

# An ordinary differential equation based solution path algorithm

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## **Abstract**

Efron, Hastie, Johnstone and Tibshirani (2004) proposed Least Angle Regression (LAR), a solution path algorithm for the least squares regression. They pointed out that a slight modification of the LAR gives the LASSO (Tibshirani, 1996) solution path. However it is largely unknown how to extend this solution path algorithm to models beyond the least squares regression. In this work, we propose an extension of the LAR for generalized linear models and the quasi-likelihood model by showing that the corresponding solution path is piecewise given by solutions of ordinary differential equation systems. Our contribution is twofold. First, we provide a theoretical understanding on how the corresponding solution path propagates. Second, we propose an ordinary differential equation based algorithm to obtain the whole solution path.