

Linear Algebra

$A+B$ has result, only if A and B have same dim

$Ax=x_1*a_1+...+x_n*a_n$ result is vector

$A*B$ row of A times column of B, result is matrix

A^T row becomes column and vice versa

Properties of transpose

- (1) if A is (m x n) A^T is (n x m)
- (2) $(A^T)^T=A$
- (3) $(A+B)^T=A^T+B^T$
- (4) $(AB)^T = B^T A^T$
- (5) $(tA)^T=tA^T$

Inverse of Matrix $AA^{-1}=I=A^{-1}A$

Properties of invertible matrix

- $(A^{-1})^{-1}=A$
- $(AB)^{-1}=B^{-1}A^{-1}$
- $(A^T)^{-1}=(A^{-1})^T$

Singular value decomposition $A = U\Sigma V^T$

what means that every vector-matrix-multiplication can be viewed as a 3 step process

- (1) rotation into space V
- (2) scaling by singular value
- (3) rotation into new space U

Eigen value decomposition $A = Q\Lambda Q^{-1}$

this is only possible, if A *and* Q are square matrices

Linear regression

Model $y = X\theta^* + z$

Risk

Ridge regression

Logistic Regression

Support Vector Machines

Neuronal Networks



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