Einladung zum Bayreuth-Würzburg-Seminar Kontrolltheorie und Optimierung am 24.03.2026

Newton's method on nonlinear spaces and its application to optimal control on manifolds

Laura Weigl (Universität Bayreuth)

In this talk we present Newton's method for finding zeros of nonlinear mappings from a manifold X into a vector bundle E. The employed curved spaces induce additional nonlinearity to the problem which has to be taken into account: a connection on E provides the geometric structure required to formulate a well-defined Newton equation, while a retraction on X enables the computation of Newton steps on the manifold. We discuss the application of Newton's method for solving variational problems on manifolds. As an example, we present the computation of elastic geodesics under force fields. This requires the construction of suitable connections, which we derive and use in a numerical implementation. Finally, we consider optimal control problems with PDE constraints involving mappings into manifolds. We introduce an appropriate Lagrangian function and derive optimality conditions. As a numerical example, we present the optimal control of elastic geodesics by force fields.

Ort: Humboldt-Gebäude, Seminarraum 41.00.006 Zeit: Dienstag, 24.03.2026, 11:15

Stability and performance of stochastic economic MPC - Stochastic characterization of the closed-loop asymptotics

Jonas Schießl (Universität Bayreuth)

Model Predictive Control (MPC) is well understood in the deterministic setting, yet stability and performance guarantees for stochastic MPC are typically limited to formulations with terminal constraints and penalties. This talk presents a stability and performance analysis of stochastic economic MPC without terminal conditions, based on stochastic dissipativity and turnpike properties. Using an expected cost criterion, we construct closed-loop Lyapunov functions that establish P-practical asymptotic stability of an optimal stationary process under different notions of stochastic convergence, such as convergence in distribution or in the p-th mean. In addition, we derive tight near-optimality bounds for both averaged and non- averaged performance, thereby extending classical deterministic results to the stochastic domain. Finally, we show that an abstract distribution-based MPC scheme and a practically implementable sampled- state algorithm share identical closed-loop properties, ensuring practical applicability of our results.

Ort: Humboldt-Gebäude, Seminarraum 41.00.006 Zeit: Dienstag, 24.03.2026, 14:00

Boundedness of reachability sets for control systems

Andrii Mironchenko (Universität Bayreuth)

Well-posedness theory studies the existence and uniqueness of solutions of dynamical and control systems, but it does not tell us anything about the bounds of solutions. In contrast to that, the stability theory investigates the global in time bounds for trajectories and families of trajectories. We know a lot about well-posedness and we understand quite a lot about stability. But what do we know about the terrain between these areas? In this talk, I invite you to join me on a trip to these much less explored lands, and see which jewels we can find along the way.

Ort: Humboldt-Gebäude, Seminarraum 41.00.006 Zeit: Dienstag, 24.03.2026, 15:00

Zu den Vorträgen laden wir Sie herzlich ein.

gez. Sergey Dashkovskiy, Gunther Dirr
Lars Grüne, Anton Schiela