

## **One-Step Estimation with Scaled Proximal Methods**

This talk we study statistical estimators computed using iterative optimization methods that are not run until completion. Classical results on maximum likelihood estimators (MLEs) assert that a one-step estimator (OSE), in which a single Newton-Raphson iteration is performed from a starting point with certain properties, is asymptotically equivalent to the MLE. We further develop these early-stopping results by deriving properties of one-step estimators defined by a single iteration of scaled proximal methods. Our main results show the asymptotic equivalence of the likelihood-based estimator and various one-step estimators defined by scaled proximal methods. By interpreting OSEs as the last of a sequence of iterates, our results provide insight on scaling numerical tolerance with sample size. Our setting contains scaled proximal gradient descent applied to certain composite models as a special case, making our results applicable to many problems of practical interest. Additionally, our results provide support for the utility of the scaled Moreau envelope as a statistical smoother by interpreting scaled proximal descent as a quasi-Newton method applied to the scaled Moreau envelope.