**Northeastern University**                                          May 27, 2022
**College of Engineering**                                          Assignment 1
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# IE 7374: Machine Learning

Prove that $X^T X + \lambda \mathrm{I}$ $is$ $PD$

**Answer to Question**

$\exists Z \neq 0 \in R^n$,
$let\ Z^T(X^T X + \lambda I)Z = Z^T X^T X Z + \lambda Z^T Z = (XZ)^T(XZ) + \lambda Z^T Z = \|XZ\|^2 + \|Z\|^2 > 0$
$So, X^T X + \lambda I\ is\ PD.$