

On Ridge Operators

Yoshio Takane

Department of Psychology, McGill University

takane@psych.mcgill.ca

Abstract

Let X be an n by p matrix, and define $R_X = X(X'X + \lambda P_{X'})^{-1}X'$ which we call ridge operator, where λ is a nonnegative constant (called ridge parameter), and $P_{X'} = X'(XX')^{-1}X$. In this paper we discuss various properties of $R_X(\lambda)$ and derive additive decompositions of this matrix similar to those of $P_X \equiv R_X(0) = X(X'X)^{-1}X'$, orthogonal projector onto the range space of X . These properties and decompositions are useful, especially in ridge estimation of reduced rank regression and multiple-set canonical correlation analyses.