

## Gastvortrag

# Advanced Control of Power Electronic Systems for Next-Generation EV Drivetrains

Prof. Matthias Preindl (Columbia University in the City of New York)

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Electric vehicles (EV) are projected to reach cost parity with conventional vehicles in 2025-2030 and account for more than 50% of the global vehicle sales by 2040. These projections are fueled by advances in EV drivetrain technologies resulting in weight and cost reductions and implementation of a fast charging infrastructure.

This talk explores how advanced control and estimation, specifically model predictive control (MPC) and model-based estimation, enables the integration of power electronic systems as well as performance enhancements. Benefits are discussed based on three research projects undergoing at the Columbia Motor Drives and Power Electronic Laboratory (MPlab): a MHz-class clean output traction inverter that doubles as (fast) charger; an integrated auxiliary power module that can manage, i.e. balance, the high-voltage battery pack, and a novel optimization-based position sensorless estimation scheme with the potential to enable a sensorless traction drive system.



**Prof. Matthias Preindl** received the B.Sc. degree in electrical engineering (summa cum laude) from the University of Padua, Italy (2008); the M.Sc. degree in electrical engineering and information technology from ETH Zurich, Switzerland (2010), and the Ph.D. degree in energy engineering from the University of Padua (2014). He was an R&D Engineer of Power Electronics and Drives at Leitwind AG, Sterzing, Italy (2010-2012), a Post Doctoral Research Associate with the McMaster Institute for Automotive Research and Technology, McMaster University, Hamilton, ON, Canada (2014-2015), and a Sessional

Professor in the Department of Electrical and Computer Engineering, McMaster University (2015). He is currently an Assistant Professor in the Department of Electrical Engineering, Columbia University in the City of New York, NY, USA. He received the Futura Award of the Futura Foundation in South Tyrol, Italy (2016) and the CAREER Award of the US National Science Foundation (NSF) (2017).