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## SEMINAR

on

### COMPLEX AND HYPERCOMPLEX ANALYSIS

Sala 11.2.21, Departamento de Matemática

11/10/2023, 14:00

## A C++ implementation of discrete adjoint sensitivity analysis for systems of ODEs

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We present a new C++ library for sensitivity analysis of optimization problems involving ordinary differential equations (ODEs). The discrete adjoint sensitivity analysis method is implemented for adaptive explicit Runge-Kutta (ERK) methods available in the C++ boost library using automatic adjoint differentiation (AAD). Update expressions for the adjoint variables at each time step are derived and AAD is employed for efficient evaluations of products between vectors and the Jacobian of the right hand side of the ODE. This approach avoids the low-level drawbacks of the black box approach of employing AAD on the entire ODE solver and opens the possibility to leverage parallelization. We study the performance of other methods and implementations of sensitivity analysis and we find that our algorithm is competitive to equivalent existing implementations.

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