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Alexandra Smirnova* (asmirnova@gsu.edu), 25 Park Pl NE, Atlanta, GA 30303-2918. *On stable parameter estimation for historic measles outbreaks in the United Kingdom by a regularized Levenberg-Marquardt algorithm with iterative rank-one updates for the derivative operator.*

In this talk, we consider a parameter estimation problem in epidemiology, where the inversion procedure is cast as nonlinear least squares constrained by a system of nonlinear differential equations (DEs). Under above assumptions, the system of DEs has to be solved numerically at every step of the iterative process and the corresponding parameter-to-data map cannot be used to evaluate the Frechet derivative analytically. Apart from that, the problem is ill-posed and one has to rely on appropriate regularization techniques to ensure stable estimation of disease parameters from which forward projections with quantified uncertainty could be generated. To address challenges related to both instability and Jacobian approximation, we propose a novel regularized Levenberg-Marquardt algorithm with iterative rank-one updates for computation of the derivative operator. In order to test the efficiency of this scheme, we conduct numerical experiments using a mathematical model of infectious disease transmission and real incidence data of historic measles outbreaks in the United Kingdom. (Received September 04, 2019)