

| | |
|---------------------------------------|---|
| Woodbury Matrix Identity | $(A + UCV)^{-1} = A^{-1} - A^{-1}U(C^{-1} + VA^{-1}U)^{-1}VA^{-1}$ |
| Sherman Morrison Formula | Given invertible $A \in R^{n \times n}$ and $u, v \in R^n$ vectors. Then $A + uv^T$ is invertible iff $1 + v^T A^{-1}u \neq 0$. Then $(A + uv^T)^{-1} = A^{-1} - \frac{A^{-1}uv^T A^{-1}}{1 + v^T A^{-1}u}$ |
| Cauchy Schwarz Inequality | $ \langle U, V \rangle \leq \langle U, U \rangle \langle V, V \rangle$ |
| Markov Inequality | X is a non-negative rv and $a > 0$ then $P(X \geq a) \leq \frac{E(X)}{a}$ |
| Minkowski inequality | $\ f + g\ _p \leq \ f\ _p + \ g\ _p$ |
| Holder Inequality | Let $p, q \in [1, \infty], 1/p + 1/q = 1$. Then for all real/complex functions $f, g, \ fg\ _1 \leq \ f\ _p \ g\ _q$ |
| Jensen Inequality | Given X is a rv and ϕ is convex. Then $\phi(E(X)) \leq E(\phi(X))$ |
| Johnson Lindenstrauss Property | A distribution on matrices $S \in R^{k \times n}$ has (ϵ, δ, l) -JL moment property if $\forall x \in R^n, \ x\ _2 = 1, E_S(\ Sx\ _2^2 - 1 ^l) \leq \epsilon^l \delta$ |
| Hoeffding Inequality | Let X_1, \dots, X_n be independent rv in $[0, 1]$. Let $\bar{X} = \frac{1}{n} \sum_i X_i$. Then $P(\bar{X} - E(\bar{X}) \geq t) \leq \exp(-2nt^2)$ |
| Chebyshev Inequality | $P(X - E(X) \geq a) \leq \frac{Var(X)}{a^2}$ |
| Golden Thompson | For Hermitian matrices A, B $tr \exp(A + B) \leq tr(\exp(A) \exp(B))$ |