Poster Formulas

Multiple regression

$$\mathbf{Y} = \mathbf{X}\beta + \varepsilon$$

Ordinany least squares

$$\hat{\beta}_{OLS} = \arg\min_{\beta} \left\{ \|\mathbf{Y} - \mathbf{X}\beta\|_2^2 \right\}$$

Ridge

$$\hat{\beta}_{Ridge} = \arg\min_{\beta} \left\{ \|\mathbf{Y} - \mathbf{X}\beta\|_2^2 + \lambda\|\beta\|_2^2 \right\}$$

KPR model

$$\mathbf{Y} = \mathbf{Z}\beta + \mathbf{E}\eta + \varepsilon$$

KPR fit

$$\hat{\beta}_{KPR}, \hat{\eta} = \arg\min_{\beta,\eta} \left\{ \|\mathbf{Y} - \mathbf{Z}\beta - \mathbf{E}\eta\|_H^2 + \lambda\|\beta\|_{Q^{-1}}^2 \right\}$$

Usage

```
library(KPR)
data(yatsunenko)

age <- yatsunenko$age
counts <- yatsunenko$raw.counts
patristic <- yatsunenko$patristic
geo <- yatsunenko$geography
unifrac <- yatsunenko$unifrac

Q <- generateSimilarityKernel(patristic)
```

```
## Correcting small and negative eigenvalues
```

```
counts.clr <- log(counts + 1) - apply(log(counts + 1), 1, mean)
Z <- apply(counts.clr, 2, function(x) x - mean(x)) # column center the centered log ratio counts
Y <- age - mean(age)
E <- model.matrix(~ geo)[,-1]
H <- generateSimilarityKernel(unifrac)
```

```
## Correcting small and negative eigenvalues
```

```
library(KPR)
kpr.out <- KPR(designMatrix = Z, covariates = E, Y = Y, Q = Q, H = H)
```