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**James Saunderson\*** (jamesfs@uw.edu) and **Hamza Fawzi** (hfawzi@mit.edu). *Matrix geometric means and semidefinite optimization.*

The weighted geometric mean of two positive scalars has a natural generalization to a pair of positive definite matrices. It is jointly matrix concave in its two arguments, a fact which leads to the joint concavity/convexity of many remarkable functions arising in matrix analysis and quantum information theory. We show how to express the (hypograph of the) weighted matrix geometric mean in terms of the feasible region of a semidefinite optimization problem, whenever the weight is rational. The size of our semidefinite description depends only on the logarithm of the denominator of the rational weight. This allows us to use standard software for semidefinite optimization to approximately solve optimization problems involving the quantum relative entropy function, among others. (Received September 18, 2015)