

# Austrian Numerical Analysis Day 2026

## A RKHS–Tikhonov Method for Unique Continuation

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We develop a reconstruction method for elliptic *unique continuation problems* based on *Tikhonov regularization* in a *reproducing kernel Hilbert space* (RKHS). The approach reformulates the inverse problem in terms of the *Neumann trace*, reducing the dimensional complexity and allowing *online computations* to be performed using only a discretization of the boundary. The resulting forward operator is compact, and the RKHS framework provides a flexible, analytic regularization space that is naturally compatible with numerical PDE solvers. We prove *optimal noise-dependent convergence rates* for both the continuous and discrete regularized solutions. Numerical experiments for Laplace-type equations on smooth and polygonal domains confirm the robustness of the method and its stability with respect to measurement noise.