

---

# Mixed-Precision FGMRES for Large Lyapunov Equations

Jonas Schulze<sup>\*1</sup>, Eda Oktay , and Jens Saak

<sup>1</sup>Max Planck Institute for Dynamics of Complex Technical Systems – Germany

## Abstract

The continuous-time algebraic Lyapunov equation is a linear matrix equation that arises in the fields of, e.g., optimal control and model order reduction. For many applications, the coefficient matrices are large and sparse, while the solution matrix has a low numerical rank. In this setting, iterative structure-preserving methods that operate directly on the factors of a low-rank decomposition are of special interest. State of the art methods are Krylov subspace projection methods and a low-rank variant of the Alternating-Directions Implicit (ADI) method. With the aim to further reduce the memory requirements during the solution process, and therefore reducing time- as well as energy-to-solution, we extend a low-rank variant of FGMRES method with ADI-preconditioning to use mixed-precision.

---

<sup>\*</sup>Speaker