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 $\gamma(t) = A^{1/2}(A^{-1/2}BA^{-1/2})^tA^{1/2}, t \in [0, 1]$, 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 $B_i, i = 1, \ldots, m$ and for any unitary invariant norm $\| \cdot \|$ 

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

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)