1135-15-2824 **Sima Ahsani*** (sza0043@auburn.edu), 221 Parker Hall, Auburn University, Auburn, AL 36849.
Inequalities Related to Geometric Mean of Matrices. Preliminary report.

An $n \times n$ complex matrix A is called positive definite if it is hermitian and all its eigenvalues are positive. The set of all positive definite matrices denoted by $\mathbb{P}_n$ and form a Riemannian manifold. The geodesic connecting $A, B \in \mathbb{P}_n$, is $\gamma(t) = A^{\frac{1}{2}}(A^{-\frac{1}{2}}BA^{-\frac{1}{2}})^t A^{\frac{1}{2}}, t \in [0,1]$, and the midpoint of it for $t = \frac{1}{2}$ is called the geometric mean of A and B and denoted as $A\sharp B$. Audenaert recently proved that for commuting pairs of positive definite matrices A_i and $B_i, i = 1, \dots m$ and for any unitary invariant norm $\|.\|$

$$\|\sum_{i=1}^{m} A_i B_i\| \leq \|(\sum_{i=1}^{m} A_i^{1/2} B_i^{1/2})^2\| \leq \|\big(\sum_{i=1}^{m} A_i\big)\big(\sum_{i=1}^{m} B_i\big)\|.$$

We will talk about similar inequalities in the non-commuting case when matrix multiplication is replaced with the geometric mean. Also, Numerical counterexamples will be given for some related inequality questions. (Received September 26, 2017)