Given a Hermitian matrix $A \in M_n(\mathbb{C})$, associate a simple, undirected graph $G(A)$ where $V(G) = \{1, 2, \ldots, n\}$ and $E(G) = \{ij \mid a_{ij} \neq 0, i \neq j\}$. The collection of all Hermitian matrices that share a common graph $G$ is denoted $\mathcal{H}(G)$. The problem of finding the multiplicities of the eigenvalues among the matrices in $\mathcal{H}(G)$ has received much attention recently. In this presentation we consider $\mathcal{P}(G) \subset \mathcal{H}(G)$ where $\mathcal{P}(G)$ is the set of all positive semidefinite matrices corresponding to $G$. The minimum semidefinite rank of $G$, denoted $\text{msr}(G)$, is defined to be the minimum rank among all matrices in $\mathcal{P}(G)$.

To each vertex $i$ in a graph $G$ we associate a vector $\vec{v}_i \in \mathbb{C}^m$ such that for $i \neq j$, $ij \in E(G)$ if and only if $\langle \vec{v}_i, \vec{v}_j \rangle \neq 0$. The set of vectors $\{\vec{v}_1, \vec{v}_2, \ldots, \vec{v}_n\}$ is called a vector representation of $G$. Using vector representations we present results on finding the $\text{msr}(G)$ when $G$ is written as a “vertex sum” of two graphs $G_1$ and $G_2$ that share a cut set of at most two vertices. Lastly, a classification of all graphs with $\text{msr}(G) = |G| - 2$ will be discussed. (Received July 25, 2007)