1145-60-2719 **Madalin Guta**, **Jonas Kahn**, **Richard Kueng*** (rkueng@caltech.edu) and **Joel A Tropp**.
Fast quantum state estimation with optimal error bounds.

In quantum mechanics, the state of a physical system is described by a positive semidefinite matrix with unit trace. The task of determining this state from empirical observations is one of the most fundamental problems in quantum physics. Projected least squares (PLS) is an intuitive and numerically cheap technique for achieving this goal. It consists of computing the least squares estimator and projecting it onto the convex set of quantum states. Despite its simplicity, this technique may be equipped with rigorous convergence guarantees that are comparable to the best existing statements in the literature. What is more, PLS implicitly exploits low rank structure in a fashion similar to matrix completion. The results are derived by re-interpreting the least squares estimator as a sum of random matrices and applying a matrix-valued concentration inequality. (Received September 25, 2018)