

# Local Asymptotic Optimality in Empirical Bayes, Bias Correction and Benign Overfitting

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We present examples to demonstrate the great power and broad impact of Le Cam's celebrated local asymptotic theory. In empirical Bayes, an extension of the Hájek–Le Cam convolution theorem applies to the estimation of functionals of both the data and parameters motivated by risk evaluation, species and network problems. In semi-low-dimensional models, Le Cam's one-step estimator leads to de-biased inference, and local asymptotic normality provides the direction of efficient projection in bias correction. Akin to local asymptotic minimaxity, the adaptive minimaxity of empirical Bayes estimators is discussed, including an application of general maximum likelihood empirical Bayes to linear regression. Finally, in an explanation of the double descent phenomenon in machine learning, Le Cam's one step method provides general local optimality of interpolation estimators in high-dimension.