

# Accelerating a Bike Without Pedaling –A Benchmark Problem for Nonsmooth Optimal Control?

*Friday, August 16, 2024 9:00 AM (30 minutes)*

In this talk, we propose a benchmark problem for numerical nonsmooth optimal control, tailored for systems with autonomous state jumps. In particular, these challenges are posed by mechanical systems with inherent nonsmoothness, characterized by abrupt jumps in both states and dynamics. Our proposed benchmark scenario involves accelerating a bicycle along an uneven mountain bike track without pedaling—a quintessential maneuver in pump track biking, a discipline where momentum is generated through upper body movements.

This application underscores the practical relevance of nonsmooth methods for calculating optimal riding strategies in a real-world setting. This stands in contrast to conventional academic examples such as bouncing balls, which often feature purely abstract control inputs. We present numerical and experimental results.

**Author:** GOLEMBIEWSKI, Julian (Institute of Energy Systems, Energy Efficiency and Energy Economics, TU Dortmund University)

**Co-author:** Prof. FAULWASSER, Timm (Institute of Energy Systems, Energy Efficiency and Energy Economics, TU Dortmund University)

**Presenter:** GOLEMBIEWSKI, Julian (Institute of Energy Systems, Energy Efficiency and Energy Economics, TU Dortmund University)

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