

1145-VP-1447      **Samuel C Gutekunst\*** (scg94@cornell.edu) and **David P Williamson**. *Semidefinite Programming Relaxations of the Traveling Salesman Problem*.

We study a semidefinite programming relaxation of the traveling salesman problem introduced by de Klerk, Pasechnik, and Sotirov [SIAM J. Optim., 19 (2008), pp. 1559–1573] and based on methods from algebraic graph theory. We begin by motivating this relaxation with a new, direct proof of its validity and discussing its relationship to association schemes. We then sketch our main result: the integrality gap of this relaxation is unbounded. Our proof involves searching for highly symmetric feasible solutions; the problem of finding such solutions reduces to finding feasible solutions for a related linear program which we can do analytically. These solutions imply several corollaries that help us better understand the semidefinite program and its relationship to other relaxations of the traveling salesman problem. (Received September 21, 2018)