1157-14-56 **Dávid Papp*** (dpapp@ncsu.edu) and **Sercan Yildiz**. *Computing rational sum-of-squares decompositions from numerical dual certificates.*

We revisit the problem of computing rational certificates for lower bounds of polynomials. Polynomial and sum-of-squares optimization problems are typically solved numerically using conic optimization algorithms. Turning the numerical solutions into exact (verifiable in rational arithmetic) certificates is a challenging problem that has been studied by Peyrl and Parrilo, Kaltofen et al., and others. The focus of the existing results is to quantify the required precision in the numerical methods (usually high) and the deterioration of the bound as the numerical certificates are "rounded" to rational ones. We present a new, dual approach to rounding numerical certificates to exact ones. The method is motivated by interior-point theory and does not require high-precision numerical solutions, but allows for the exactly certified bound to be more precise than what is achievable using purely numerical methods. Computational results demonstrate that in the extreme case the exactly certified bound can be within machine epsilon of the true minimum of the polynomial. (Received January 09, 2020)