Indefinite Kernel Logistic Regression

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Motivation

Kernel could be indefinite due to *domain-specific structure*, *noises*, *difficult to verify the Mercer condition*, *etc.*

Goal: Positive definite kernels in **Kernel Logistic Regression (KLR)**

$\implies$ KLR with indefinite kernels

$$\textbf{Model}: \quad \min_{\boldsymbol{\beta}} \frac{\lambda}{2} \boldsymbol{\beta}^\top \underbrace{\mathbf{K}}_{\triangleq \; \mathbf{K}_+ - \mathbf{K}_-} \boldsymbol{\beta} + \frac{1}{n} \mathbf{1}^\top \ln\left(\mathbf{1} + \exp(-\mathbf{Y} \underbrace{\mathbf{K}}_{\mathbf{K}_+ - \mathbf{K}_-} \boldsymbol{\beta})\right), \quad (1)$$

where $\mathbf{K}_+$ and $\mathbf{K}_-$ are two positive semi-definite matrices.

Optimization: Difference of convex algorithm

Accelerate: obtain an **inexact** solution in the inner loop

- with theoretical guarantees by *the upper error bound*