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## Title:

Generalized Differentiation and Piecewise Linearization

## Abstract:

Nonsmooth problems of practical interest tend to be piecewise smooth. They can be approximated by piecewise linearizations generated from evaluation codes using established techniques of automatic or algorithmic differentiation. The resulting generalized Taylor expansions have an error of second order and can be utilized in algorithms based on successive piecewise linearization for the following classical computational tasks:

- Solving systems of equation by Newton variants,

- (Un)constrained minimization by bundle methods,

- Numerical integration of ODEs by midpoint/trapezoidal rules.

Future domains of applications are algebraic or differential inclusions and the solution of variational problems in PDEs.