your contributions