

Graz, 5. Juni 2025

Seminar Numerical Simulations in Technical Sciences

11.6.2025 Prof. Dr. Leszek Demkowicz (Oden Institute, University of Texas at Austin)

17.00–18.00 Steepest Descent Method for Minimum Residual Methods for Nonlinear Problems

Ort: Hörsaal BE01, Steyrergasse 30

2025 marks the 17th anniversary of our first foundational paper on the Discontinuous Petrov-Galerkin method, in short the DPG method. In the talk, I will attempt to present an extension of the DPG concepts [1] to general nonlinear problems represented by a class of 2D nonlinear elasticity examples. In context of the nonlinear elasticity, we will focus on two issues:

- 1. choice of a proper variational formulation;
- 2. comparison of Newton-Raphson and Steepest Descent methods.
- [1] L. Demkowicz and J. Gopalakrishnan: The Discontinuous Petrov-Galerkin Method, Acta Numerica, 2025.
- [2] J. Zhang and L. Demkowicz: Nonlinear elasticity with the Discontinuous Petrov-Galerkin method. I. Various Variational Formulations, Oden Institute Report 2024/5.
- [3] J. Zhang and L. Demkowicz: Nonlinear elasticity with the Discontinuous Petrov-Galerkin method. II. The Steepest Descent Method, Oden Institute Report 2025/1.