1158-49-225 **Radoslav G Vuchkov*** (rvuchkov@ucmerced.edu), 5200 N. Lake Road, Merced, CA 95343, **Cosmin Gheorghita Petra** (petra1@llnl.gov), 7000 East Avenue, Livermore, CA 94550, and **Noemi Petra** (npetra@ucmerced.edu), 5200 N. Lake Road, Merced, CA 95343. *Quasi-Newton Methods for Infinite-Dimensional Inverse Problems Governed by PDEs.*

Many engineering applications are modeled as optimization problems governed by differential equations. Newton's method is usually the method of choice to solve these problems due it's superior convergence properties compared to gradient-based or derivative-free optimization algorithms. However, deriving and computing second-order derivatives needed by Newton's method often is not trivial and sometimes not possible. In such cases quasi-Newton algorithms are a great alternative since they use only gradient information to build approximations to the second derivative. In this talk, we provide a new derivation of the Broyden-Fletcher-Goldfarb-Shanno (BFGS) quasi-Newton method update in an infinite-dimensional Hilbert space setting. The key component of this derivation is the formulation of variational problems related to the quasi-Newton methods within the space of self-adjoint Hilbert-Schmidt operators. Similarly by changing the constraints of the variational problem we obtain updates for other quasi-Newton methods such as Davidon–Fletcher–Powell, Symmetric Rank One, and Powell-Symmetric-Broyden. We show numerical results for an inverse problem governed by a partial differential equation and demonstrate the desired mesh-independent property of the quasi-Newton methods. (Received March 02, 2020)