High-Dimensional Regression
Under Low-Moment Conditions On Random Designs

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We prove that in high-dimensional regression with random design, the population version of the restricted eigenvalue and related conditions imply its sample version under a second moment assumption on the linear combinations of the design variables and a forth or higher moment condition on the marginal distributions of the design variables, provided the usual sample size requirement. Our results demonstrate a benefit of standardizing the design variables in penalized least squares estimation for heavy tailed random designs.